

**DIVISION OF DIGITAL
SCIENCES**

LIST OF NEW COURSES

S. No.	Course Code	Course Title	Credits			
			L	T	P	C
1	24CA3001	Intelligent Agent Based Computing	3	0	0	3
2	24CA3002	Advanced Computer Architecture	3	0	0	3
3	24CA3003	Artificial Intelligence in Bioinformatics	3	0	0	3
4	24CA3004	Reinforcement Learning	3	0	0	3
5	24CA3005	Cognitive Computing	3	0	0	3
6	24CA3006	Pattern Matching and Anomaly Detection	3	0	0	3
7	24CA3007	Data Science with Julia Programming	3	0	0	3
8	24CA3008	Data Science with Julia Programming Laboratory	0	0	2	2
9	24CA3009	Video Analytics	3	0	0	3
10	24CA3010	Full Stack Web Development	3	0	0	3
11	24CA3011	Full Stack Web Development Laboratory	0	0	2	2
12	24CA3012	Artificial Intelligence in Healthcare	3	0	0	3
13	24CA3013	Data Storage Technologies and Networking	3	0	0	3
14	24CA3014	Nature Inspired Computing	3	0	0	3
15	24CA3015	Cyber Threat Intelligence	3	0	0	3

Course Code	INTELLIGENT AGENT BASED COMPUTING	L	T	P	C
24CA3001		3	0	0	3
Course Objectives:					
Enable the student to: 1. Gain knowledge on the architecture of agents 2. Represent the agents’ knowledge, reasoning, learning and the relationships among them 3. Explore the usage of multi – agents					
Course Outcomes:					
The student will be able to: 1. Examine the architecture of agents and social impact 2. Analyze the act of agents in problem situations 3. Determine the learning and reasoning of agents in uncertain situations 4. Analyse the relationships among the agents in complex environments 5. Explore the concepts of modelling methods of multi-agents 6. Explore the knowledge in developing multi agent systems					
Module: 1	Agents in the World				9 Hours
Artificial Intelligence and Agents: What is Artificial Intelligence – A Brief History of Artificial Intelligence – Agents situated in Environments – Prototypical Applications – Agent Design Space – Designing Agents – Social Impact – Agents Architecture and Hierarchical Control: Agents and Environments – Hierarchical Control – Designing Agents – Social Impact.					
Module: 2	Reasoning and Planning with Certainty				9 Hours
Searching for Solutions: Problem Solving as Search – Search spaces – Graph Searching – Generic Searching Algorithm – Uninformed Search Strategies – Heuristic Search – Pruning the search space – Search Refinements – Social Impact – Reasoning with Constraints – Propositions and Inference – Deterministic Planning.					
Module: 3	Learning and Reasoning with Uncertainty				9 Hours
Reasoning with Uncertainty: Probability- Independence – Belief Networks – Probabilistic Inference – Exact probabilistic inference – sequential probability models – stochastic simulation – Social impact – Learning with Uncertainty: Probabilistic learning - Bayesian Learning – Learning Belief networks – social impact- Causality: Probabilistic causal models – missing data – inferring causality – Instrumental variables – counterfactual Reasoning.					
Module: 4	Representing Individuals and Relations				9 Hours

Individuals and Relations: Exploiting Relational structure – Symbols and Semantics – Predicate Calculus – Datalog – Proofs and Substitutions – Function Symbols and Data structures- Applications in Natural Language – Equality – Complete Knowledge assumption- Social impact - Knowledge Graphs and Ontologies – Relational Learning and Probabilistic Reasoning.

Module: 5	The Technical Foundation of a Multi-Agent system	9 Hours

Introduction - The Structure of an Agent - The Structure of a Multi-Agent System - Modeling Methods of a Multi-Agent System - The Communication and Interaction Model of a Multi-Agent System - The Interaction Protocol for a Multi-Agent System.

Total Lectures	45 Hours

Reference Books

- David L. Poole, Alan K. Mackworth (2023), *Artificial Intelligence: Foundations of Computational Agents* (3rd edition). Cambridge University Press. ISBN No. 978-1009258197.
- Jie Zhang (2017), *Multi-Agent-Based Production Planning and Control*. Wiley Publications. ISBN No. 978-1118890080.
- Fouad Sabry (2023), *Intelligent Agent: Fundamentals and Applications*. One Billion Knowledgeable Publishers, ISBN No. 978-3540634119.
- Gerhard Weiss (2016), *Multiagent Systems* (2nd edition). MIT Press Publishers. ISBN No. 978-0262533874.
- Olivier Boissier, Rafael H. Bordini, Jomi Hubner, Alessandro Ricci (2020), *Multi-Agent Oriented Programming: Programming Multi-Agent Systems Using JaCaMo*. MIT Press Publishers. ISBN No. 978-026253387478.

Recommended by Board of Studies	17.04.2024

Approved by Academic Council	11.05.2024

Course Code	ADVANCED COMPUTER ARCHITECTURE	L	T	P	C
24CA3002		3	0	0	3

Course Objectives:

Enable the student to:

- Explore pipeline architectures and analyze the performance considerations
- Investigate emerging memory technologies and their impact on overall system performance
- Examine the architecture of multicore systems, parallel programming, and their role in enhancing overall system performance

Course Outcomes:

The student will be able to:

- Analyze the role pipeline architectures play in improving the performance of modern processors
- Explore the stages of execution of Instructions
- Utilize advanced problem-solving skills to evaluate the efficiency of memory hierarchy, caching mechanisms, and emerging memory technologies
- Analyze and optimize memory system performance
- Design and implement parallel programming solutions for multicore systems
- Demonstrate the ability to design secure architectures and understand their implications in real-world scenarios

Module: 1	Fundamentals of Computing Architecture	9 Hours

Out-of-order Pipelines: In-order Pipelines - Performance Considerations - Out-of-order Pipelines - Fetch and Decode Stages: Instruction Delivery from the I-Cache - Discussion on various types of Problems.

Module: 2	Stages of Execution	9 Hours

Issue, Execute and Commit Stages: Instruction Renaming - Dispatch, Wakeup and Select - The Load-Store Queue - Instruction Commit. Alternative Approaches: Load Speculation - Replay Mechanisms.

Module: 3	Caches and Graphics Processors	9 Hours

Caches: Memory Hierarchy and the notion of Caches - Virtual Memory - Instruction Prefetching - Graphics Processors: Traditional GPUs - General Purpose Graphics Processors.		
Module: 4	Main Memory	9 Hours
Main Memory: Dynamic RAMs - Design Space of DRAMs - DRAM Timing - Memory Controller - Emerging Memory Technologies - Roofline Model.		
Module: 5	Advanced Architecture	9 Hours
Multicore Systems: Parallel Programming - Secure Processor Architectures: Data Encryption - Hashing and Data Integrity - Secure Architectures - Architectures for Machine Learning: Basics of Deep Learning - Intra-PE Parallelism - Optimization - Memory System Organization.		
Total Lectures		45 Hours
Reference Books		
1.	Smruti R. Sarangi (2021), <i>Advanced Computer Architecture</i> . McGraw Hill. ISBN No. 978-9390727490.	
2.	Parthasarathy (2011), <i>Advanced Computer Architecture</i> . Tata McGraw Hill Education. ISBN No. 978-8182093126.	
3.	Kai Hawang, Naresh Jotwani (2015), <i>Advanced Computer Architecture</i> . McGraw Hill. ISBN No. 978-9339220921.	
4.	Jim Ledin (2022), <i>Modern Computer Architecture and Organization</i> . Packt Publishing. ISBN No. 978-1803234519.	
5.	Steve Alten (2021), <i>Computer Architecture and Parallel Processing</i> . Ed Tech Press. ISBN No. 978-1788826334.	
6.	Richard Y. Kain (2015), <i>Advanced Computer Architecture: A Systems Design Approach</i> . PHI, ISBN No. 978-9332551923.	
Recommended by Board of Studies		17.04.2024
Approved by Academic Council		11.05.2024

Course Code	ARTIFICIAL INTELLIGENCE IN BIOINFORMATICS	L	T	P	C
24CA3003		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire adequate knowledge on artificial intelligence 2. Interpret Sequence and structure analysis 3. Implementing Biological Networks and pathway Analysis in Bioinformatics					
Course Outcomes:					
The student will be able to: 1. Explore the concept of artificial intelligence in bioinformatics 2. Examine intelligent agents in bioinformatics 3. Apply the structure, sequence analysis in biological data 4. Examine the omics sciences, biological networks and pathway analysis 5. Develop knowledge extraction from biomedical texts 6. Explore the challenges of artificial intelligence in bioinformatics					
Module: 1	Explainability of AI methods				9 Hours
Artificial intelligence and bioinformatics - Artificial intelligence in medicine: a short tale. Explainability of AI methods- Introduction- Explainable models in machine learning- Application of explainable AI in medicine.					
Module: 2	Intelligent Agents, Sequence Analysis				9 Hours
Intelligent agents - Introduction - Types of intelligent agents - Agent-oriented programming frameworks- Sequence analysis - Introduction - String similarity methods - Dynamic programming algorithm for edit distances - Multi-parameterized edit distances - Alignment free sequence comparison.					
Module: 3	Structure analysis- Omics sciences				9 Hours

Structure analysis -Introduction- Protein secondary structure prediction -Tertiary structure prediction - Omics sciences - Introduction – Genomics -Transcriptomics - Epigenomics - Proteomics – Metabolomics - Interactomics - Gene prioritization.		
Module: 4	Biological Networks analysis, pathway Analysis	9 Hours
Introduction - Modeling Processes and Workflow - Evaluation Metrics - Parameters and Hyperparameters - Tests, Statistical Power, and the Size of an Effect - Data Variance - Ethics of Intelligence: Introduction - Principles and Values for Machine Learning and AI - Health Intelligence - Policies for Managing Data and Information. Biological networks analysis- Introduction - Networks in biology- Motif discovery- Network embedding (representation learning) - Networks alignment- Biological pathway analysis – Introduction - Biological pathways - Pathway databases - Pathway representation formats - Pathways enrichment analysis methods - Pathway enrichment analysis tools.		
Module: 5	Knowledge extraction from biomedical texts, AI in Bioinformatics	9 Hours
Knowledge extraction from biomedical texts – Introduction - A primer on text analysis - Biomedical text mining tasks - Artificial intelligence in bioinformatics: issues and challenges – Introduction - Evolution of bioinformatics- Challenges for artificial intelligence in bioinformatics.		
Total Lectures		45 Hours
Reference Books		
1.	Mario Cannataro, Pietro Hiram Guzzi, Giuseppe Agapito, Chiara Zucco, Marianna Milano (2022), <i>Artificial Intelligence in Bioinformatics, From Omics Analysis to Deep Learning and Network Mining</i> . Elsevier. ISBN No. 978-0128229521.	
2.	Nils J. Nilsson (2014), <i>Artificial Intelligence A New Synthesis</i> . Morgan Kaufmann Publishers. ISBN No. 978-8181471901.	
3.	Denis Roathman (2020), <i>Artificial Intelligence by Example</i> . Packt Publishing. ISBN No. 978-1839211539.	
4.	Stuart J. Russell and Peter Norvig (2010), <i>Artificial Intelligence A Modern Approach</i> . Pearson Education, ISBN No. 978-0136042594.	
5.	Louis J Catania (2021), <i>Foundation of Artificial Intelligence in Healthcare and Bioscience</i> , Elsevier. ISBN No. 978-0128244777.	
Recommended by Board of Studies		17.04.2024
Approved by Academic Council		11.05.2024

Course Code	REINFORCEMENT LEARNING	L	T	P	C
24CA3004		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire the knowledge on reinforcement learning 2. Comprehend reinforcement learning techniques 3. Explore various agents and applications of reinforcement learning					
Course Outcomes:					
The student will be able to: 1. Analyze the basics of reinforcement learning 2. Explore various value-based reinforcement learning techniques 3. Examine different levels of agents 4. Apply markov and monte carlo algorithms 5. Explore advanced techniques and applications in RL 6. Implement policy gradient methods					
Module: 1	Introduction	9 Hours			
Reinforcement Learning: Elements, Examples, limitations and scopes, three machine learning paradigm - Multi armed Bandits: k-armed bandit problem, action value methods - 10-armed test bed - incremental implementation - tracking a non-stationary problem - optimistic initial values - gradient bandit algorithm.					

Module: 2	Finite Markov decision process	9 Hours
The agent environment interface - Goals and rewards - returns and episodes - unified notation for episodic and continuing tasks - policies and value functions - optimal policies and optimal value functions - optimality and approximation functions, monte carlo prediction.		
Module: 3	Value based reinforcement Learning	9 Hours
Tabular value based: sequential decision problems, tabular value based agents, classic gym environments, Deep value-based: Large, high dimensional problems, Deep value based agents, Atari 2600 Environments, policy based agents, learning and planning agents, high dimensional environments.		
Module: 4	Meta, Multi, Hierarchical reinforcement Learning	9 Hours
Transfer learning and meta learning agents, meta learning environments, multi agent problems, agents, environments, hierarchical reinforcement learning: granularity of the structure of problems, divide and conquer for agents, hierarchical environments.		
Module: 5	Knowledge extraction from biomedical texts, AI in Bioinformatics	9 Hours
TD Gammon, Samuel's checkers player - Watson's daily double wagering - optimizing memory control - Human level video Game play - mastering the game of GO - personalized web services - Thermal soaring.		
Total Lectures		45 Hours
Reference Books		
1.	Aske Plaat (2023), <i>Deep Reinforcement Learning</i> . Springer Nature. ISBN No. 978-9811906381.	
2.	Richard S. Sutton and Andrew G Barto (2018), <i>Reinforcement Learning An Introduction</i> . MIT Press Cambridge, ISBN No. 978-262193986.	
3.	Hao Dong,Zihan Ding, Shanghang zhang (2020), <i>Deep Reinforcement Learning Fundamentals Research and Applications</i> , ISBN No. 978-9811540950.	
4.	Mohit sewak (2019), <i>Deep Reinforcement Learning</i> , Springer. ISBN No. 978-9811382857.	
Recommended by Board of Studies		17.04.2024
Approved by Academic Council		11.05.2024

Course Code	COGNITIVE COMPUTING	L	T	P	C
24CA3005		3	0	0	3
Course Objectives:					
Enable the student to:					
1. Acquire adequate knowledge on cognitive computing design principles					
2. Explore the algorithms about AI and machine learning along with cognitive computing					
3. Recognize the cognitive computing supports for human reasoning by evaluating data in context.					
Course Outcomes:					
The student will be able to:					
1. Acquire the knowledge of cognitive computing and its differences from traditional Approaches of Computing.					
2. Explore the knowledge about AI and machine learning along with cognitive computing					
3. Explore primary tools associated with cognitive computing					
4. Recognize the cognitive computing supports for human reasoning by evaluating data in context					
5. Explore the analytics used in cognitive computing					
6. Create project that leverages cognitive computing					
Module: 1	The Foundation of Cognitive Computing	9 Hours			
Cognitive Computing as a New Generation-The Uses of Cognitive Systems - What Makes a System Cognitive? - Domains Where Cognitive Computing Is Well Suited - Artificial Intelligence as the Foundation of Cognitive Computing - Understanding Cognition - The Two Systems of Judgment and Choice - System 1—Automatic Thinking; Intuition and Biases - System 2—Controlled, Rule-Centric, and Concentrated Effort-Elements of a Cognitive System - Infrastructure and Deployment Modalities.					

Module: 2	Design Principles for Cognitive Systems	9 Hours
Components of a Cognitive System - Bringing Data into the Cognitive System - Leveraging Internal and External Data Sources - Data Access and Feature Extraction Services - Hypotheses Generation and Scoring - Hypothesis Generation - Hypothesis Scoring - Presentation and Visualization Services.		
Module: 3	Role of NLP in Cognitive Computing	9 Hours
Role of NLP in a Cognitive System - Applying Natural Language Technologies to Business Problems - Enhancing the Shopping Experience - Leveraging the Connected World of Internet of Things - Fraud Detection - Representing Knowledge in Taxonomies and Ontologies.		
Module: 4	Advanced Analytics to Cognitive Computing	9 Hours
Advanced Analytics Is on a Path to Cognitive Computing- Key capabilities in Advanced Analytics - Acquiring the Relevant Data Sources- Creating and Refining the Corpora- Training and Testing - Text Analytics - Image Analytics -Speech Analytics - IBM Watson - Why Cloud Services Are Fundamental to Cognitive Computing Systems.		
Module: 5	Building a Cognitive Application	9 Hours
Building a Cognitive Healthcare Application: Foundations of Cognitive Computing for Healthcare- Constituents in the Healthcare Ecosystem- Learning from Patterns in Healthcare Data - Cognitive Applications across the Healthcare Ecosystem- Starting with a Cognitive Application for Healthcare Smarter Cities: Cognitive Computing in Government: The Characteristics of a Smart City- The Rise of the Open Data Movement Will Fuel Cognitive Cities - The Internet of Everything and Smarter Cities.		
Total Lectures		45 Hours
Reference Books		
1.	Judith S.Hurwitz, Marcia Kaufman and Adrian Bowles (2015), <i>Cognitive Computing and Big Data Analytics</i> . John Wiley & Sons Indianapolis. ISBN No. 978-1118896624.	
2.	Peter Fingar (2015), <i>Cognitive Computing: A Brief Guide for Game Changers</i> . PHI Meghan-Kiffer Press, ISBN No. 9780929652511.	
3.	Gerardus Blokdyk (2018), <i>Cognitive Computing Complete Self-Assessment Guide</i> . CreateSpace. ISBN No. 978-1489140364.	
4.	Rob High, Tanmay Bakshi (2019), <i>Cognitive Computing with IBM Watson: Build smart applications using Artificial Intelligence as a service</i> . IBM Book Series. Packt Publishing, ISBN No. 978-1788478984.	
5.	Neil Stillings, Steven E. Weisler, Christopher H. Chase and Mark H. Feinstein (2018), <i>Cognitive Science: An Introduction</i> ". MIT Press. ISBN No. 978-0262691758.	
Recommended by Board of Studies		17.04.2024
Approved by Academic Council		11.05.2024

Course Code	PATTERN MATCHING AND ANAMOLY DETECTION	L	T	P	C
24CA3006		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire the concepts, principles, trade-offs, and techniques in pattern matching 2. Select suitable pattern recognition technique and effectively apply it to solve real-world problems 3. Define the types of anomaly detection methods					
Course Outcomes:					
The student will be able to: 1. Identify the techniques involved in pattern recognition 2. Categorize the types of feature extraction and classification techniques for pattern recognition 3. Illustrate pattern matching using different machine learning classifiers 4. Apply classification techniques for pattern recognition for different applications 5. Apply anomaly detection algorithms on real-time data 6. Apply Explainable AI techniques for anamoly detection					

Module: 1	Introduction to pattern recognition	9 Hours
Pattern recognition system - design cycle - learning and adaptation - clustering and machine learning- Features and Patterns-types of features-proximity measures.		
Module: 2	Feature extraction and feature selection	7 Hours
Types of feature selection-Mutual information for feature selection-Chi-square Statistic-Goodman-Kruskal Measure-Laplacian Score-Singular Value Decomposition (SVD)-Non- negative Matrix Factorization (NMF)-Random Projections (RPs) for Feature Extraction - Locality Sensitive Hashing (LSH)-Class Separability-Genetic and Evolutionary Algorithms - Ranking for Feature Selection-Feature Selection for Time Series Data.		
Module: 3	Anomaly Detection	9 Hours
Anomaly detection - Categories-styles of anomaly detection - uses of anomaly detection- traditional anomaly detection techniques - Introduction to deep learning - autoencoders - LSTM for anomaly detection.		
Module: 4	Temporal Convolution Neural Network	10 Hours
What Is a Temporal Convolutional Network? Dilated Temporal Convolutional Network - Anomaly Detection with the Dilated TCN - Encoder-Decoder Temporal Convolutional Network		
Module: 5	Explainable AI for anomaly detection	10 Hours
Understanding the basics of XAI, significance of XAI, NLP Anomaly explainability, Time series anomaly explainability, Computer vision anomaly explainability.		
Total Lectures		45 Hours
Reference Books		
1.	Cher Simon (2023), <i>Deep Learning and XAI Techniques for Anomaly Detection: Integrate the theory and practice of deep anomaly explainability</i> . Packt Publishing. ISBN No. 978-1804617755.	
2.	V. Susheela Devi, M. Narasimha Murty (2015), <i>Introduction To Pattern Recognition And Machine Learning (Iisc Lecture Notes Series Book 5)</i> . World Scientific Publishing, ISBN No. 978-9814335454.	
3.	Christopher Bishop (2016), <i>Pattern Recognition and Machine Learning</i> . Springer. ISBN No. 978-1493938438.	
4.	Suman Kalyan Adari, Sridhar Alla (2019), <i>Beginning Anomaly Detection Using Python-Based Deep Learning</i> . APress. ISBN No. 1484251768.	
5.	Richard O. Duda, Peter E. Hart, David G. Stork (2007), <i>Pattern Classification (2nd Edition)</i> . Springer. ISBN No. 978-0471056690.	
Recommended by Board of Studies		17.04.2024
Approved by Academic Council		11.05.2024

Course Code	DATA SCIENCE WITH JULIA PROGRAMMING	L	T	P	C
24CA3007		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire adequate knowledge in Julia Programming 2. Perform data preprocessing techniques 3. Analyze data using libraries in Julia					
Course Outcomes:					
The student will be able to: 1. Expertise in Juila programming to solve computational problems 2. Apply various data structures to effectively manage data 3. Develop programs using functions and control flow statements 4. Apply data preprocessing techniques 5. Analyze data to interpret the knowledge 6. Create visualization to identify the insights of the data					

Module: 1	Introduction	9 Hours
Introduction - JIT compiler - Brief history - Procedural Programming Vs OOP- Object -Type of object- Object Reference – Variables - Basic Math with Julia: REPL, Some Experiment with numbers, Data type for Integers and Real Numbers, Type Assignment, Arbitrary precision arithmetic, Numerical Conversion, Arithmetic Operators, Boolean numbers, updating operators, Operator precedence.		
Module: 2	Data Structures in Julia	9 Hours
Introduction to Arrays – Construction - Properties of Arrays – Indexing - Filling Arrays with values - Reshaping Arrays – Sorting - Finding items in Arrays - Copying an Array – Comprehension - Generator Expressions - Assignment Operator and Arrays – Dictionary - Strings: Introduction - ASCII System- Unicode System – Characters - Corresponding integer values - +operator and characters - + operator and Strings – Concatenation – Interpolation - Strings are like Arrays – Common String functions – Reading Data as Arrays from Strings.		
Module: 3	Functions and Control Flow Statements	9 Hours
Introduction to functions - Defining a simple Julia function – Multiple Dispatches – Operators defined as functions – Introduction to Control Flow – Ternary Expressions – Boolean Switching – if – else – for loop – while loop – Nested Loops – do – end.		
Module: 4	Handling Data	9 Hours
Load and Save Files – Index and Summarize – Filter and Subset – Select – Types and Categorical data – Join – Variable Transformations – Group by and Combine – Missing Data – Performance.		
Module: 5	Data Visualization	9 Hours
CairoMakie.jl – Attributes – Create Plot Figure – Create Sheets – Themes – Colors and Colormaps – Layouts – Layers – Layouts – Statistical Visualizations – Plot Customization.		
Total Lectures		45 Hours
Reference Books		
1.	Sundeeep Nagar (2017), <i>Beginning Julia Programming: For Engineers and Scientists</i> . Apress. ISBN No. 978-1484231715.	
2.	Jose Storopoli, Rik Huijzer, Lazaro Alonso (2021), <i>Julia Data Science</i> . Julia DataScience.io publisher. ISBN No: 978-489859165.	
3.	Ivo Balbaert (2018), <i>Getting Started with Julia Programming</i> . Packt Publishing. ISBN No. 978-1783284795.	
4.	Zacharias Voulgaris (2016), <i>Julia for Data Science</i> . Technics Publications. ISBN No. 978-1634621304.	
5.	Paul D. McNicholas, Peter A. Tait (2019), <i>Data Science with Julia</i> . CRC Press. ISBN No. 978-1138499980.	
Recommended by Board of Studies		17.04.2024
Approved by Academic Council		11.05.2024

Course Code	DATA SCIENCE WITH JULIA PROGRAMMING	L	T	P	C
24CA3008	LABORATORY	0	0	2	2
Course Objectives:					
Enable the student to:					
1. Acquire skills in developing programs. 2. Develop programs using libraries in julia. 3. Create high performance computing with Julia.					
Course Outcomes:					
The student will be able to:					
1. Develop programs using comprehensions and generators. 2. Apply modular programming approach for solving problems. 3. Implement data manipulation with Julia. 4. Apply set and dictionaries for solving problems.					

5. Develop parallel programming.
6. Create ensemble models.
LIST OF EXERCISES
1. Implementation of Arrays using comprehensions and generators. 2. Decision making statements. 3. Usage of Iterative statements. 4. Create user defined functions. 5. Creating tuples in julia. 6. Creating sets and dictionaries in Julia. 7. Implement data manipulation with Julia. 8. Perform high performance computing in Julia. 9. Create metaprogramming. 10. Implement regression algorithms on suitable dataset. 11. Implement timeseries analysis. 12. Create ensemble models in Julia.
Recommended by Board of Studies 17.04.2024
Approved by Academic Council 11.05.2024

Course Code	VIDEO ANALYTICS	L	T	P	C
24CA3009		3	0	0	3
Course Objectives:					
Enable the student to: 1. Explore the concepts of image and video processing 2. Investigate emerging technologies in motion analysis and human active recognition 3. Examine the architecture of surveillance systems and the roles of video analytics in business intelligence through case studies					
Course Outcomes:					
The student will be able to: 1. Analyze the basics of image and video processing 2. Explore the basics of video compression and motion analysis 3. Utilize advanced techniques for human active recognition 4. Analyze and prepare an optimal solution for surveillance systems 5. Design and prepare a case study on video analytics for business intelligence 6. Demonstrate the ability to design video analytics concept for business intelligence					
Module: 1	Basics of Image and Video Processing				9 Hours
Basics of Image Processing - Digital Image Processing System - Digital Image Processing Methods - Digital Image Segmentation - Edge Detection - Edge Linking – Thresholding - Region Growing - Region Splitting and Merging - Watershed-Based Segmentation – Applications.					
Module: 2	Basics of Video Compression and Motion Analysis				9 Hours
Video Compression - Motion Segmentation - Optical Flow Methods – Applications - Background Modeling - Background Modeling Techniques - Shadow Detection and Removal - Object Tracking - Object Classification - Object Classification Using Convolutional Neural Networks - Convolutional Neural Network Models.					
Module: 3	Human Activity Recognition				9 Hours
Motion History Image-Based Human Activity Recognition - Hidden Markov Models - HMM-Based Activity Recognition - Dynamic Time Warping-Based Activity Recognition - Abnormal Activity Recognition - Challenges of Intelligent Human Activity Recognition - Video Object Tracking.					
Module: 4	Learning Evaluation for Intelligence				9 Hours
Camera Network for Surveillance - Types of CCTV Cameras - Smart Cameras - Smart Imagers - Multiple View Geometry - Camera Network - Camera Calibration - Surveillance Systems and Applications - Video Content Analytics - Baggage Exchange Detection - Fence-Crossing Detection - Military Applications – Transportation.					

Module: 5	Case Studies on Video Analytics for Business Intelligence	9 Hours
Object Detection and Tracking - Human Age Estimation and Sex Classification - Scene Invariant Crowd Counting and Crowd Occupancy Analysis - Automatic Activity Profile Generation from Detected Functional Regions for Video Scene Analysis - Video Analytics for Business Intelligence.		
Total Lectures		45 Hours
Reference Books		
1.	Maheshkumar H. Kolekar (2018), <i>Intelligent Video Surveillance Systems an Algorithmic Approach</i> . Taylor & Francis. ISBN No. 978-1498767118.	
2.	Caifeng Shan, Fatih Porikli, Tao Xiang and Shaogang Gong (2012), <i>Video Analytics for Business Intelligence</i> . Springer. ISBN No. 978-3642285974.	
3.	Jerry D. Gibson (2000), <i>Hand Book of Image and Video Processing</i> . Academic Press. ISBN No. 0121197905.	
Recommended by Board of Studies		17.04.2024
Approved by Academic Council		11.05.2024

Course Code	FULL STACK WEB DEVELOPMENT	L	T	P	C
24CA3010		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire the basics of web content 2. Design and develop web applications 3. Illustrate the role of databases					
Course Outcomes:					
The student will be able to: 1. Examine the importance of full stack web development 2. Design webpages using HTML and CSS 3. Analyze the various methods of designing web pages 4. Develop Web and Mobile related applications 5. Create web services 6. Visualize the databases used in the web applications					
Module: 1	Understanding the Basics				9 Hours
Terminology – Client and Server - Relationship between URLs, Domains, and IP Addresses - Structure of Web Applications : Creating Web Pages Using HTML - Designing Web Pages with CSS - Making Web Pages Interactive with JavaScript - Making Web Pages Dynamic Using Server-Side Logic - Full Stack Development : Software Stacks – Full Stack developer – Tools for Full Stack developers : Editors-Developer Environments – Browsers.					
Module: 2	Designing Web Pages				9 Hours
Structuring Web pages with HTML – Designing Web pages with CSS – Making Interactive Web pages with Javascript – Using Web APIs.					
Module: 3	Implementing Web Applications				9 Hours
AngularJS - Implementing Single Page Applications – Implementing Mobile Applications Understanding and Using Web Architectures – Using Javascript on the Server side.					
Module: 4	Implementing Web Services				9 Hours
Introduction – SOAP : The Workflow with SOAP -Description of Web Services with WSDL – Structure of SOAP messages – REST : The Workflow with REST – Principles of REST – Implementing a REST API – Calling a REST API.					
Module: 5	Storing data in databases				9 Hours
Relational databases : The functionality of relational databases – SQL – Using relational databases in Node.js - Non relational databases : Relational vs Non relational databases : The functionality of non-relational databases – key-value databases – document-oriented databases.					

Total Lectures		45 Hours
Reference Books		
1.	Philip Ackermann (2023), <i>Full Stack Web Development (1st edition)</i> . Rheinwerk Publishing Inc. ISBN No. 978-1493224388.	
2.	David Herron (2018), <i>Node.js Web Development (4th edition)</i> . Packt Publishing. ISBN No. 978-1788627368.	
3.	Chris Northwood (2018), <i>The Full Stack Developer</i> . Apress Publishers. ISBN No. 978-1484241523.	
4.	Riaz Ahmed (2021), <i>Full Stack Web Development For Beginners</i> . Amazon Digital Services LLC – Kdp Publishers, ISBN No. 978-8738951268.	
5.	Nate Murray, Felipe Coury, Ari Lerner, and Carlos Taborda (2020), <i>The Complete Guide to Angular</i> . California by Fullstack.io. ISBN No. 978-1985170285.	
Recommended by Board of Studies		17.04.2024
Approved by Academic Council		11.05.2024

Course Code	FULL STACK WEB DEVELOPMENT LABORATORY	L	T	P	C
24CA3011		0	0	2	2
Course Objectives:					
Enable the student to: 1. Develop web forms 2. Design and develop web applications 3. Create databases for web applications					
Course Outcomes:					
The student will be able to: 1. Create websites using Javascript, CSS and HTML 2. Develop single page web applications 3. Create and validate forms using ReactJS 4. Create various event handlers using Node.js 5. Create the databases for web applications 6. Develop programs to enable security					
LIST OF EXERCISES					
1. Design a simple web page using HTML. 2. Develop a website using HTML, CSS and Javascript. 3. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and displays the resulting values in an HTML table format. 4. Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXTSHRINKING” in BLUE color. Then the font size decreases to 5pt. 5. Create a simple calculator application using ReactJS. 6. Design a login page using ReactJS. 7. Creating Node.js Application. 8. Create Events, Listeners, Timers, and Callbacks in Node.js. 9. Creating the RESTful Layer for Application. 10. Creating Single-Page Application using AngularJS. 11. Securing RESTful API Using Spring Security. 12. Develop database application for an online grocery application.					
Recommended by Board of Studies		17.04.2024			
Approved by Academic Council		11.05.2024			

Course Code	ARTIFICIAL INTELLIGENCE IN HEALTHCARE	L	T	P	C
24CA3012		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire adequate knowledge on artificial intelligence 2. Interpret healthcare industry and rule-based expert systems 3. Implementing tools and technologies for AI in healthcare					

Course Outcomes:		
The student will be able to:		
1. Explore the concept of human intelligence in healthcare 2. Examine artificial intelligence with rule-based expert systems 3. Apply the principles of robotic process automation in healthcare 4. Examine the evaluation metrics for intelligence 5. Develop digital security and privacy in healthcare artificial intelligence 6. Design and implement the principles of artificial intelligence in healthcare		
Module: 1	Introduction to Human and Artificial Intelligence	9 Hours
Introduction to Human Intelligence - Applications of AI in Healthcare - Knowledge Representation and Reasoning - Types of Knowledge - AI Knowledge Cycle - Primary Approaches to Knowledge Representation - Features of Knowledge Representation System - Techniques of Knowledge Representation - Propositional Logic - Bayesian Belief Network in Artificial Intelligence.		
Module: 2	Artificial Intelligence in Healthcare	9 Hours
Development of Intelligent and Expert Systems in the Healthcare Industry - Difficulties Presented by Big Data - Management of Data and Information - Healthcare-Relevant AI Categories - Rule-Based Expert Systems : Introduction - Expert System - Interacting with Expert Systems - Anatomy of a Rule-Based Expert System - Properties - Inference Methods.		
Module: 3	Robotic Process Automation: A Path to Intelligent Healthcare	9 Hours
Introduction - Applications of RPA in Healthcare - Advantages of Using Robots in Healthcare Processes - Use Cases of Robotic Process Automation in Healthcare - RPA's Potential Impact on the Healthcare Industry - Tools and Technologies for Implementing AI Approaches in Healthcare: Introduction - Importance of Patient Data Management in Healthcare Industry - Participants in Healthcare Information Management - Types of Healthcare Data Management Tools.		
Module: 4	Learning Evaluation for Intelligence	9 Hours
Introduction - Modeling Processes and Workflow - Evaluation Metrics - Parameters and Hyperparameters - Tests, Statistical Power, and the Size of an Effect - Data Variance - Ethics of Intelligence : Introduction - Principles and Values for Machine Learning and AI - Health Intelligence - Policies for Managing Data and Information.		
Module: 5	Security, privacy, and information-sharing aspects of healthcare artificial intelligence	9 Hours
Introduction to digital security and privacy - Security and privacy concerns in healthcare artificial intelligence - Artificial intelligence's risks and opportunities for data privacy - Addressing threats to health systems and data in the artificial intelligence age - Overview of the global health insurance industry - Key challenges facing the health insurance industry - The application of artificial intelligence in the health insurance industry - The limitations of artificial intelligence.		
Total Lectures		45 Hours
Reference Books		
1.	Jyotismita Talukdar, Thipendra P. Singh, Basanta Barman (2023), <i>Artificial Intelligence in Healthcare Industry</i> ". Springer. ISBN No. 978-9819931569.	
2.	Adam Bohr, Kaveh Memarzadeh (2020), <i>Artificial Intelligence in Healthcare</i> . Elsevier. ISBN No. 978-0128184387.	
3.	Ankur Saxena, Shivani Chandra (2021), <i>Artificial Intelligence and Machine Learning in Healthcare</i> . Springer. ISBN No. 978-9811608100.	
4.	Stuart J. Russell and Peter Norvig (2010), <i>Artificial Intelligence A Modern Approach</i> . Pearson Education, Inc. ISBN No. 978-0136042594.	
5.	Louis J Catania (2021), <i>Foundation of Artificial Intelligence in Healthcare and Bioscience</i> . Elsevier. ISBN No. 978-0128244777.	
Recommended by Board of Studies		17.04.2024
Approved by Academic Council		11.05.2024

Course Code	DATA STORAGE TECHNOLOGIES AND NETWORKING	L	T	P	C
24CA3013		3	0	0	3
Course Objectives:					
Enable the student to:					
1. Explore the data storage technologies					
2. Examine the concepts of networking					
3. Investigate the concepts of storage area network and green data centers					
Course Outcomes:					
The student will be able to:					
1. Analyze the roles of network and storage area networks					
2. Explore the principles of ethernet networking concepts					
3. Utilize storage area network as a service for cloud computing					
4. Analyze and enhance security in the storage area network					
5. Design and implement storage area network and green data centers					
6. Demonstrate the ability to design and secure the storage area networks					
Module: 1	Introduction to Network and Storage area networks	9 Hours			
Networks - Interconnection models – Storage - Storage area networks - Storage area network components - The importance of standards or models - Storage area networks - Using a storage area network - Using the storage area network components.					
Module: 2	Ethernet and system networking concepts	9 Hours			
Ethernet - Storage area network IP networking - Delving deeper into the protocols - Multiprotocol solution briefs - Topologies and other fabric services - Port types – Addressing - Fibre Channel Arbitrated Loop protocols - Fibre Channel port initialization and fabric services - Fabric services - Routing mechanisms – Zoning.					
Module: 3	Storage area network as a service for cloud computing	9 Hours			
The cloud - Virtualization and the cloud - SAN virtualization - Building a smarter cloud - Storage area network devices – Components - Gigabit transport technology - Inter-switch links.					
Module: 4	Security in the storage area network	9 Hours			
Security principles - Data security - Storage area network encryption - Encryption standards and algorithms - Security common practices - Disaster backup and recovery - Information lifecycle management - Long-term data retention - Data lifecycle management.					
Module: 5	Storage area networks and green data centers	9 Hours			
Data center constraints - Data center optimization - Green storage - SAN Fibre Channel networking - Entry SAN switches - Mid-range SAN switches - Enterprise SAN directors - Extension switches.					
Total Lectures					45 Hours
Reference Books					
1.	Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan, Kumaravel and Libor Miklas (2017), <i>Introduction to Storage Area Networks</i> , IBM. ISBN No. SG24547008.				
2.	Jeff Kellum (2014), <i>Data Storage Networking</i> . John Wiley & Sons. ISBN No. 978-1118679210.				
3.	Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan and Kumaravel Libor Miklas (2012), <i>Introduction to Storage Area Networks and System Networking</i> . IBM. ISBN No. SG24547004.				
Recommended by Board of Studies			17.04.2024		
Approved by Academic Council			11.05.2024		

Course Code	NATURE INSPIRED COMPUTING	L	T	P	C
24CA3014		3	0	0	3
Course Objectives:					
Enable the student to:					
1. Identify the challenges in bio inspired computing 2. Compare various optimization techniques					

3. Analyze ant colony optimization		
Course Outcomes:		
The student will be able to:		
1. Describe about bio inspired computing fundamentals 2. Illustrate about optimization problems and its types 3. Explore with Genetic algorithm and its applications 4. Compare different Ant Colony Optimization algorithmic models 5. Explore the concepts of swarm techniques 6. Explore ant colony decision forest approach		
Module: 1	Introduction to bio inspired computing	9 Hours
Models of Life and Intelligence - Fundamentals of bio-inspired models and bio-inspired computing. Evolutionary models and techniques, Swarm models and its self-organization, swarm and evolutionary algorithms. Optimization problems – single and multi-objective optimization, heuristic, meta-heuristic and hyper heuristic functions.		
Module: 2	Genetic Algorithm	9 Hours
Genetic algorithms- Fire cannon balls- How to breed solutions – Fire some cannons – How it works - application of genetic algorithm.		
Module: 3	Nature Inspired Swarm	9 Hours
Swarm algorithm – crowd control – How to form a swarm – Working of swarm – Stochastic model- Explore CA with GA.		
Module: 4	Ant Colony Optimization	9 Hours
Classification problem in machine learning- Ant colony optimization as part of swarm intelligence- Ant colony decision tree approach.		
Module: 5	Ant Colony Decision Forest Approach	9 Hours
Ant colony decision forest approach-Adaptive ant colony decision forest approach.		
Total Lectures		45 Hours
Reference Books		
1.	Frances Buontempo, <i>The Practical Handbook of Genetic Algorithms: New Frontiers (1st edition)</i> . O'Reilly. ISBN No. 978-0849325298.	
2.	Jan Kozak (2019), <i>Decision Tree and Ensemble Learning Based on Ant Colony Optimization</i> ISBN No. 978-3319937519.	
3.	Albert Y.Zomaya (2006), <i>Handbook of Nature-Inspired and Innovative Computing</i> , Springer. ISBN No. 978-1860584282.	
Recommended by Board of Studies		17.04.2024
Approved by Academic Council		11.05.2024

Course Code	CYBER THREAT INTELLIGENCE	L	T	P	C
24CA3015		3	0	0	3
Course Objectives:					
Enable the student to: 1. Identify, assess, and respond to cyber threats effectively 2. Classify threat intelligence methodologies 3. Develop a comprehensive understanding of threat intelligence tools					
Course Outcomes:					
The student will be able to: 1. Analyze the principles and frameworks of threat intelligence 2. Apply advanced techniques for collecting and analyzing threat data 3. Develop proficiency in threat actor profiling and attribution 4. Explore the role of machine learning and artificial intelligence in threat intelligence analysis 5. Explore threat hunting and incident response					

6. Assess intelligence findings effectively		
Module: 1	Introduction to Threat Intelligence	9 Hours
Threat Landscape and Cybersecurity Incidents - Knowing the threat landscape - Supply chain attacks - Understanding the motivation - The ransomware that was not - cyber threats - Cyber-attacks targeting IOT devices - Autonomous vehicles - Drones - Electronic voting machines - Cyber-attacks on robots - Cyber threat intelligence - Strategic level - Operational level - Tactical level - The intelligence cycle - Planning and targeting - Processing and exploitation - Analysis and production- Dissemination and integration - The collection process - Indicators of compromise - Understanding malware - Using public sources for collection – OSINT, Honeypots, Malware analysis and sandboxing.		
Module: 2	Identifying and Profiling Threat Actors	9 Hours
Exploring the different types of threat actors - Advanced Persistent Threats (APT) groups - Cyber-mercenaries - Researching adversaries and threat actors - Creating threat actor and campaign profiles. Types of threat hunts - The Pyramid of Pain - The Threat Hunting Maturity Model - Determining our maturity model - The threat hunting process - The Threat Hunting Loop - Threat Hunting Model - The data-driven methodology - TaHiTI – Targeted Hunting Integrating Threat Intelligence.		
Module: 3	Understanding the Cyber Kill Chain and the MITRE ATT&CK Framework	9 Hours
Introducing the Cyber Kill Chain framework - Understanding the MITRE ATT&CK framework - Use cases - Discovering and containing malicious behaviors - The Diamond Model of Intrusion Analysis - Mapping ATT&CK TTPs from CTI reports Case study – a weaponized document. Understanding the data that's been collected - Operating systems basics - Networking basics - Windows-native tools - Windows Event Viewer - Windows Management - Instrumentation (WMI) - Event Tracing for Windows (ETW). Mapping the Adversary - The ATT&CK Framework - Tactics, techniques, sub-techniques, and procedures - The ATT&CK Matrix - The ATT&CK Navigator - Mapping with ATT&CK		
Module: 4	Working with Data and Emulating the Adversary	9 Hours
Using data dictionaries - Open-Source Security Events Metadata - Using MITRE CAR - CARET – The CAR Exploitation Tool - Using Sigma - Creating an adversary - emulation plan - What is adversary emulation? - MITRE ATT&CK emulation plan - Atomic Red Team - Mordor - Caldera - Installing VMware ESXI - Creating our VLAN - Configuring the firewall - Installing Windows Server -Configuring Windows Server as a domain controller - Understanding the structure of Active Directory - Giving the server's domain controller a status - Configuring the DHCP server - Creating organizational Modules - Filling the users - Creating groups - Group Policy Objects - Setting up our audit policy - Adding new clients - Setting up ELK - Configuring Sysmon - Retrieving the certificate - Configuring Winlogbeat.		
Module: 5	Querying Data	9 Hours
Atomic hunting with Atomic - Red Team - The Atomic Red Team testing cycle - Testing for Initial Access - Testing for Execution - Testing for Persistence - Testing for Privilege Escalation - Testing for Defense Evasion - Testing for Discovery - Testing for Command and Control - Invoke-Atomic Red Team - Quasar RAT - Quasar RAT real-world use cases - Executing and detecting Quasar RAT - Testing for persistence.		
Total Lectures		45 Hours
Reference Books		
1.	Roberto Martínez (2022), <i>Incident Response with Threat Intelligence</i> . Packt Publishing. ISBN No. 978-1801072953.	
2.	Valentina Palacín (2021), <i>Practical Threat Intelligence and Data-Driven Threat Hunting</i> ”, Packt Publishing. ISBN No. 978-1838556372.	
3.	Jean Nestor M. Dahj (2022), <i>Mastering Cyber Intelligence</i> . Packt Publishing ISBN No. 978-1800209404.	
4.	Kyle Wilhoit, Joseph Opacki (2022), <i>Operationalizing Threat Intelligence: A guide to developing and operationalizing cyber threat intelligence programs</i> . Packt Publishing. ISBN No. 978-1801814683.	

5.	Valentina Costa-Gazcon (2022), <i>Practical Threat Intelligence and Data Driven Threat Hunting: A handson guide to threat hunting with the ATT&CK (TM) Framework and opensource tools</i> , Packt Publishing. ISBN No. 978-1838556372.	
Recommended by Board of Studies		17.04.2024
Approved by Academic Council		11.05.2024

**DIVISION OF
DIGITAL SCIENCES**

LIST OF NEW / REVISED COURSES

S. No.	Course Code	Course Title	Credits			
			L	T	P	C
1	20CA2053	Machine Learning Lab - I	0	0	1	1
2	20CA2054	Python for Network and Security Lab - I	0	0	1	1
3	20CA2055	Cloud Security Lab - I	0	0	1	1
4	20CA2056	Machine Learning Lab - II	0	0	1	1
5	20CA2057	Python for Network and Security Lab - II	0	0	1	1
6	20CA2058	Cloud Security Lab - II	0	0	1	1
7	21CA2024	Java Programming Lab -I	0	0	1	1
8	21CA2025	Java Programming Lab -II	0	0	1	1
9	23CA2001	Problem Solving using Programming	3	0	0	3
10	23CA2002	Problem Solving Lab	0	0	2	2
11	23CA2003	Fundamentals of Computing Concepts	3	0	0	3
12	23CA2004	Hardware and Computing Lab	0	0	2	2
13	23CA2005	Essentials of Python Programming	3	0	0	3
14	23CA2006	Programming in Python Lab	0	0	2	2
15	23CA2007	Computer Networks	3	0	0	3
16	23CA2008	Operating System Security	3	0	1	4
17	23CA2009	Fundamentals of Object-Oriented Programming	3	0	0	3
18	23CA2010	Object-Oriented Programming Lab	0	0	2	2
19	23CA2011	Data Structures and Applications	3	0	0	3
20	23CA2012	Data Structures Lab	0	0	2	2
21	23CA2013	Fundamentals of General Forensics Science	3	0	0	3
22	23CA2014	Information Security	3	0	0	3
23	23CA2015	Cyber Crimes and Cyber Security	3	0	0	3
24	23CA2016	Fundamentals of Cyber Forensics	3	0	0	3
25	23CA2017	Cyber Forensics Lab	0	0	2	2
26	23CA2018	Web Development	3	0	0	3
27	23CA2019	Web Development Lab	0	0	2	2
28	23CA2020	Security Assessment of Information Systems through Ethical Hacking	3	0	0	3
29	23CA2021	Security Assessment of Information Systems through Ethical Hacking Lab	0	0	2	2
30	23CA2022	Database Security	3	0	0	3
31	23CA2023	Database Security Lab	0	0	2	2
32	23CA2024	Incident Response Management	3	0	0	3
33	23CA2025	Fundamentals of Artificial Intelligence	3	0	0	3
34	23CA2026	Information Security Ethics	3	0	0	3
35	23CA2027	Cyber Security Governance	3	0	0	3
36	23CA2028	Security of Web Applications	3	0	0	3
37	23CA2029	Fundamentals of Cloud Computing	3	0	0	3
38	23CA2030	Linux Administration and Programming	3	0	0	3
39	23CA2031	Linux Administration and Programming Lab	0	0	2	2
40	23CA2032	Biometric Security	3	0	1	4
41	23CA3001	Cyber Criminology and Criminal Justice Administration	3	0	0	3
42	23CA3002	Web Application Security	3	0	0	3
43	23CA3003	Web Application Security Lab	0	0	2	2
44	23CA3004	Information Security Management	3	0	0	3
45	23CA3005	Python and Scripting	3	0	0	3
46	23CA3006	Python and Scripting Lab	0	0	2	2
47	23CA3007	Digital Forensics	3	0	0	3
48	23CA3008	Digital Forensics Lab	0	0	2	2
49	23CA3009	Cyber Security Audit and Compliance	3	0	0	3

50	23CA3010	Network Forensics	3	0	0	3
51	23CA3011	Network Forensics Lab	0	0	2	2
52	23CA3012	Database Security Management	3	0	0	3
53	23CA3013	Database Security Management Lab	0	0	2	2
54	23CA3014	Forensics of Embedded System	3	0	0	3
55	23CA3015	Artificial Intelligence Security	3	0	0	3
56	23CA3016	Malware Analysis and Forensics	3	0	0	3
57	23CA3017	Malware Analysis and Forensics Lab	0	0	2	2
58	23CA3018	Modern Cryptography and Steganography	3	0	0	3
59	23CA3019	Ethical Hacking	3	0	0	3
60	23CA3020	Ethical Hacking Lab	0	0	2	2
61	23CA3021	Social Media Crimes	3	0	0	3
62	23CA3022	Security in the Cloud	3	0	0	3
63	23CA3023	Security in the Cloud Lab	0	0	2	2
64	23CA3024	Cyber Security	3	0	0	3
65	23CA3025	Cyber Security Lab	0	0	2	2
66	23CA3026	Internet of Things Security	3	0	0	3
67	23CA3027	Artificial Intelligence Techniques	3	0	0	3
68	23CA3028	Artificial Intelligence Techniques Lab	0	0	2	2
69	23CA3029	Python for Data Science	3	0	0	3
70	23CA3030	Python for Data Science Lab	0	0	2	2
71	23CA3031	Cloud Computing	3	0	0	3
73	23CA3032	Big Data Technologies	3	0	0	3
73	23CA3033	Big Data Technologies Lab	0	0	2	2
74	23CA3034	Data Warehousing and Data Mining Techniques	3	0	0	3
75	23CA3035	Machine Learning Lab	0	0	2	2
76	23CA3036	Data Analytics and Visualization	3	0	0	3
77	23CA3037	Data Analytics and Visualization Lab	0	0	2	2
78	23CA3038	Advanced Database Technologies	3	0	0	3
79	23CA3039	Human Centered Computing	3	0	0	3
80	23CA3040	Modelling Techniques in Predictive Analytics	3	0	0	3
81	23CA3041	Predictive Analytics Lab	0	0	2	2
82	23CA3042	Internet of Things and Blockchain Technology	3	0	0	3
83	23CA3043	Image Processing and Computer Vision	3	0	0	3
84	23CA3044	Machine Learning Operations	3	0	0	3
85	23CA3045	Machine Learning Operations Lab	0	0	2	2
86	23CA3046	Deep Learning Techniques	3	0	0	3
87	23CA3047	Deep Learning Techniques Lab	0	0	2	2
88	23CA3048	Robotic Process Automation	3	0	0	3
89	23CA3049	Robotic Process Automation Lab	0	0	2	2
90	23CA3050	Natural Language Processing	3	0	0	3

Course Code	MACHINE LEARNING LAB - I	L	T	P	C
20CA2053		0	0	1	1
Course Objectives:					
To Enable the student to:					
1. acquire skills in the basic machine learning concepts. 2. experiment with various libraries. 3. apply dimensionality reduction techniques.					
Course Outcomes:					
The students will be able to:					
1. experiment with various statistical functions. 2. apply various libraries to solve problems. 3. experiment using various machine learning algorithms.					

4. experiment with sample dataset. 5. identify the missing values in the dataset. 6. apply transformation functions on the dataset for data conversion and reduction.	
List of Exercises	
1. Develop a program to perform various statistical functions. 2. Apply preprocessing techniques for a sample dataset. 3. Develop a Program to Generate Random Number from Standard Distributions. 4. Develop a program to retrieve the information from the population dataset. 5. Apply object identification techniques in an image. 6. Develop a program to find the eigenvalues and eigenvectors of a square matrix.	
Recommended by Board of Studies	13 May 2023
Approved by Academic Council	03 June 2023

Course Code	PYTHON FOR NETWORK AND SECURITY LAB - I	L	T	P	C
20CA2054		0	0	1	1
Course Objectives:					
To Enable the student to: 1. acquire knowledge on the basics of network security. 2. develop programs to secure the network. 3. create cyber security tools using python packages.					
Course Outcomes:					
The students will be able to: 1. describe the security issues in network. 2. illustrate the usage of vulnerability scanner. 3. apply cryptography concepts to secure the network. 4. analyze the network traffic. 5. develop keylogger programs using python packages. 6. develop programs using socket.					
List of Exercises					
1. Creating password using random number generator. 2. Encrypting and Decrypting files using AES algorithm. 3. Developing a Keylogger application using pynput. 4. Analyzing Network Traffic using scapy package. 5. Build Vulnerability Scanner using port scanning. 6. Developing a chat application using socket.					
Recommended by Board of Studies		13 May 2023			
Approved by Academic Council		03 June 2023			

Course Code	CLOUD SECURITY LAB - I	L	T	P	C
20CA2055		0	0	1	1
Course Objectives:					
To Enable the student to: 1. acquire skills in Cloud Computing concepts. 2. apply new technologies in Cloud Computing concepts. 3. identify cloud computing risk issues and challenges.					
Course Outcomes:					
The students will be able to: 1. compare deployment models and service models of cloud computing. 2. illustrate the architecture and categorize the services using cloud computing. 3. identify the known threats, risks, vulnerabilities and privacy issues associated with cloud-based IT services. 4. summarize the concepts and guiding principles for designing and implementing appropriate safeguards and countermeasures for cloud-based IT services.					

5. describe the industry security standards, regulatory mandates, audit policies and compliance requirements for cloud-based infrastructures. 6. use the cloud services provided by Amazon Web Services.	
List of Exercises	
1. Study and implementation of Storage as a Service. 2. Working of Google Drive to make spreadsheet and notes. 3. Installation and Configuration of Justcloud. 4. Working in Cloud to demonstrate different languages. 5. Managing Cloud Security in AWS. 6. Installation and Configuration of Hadoop/Eucalyptus.	
Recommended by Board of Studies	13 May 2023
Approved by Academic Council	03 June 2023

Course Code	MACHINE LEARNING LAB - II	L	T	P	C
20CA2056		0	0	1	1
Course Objectives:					
To Enable the student to: 1. acquire the basics of machine learning concepts. 2. experiment with various libraries. 3. apply clustering algorithm.					
Course Outcomes:					
The students will be able to: 1. understand and apply statistical functions. 2. summarize various libraries. 3. apply classification algorithms. 4. sketch various charts. 5. identify the missing values in the dataset. 6. apply clustering algorithm to the dataset.					
List of Exercises					
1. Write a program to create, append, select information from a dataset. 2. Create a program to extract the content from various types of files. 3. Apply classification on Iris dataset. 4. Apply clustering on Iris dataset. 5. Generate Bar and Histogram chart for Iris dataset. 6. Analysis of Agriculture dataset.					
Recommended by Board of Studies		13 May 2023			
Approved by Academic Council		03 June 2023			

Course Code	PYTHON FOR NETWORK AND SECURITY LAB - II	L	T	P	C
20CA2057		0	0	1	1
Course Objectives:					
To Enable the student to: 1. illustrate security practices using python programming. 2. experiment the issues related to cyber security. 3. develop programs to secure the network.					
Course Outcomes:					
The students will be able to: 1. identify the security issues in networks. 2. apply ethical hacking techniques using various python packages. 3. develop programs to validate images. 4. identify and extract object from images. 5. develop programs to parse website.					

6. apply cryptography concepts to secure images.	
List of Experiments	
1. Inspect man in the middle attack and visualize using wireshark. 2. Validating digital images using pillow package. 3. Apply pillow package to enhance image. 4. Utilize re package to parse website and extract email. 5. Detect and extract objects using opencv. 6. Securing digital images using cryptography.	
Recommended by Board of Studies	13-05-2023
Approved by Academic Council	03 June 2023

Course Code	CLOUD SECURITY LAB - II	L	T	P	C
20CA2058		0	0	1	1
Course Objectives:					
To Enable the student to:					
1. apply new technologies in Cloud Computing.					
2. identify cloud computing risk issues and challenges.					
3. apply the concepts of AWS.					
Course Outcomes:					
The students will be able to:					
1. compare the deployment models versus service models of cloud computing.					
2. illustrate the architecture and categorize the services using cloud computing.					
3. identify the known threats, risks, vulnerabilities and privacy issues associated with cloud-based IT services.					
4. describe the concepts and guiding principles for designing and implementing appropriate safeguards and countermeasures for cloud-based IT services					
5. describe the industry security standards, regulatory mandates, audit policies and compliance requirements for cloud-based infrastructures.					
6. use the cloud services provided by Amazon Web Services.					
List of Exercises					
1. Working and installation of Google App Engine.					
2. Working and installation of Microsoft Azure.					
3. Working with Mangrasoft Aneka Software.					
4. Working with Amazon S3 service.					
5. Working with amazon encrypted EBS.					
6. Study Cloud Security management in AWS.					
Recommended by Board of Studies		13 May 2023			
Approved by Academic Council		03 June 2023			

Course Code	JAVA PROGRAMMING LAB - I	L	T	P	C
21CA2024		0	0	1	1
Course Objectives:					
To Enable the student to:					
1. acquire knowledge on the the basics of object-oriented concepts. 2. apply the concepts and techniques to create programs. 3. experiment with various computing strategies to solve real world problems using java.					
Course Outcomes:					
The students will be able to:					
1. illustrate the usage of input-output functions. 2. develop programs in java using conditionals and looping statements for solving problems. 3. create programs using classes and objects. 4. apply inheritance concepts. 5. apply the concent of packages.					

6. develop programming solutions to real world problems.	
List of Experiments	
1. Develop a java program to create employee details. 2. Develop a Java application to generate Electricity bill. 3. Develop a program to find the maximum value from the given type of elements. 4. Develop a program to illustrate the concept of class and object creation. 5. Develop a program to show the details of students using the concepts of inheritance. 6. Write a java program to demonstrate the concept of package. i. Create a package named shape. ii. Create classes in the package representing some common shapes like Square, Triangle, and Circle. Import and compile these classes in another program to display all the details.	
Recommended by Board of Studies	13 May 2023
Approved by Academic Council	03 June 2023

Course Code	JAVA PROGRAMMING LAB - II	L	T	P	C
21CA2025		0	0	1	1
Course Objectives:					
To Enable the student to: 1. apply the object-oriented features of java. 2. develop application using AWT. 3. experiment various computing strategies to solve real world problems using java.					
Course Outcomes:					
The student will be able to: 1. develop programs with multiple class and objects. 2. experiment programs in java using exceptions. 3. develop programs using event handling techniques. 4. apply interfaces concepts. 5. apply the concept of AWT. 6. develop programming solutions to real world problems.					
List of Exercises					
1. Write a program to demonstrate implementation of an interface which contains two methods declaration of square and cube. Write a java program to implement overriding methods. 2. Develop simple GUI programs using applet. 3. Write a java program to create multithreads. 4. Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named “Compute” is clicked.. 5. Write a java program to implement AWT applications. 6. Design a calculator using event-driven programming paradigm of Java with the following options. a) Decimal manipulations b) Scientific manipulations					
Recommended by Board of Studies		13 May 2023			
Approved by Academic Council		03 June 2023			

Course Code	PROBLEM SOLVING USING PROGRAMMING	L	T	P	C
23CA2001		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire knowledge on basics of programming. 2. Choose the appropriate programming constructs for solving problems. 3. Develop applications using programming language.					
Course Outcomes:					
The student will be able to:					

1. Relate character sets and data types. 2. Apply control structure concepts in programming. 3. Develop programs to solve computational problems using functions. 4. Construct programs using arrays and strings. 5. Develop programs using user-defined data types. 6. Exhibit proficiency in applying test cases.		
Unit: 1	Introduction	9 Hours
Generation of Programming Languages - Design and Implementation of efficient program - Program Design Tools - Types of Errors - Introduction to C - Anatomy of a C program - creating your first program - Variables, Memory and Operators: Variables a brief introduction – Data typing in variables – defining and initializing variables – Setting and Reading the values of variables - Some Working with variable and operators.		
Unit: 2	Selection and Repetition Structures	9 Hours
Introduction to Decision Control Statements – Conditional Branching Statements- Iterative Statements- Nested Loops – Break and Continue - Goto Statements.		
Unit: 3	Function and its scope	8 Hours
Function Declaration/ Function Prototype –Function Definition-Function Call- Return Statement-Passing Arguments to Function-Recursion.		
Unit: 4	Arrays and Strings	9 Hours
Introduction – Declaration of Arrays- Accessing the Elements of an Array- Passing Arrays to Functions- Storing Values in Arrays- Multidimensional Arrays-Introduction to Strings- Operation on Strings.		
Unit: 5	Pointers and User Defined Datatype	10 Hours
Understanding the Computer’s Memory - Introduction to Pointers - Declaring Pointer Variable- Pointer Expressions and Pointer Arithmetic - Passing Arguments to Functions - Structures-Unions-Enumerated Data Type - Files in C - Dynamic memory allocation.		
Total Lectures		45 Hours
Text Books		
1.	Avelino J. Gonzalez, “Computer Programming in C for Beginners”, Springer, 2020, ISBN:9783030507497.	
2.	Reema Thareja, “Programming in C”, Oxford University Press, 2018, ISBN: 9780199492282.	
Reference Books		
1.	Herbert Schildt, “The Complete Reference C”, McGraw Hill Education, 4 th Edition, 2017, ISBN: 9780070411838.	
2.	Stephen G. Kochan, “Programming in C”, Pearson Education, 4 th Edition, 2015, ISBN: 9789332554665.	
3.	Brain W. Kernighan, Dennis Ritche,” The C Programming Language”, Pearson Publications, 2015, ISBN: 9332549443.	
4.	Jeff Szuhay, “Learn C Programming”, Packt Publisher, 2020, ISBN:9781789349917.	
5.	Yashavant Kanetkar, “Let Us C”, BPB publications, 16 th Edition, 2017, ISBN: 9789387284494.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	PROBLEM SOLVING LAB	L	T	P	C
23CA2002		0	0	2	2
Course Objectives:					
Enable the student to: 1. Acquire skills in developing programs. 2. Solve problems using arrays and functions. 3. Develop programs using user-defined data type.					
Course Outcomes:					

The student will be able to:

1. Develop programs using structured programming.
2. Apply modular programming approach for solving problems.
3. Develop programs using different programming constructs.
4. Apply array and predefined functions for solving problems.
5. Develop applications using files.
6. Develop programs using user defined data types.

LIST OF EXERCISES

1. Implementation of I/O statements.
2. Implementation of Operators.
3. Decision making statements.
4. Usage of Iterative statements.
5. User defined functions.
6. Usage of Pointers and functions.
7. Usage of Arrays.
8. String handling functions.
9. Usage of Structures.
10. Applications of Enumerated Data Type.
11. Create Applications using Files.
12. Usage of Dynamic Memory Allocation.

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Course Code	FUNDAMENTALS OF COMPUTING CONCEPTS	L	T	P	C
23CA2003		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire adequate knowledge on computing concepts. 2. Interpret computer hardware and operating systems. 3. Practice modern computing techniques.					
Course Outcomes:					
The student will be able to: 1. Compare various number systems. 2. Examine the representation of numbers and arithmetic operations. 3. Apply the working principles of computer hardware components. 4. Examine the core capabilities of operating systems. 5. Differentiate various modern computing concepts. 6. Compile the concepts of bitcoin and virtual reality.					
Unit: 1	Computing Concepts	9 Hours			
Defining a Computer - Analog and Digital - The Analog Approach - Going Digital - Number Systems - Decimal Numbers - Binary Numbers - Bits and Bytes - Representing Data Digitally - Digital Text – ASCII - Digital Colors and Images - Approaches for Representing Colors and Images - Interpreting Binary Data.					
Unit: 2	Math with Digital Circuits	9 Hours			
What Is a Digital Circuit? - Logic with Mechanical Switches - The Amazing Transistor - Logic Gates - Designing with Logic Gates - Integrated Circuits - Binary Addition - Half Adders - Full Adders - A 4-bit Adder - Signed Numbers - Unsigned Numbers - JK Flip-Flops - T Flip-Flops.					
Unit: 3	Computer Hardware	9 Hours			
Computer Hardware Overview - Main Memory - Central Processing Unit (CPU) - Instruction Set Architectures - CPU Internals - Clock, Cores, and Cache - Beyond Memory and Processor - Secondary Storage - Input/Output - Bus Communication - Operating Systems Overview.					
Unit: 4	Operating Systems	9 Hours			

Programming Without an Operating System - Operating Systems Overview - Operating System Families - Kernel Mode and User Mode – Processes – Threads - Virtual Memory Application Programming Interface (API) - The User Mode Bubble and System Calls - APIs and System Calls - Operating System Software Libraries - Application Binary – Interface - Device Drivers – Filesystems - Services and Daemons.

Unit: 5	Internet and Modern Computing	9 Hours

The Internet Protocol Suite - Overview of the World Wide Web – Apps - Native Apps - Web Apps - Virtualization and Emulation – Virtualization – Emulation - Cloud Computing - The History of Remote Computing - The Categories of Cloud Computing - The Deep Web and Dark Web – Bitcoin - Bitcoin Basics - Bitcoin Wallets - Bitcoin Transactions - Bitcoin Mining - Virtual Reality and Augmented Reality - The Internet of Things.

Total Lectures	45 Hours

Text Book

1.	Matthew Justice, “How computers really work. A hands-on guide to the inner workings of the machine”, No Starch Press, 2021, ISBN: 9781718500662.

Reference Books

1.	Alexis Leon and Mathews Leon, “Introduction to Computers”, Vikas Publishing, 2009, ISBN: 978818209234.
2.	Peter Norton, “Introduction to Computers”, McGraw Hill, 7 th Edition, 2013, ISBN: 9780070671201.
3.	Darrell W Hajek and Cesar Herrera, “Introduction to Computers”, CreateSpace Independent Publishing Platform, 2017, ISBN: 9781545236468.
4.	Eric Frick, “Information Technology Essentials: An Introduction to Information Technology”, Frick Industries LLC, 2017, ISBN: 9781733009423.
5.	Brian K. Williams and Stacey C. Sawyer, “A Practical Introduction to Computers & Communications Complete Version”, 2011, ISBN: 9780072485554.

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Course Code	HARDWARE AND COMPUTING LAB	L	T	P	C
23CA2004		0	0	2	2

Course Objectives:

Enable the student to:

1. Develop skills to work with MS-Word.
2. Prepare effective PowerPoint presentations incorporating appropriate features.
3. Exhibit proficiency in MS-Excel and MS-Access.

Course Outcomes:

The student will be able to:

1. Prepare documents by applying appropriate techniques.
2. Develop presentations using MS-PowerPoint.
3. Apply the basic text editing functionalities in a document.
4. Apply appropriate formulas in worksheets.
5. Create tables and graphical charts for analysis.
6. Examine forecasting models.

LIST OF EXERCISES

1. Identify the internal and external hardware/peripheral components.
2. Familiarisation with the operating system along with file management commands like create, copy, move, delete and rename files and folders.
3. Familiarize with Network Basics and Components.
4. Preparing resume.
5. Creating Presentation.
6. Usage of Text functions.
7. Conditional and Formatting statements.
8. Usage of Mathematical Functions.

9. Creating a database. 10. Sorting and filtering. 11. Pivot Table and Charts. 12. Forecasting Models.	
Recommended by Board of Studies	04 Aug 2023
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Course Code	ESSENTIALS OF PYTHON PROGRAMMING	L	T	P	C
23CA2005		3	0	0	3
Course Objectives: Enable the student to: 1. Acquire programming knowledge in Python. 2. Examine the data structures in Python. 3. Develop applications using Python programming.					
Course Outcomes: The student will be able to: 1. Expertise in Python programming. 2. Construct programs using control flow statements in Python. 3. Develop modules for reusability of code. 4. Infer the concept of collections in Python. 5. Classify object-oriented concepts. 6. Develop GUI applications.					
Unit: 1	Introduction to Python				9 Hours
Basics - Variables – Naming Conversion - Assignment Operator – Statements - Comments in Code - Scripts Versus Programs - Python Strings - String Functions - String Formatting - String Templates - Types of Numbers - Integers- Floating Point Numbers - Complex numbers - Boolean values - Arithmetic Operators - Assignment numbers - None value.					
Unit: 2	Control Flow statements and Functions				9 Hours
Flow of Control using IF Statements - Comparison Operators- Logical Operators - If Statement- Working with an if Statement - Else in an If Statement - The Use of elif - Nested If Statements - If Expressions - Introduction to Iteration - While Loop - For Loop - Break Loop Statement - Continue Loop Statement - For Loop with Else - Structured Analysis and Function Identification - Functional Decomposition - Functional Flow - Functions-How Functions Work - Types of Functions - Defining Functions - Returning Values from Functions - Docstring - Function Parameters - Anonymous Functions - Recursion - Scope and Lifetime of Variables: Local Variables - The Global Keyword – Non - Local Variable.					
Unit: 3	Collections				8 Hours
Python Collection Types – Tuples – Lists – Sets - Working with sets - Set Operations, methods – Dictionaries - Working with Dictionaries- Dictionary Methods-map filter and reduce.					
Unit: 4	Object Oriented Concepts				9 Hours
Introduction - Class Definition - Objects - Class Comments- Instance Methods - del keyword- Automatic Memory Management - Intrinsic Attributes - Class Side Data - Class Side Methods -Static Method - Class Inheritance - Operator Overloading – Inheritance - method overriding.					
Unit: 5	Files and Networking				9 Hours
Introduction to files- Reading and writing files- Graphical User Interface, Network Programming, Data base.					
Total Lectures					45 Hours
Text Book					
1.	John Hunt, “A Beginners Guide to Python 3 Programming”, Springer, 2020, ISBN: 9783030202903.				
2.	John Hunt, “Advanced Guide to Python 3”, Springer, 2019, ISBN: 9783030259426.				
Reference Books					

1.	Yashavant Kanetkar, Aditya Kanetkar, “Let Us Python: Python is Future, Embrace It Fast Learn Python Quickly A Programmer – Friendly Guide”, BPB, 2022, ISBN: 9789355511867.	
2.	R. Nageswari Rao, “Core Python Programming”, Dreamtech, 2018, ISBN: 9789386052308	
3.	Jeeva Jose, “Taming Python Programming”, Khanna Publishing, 2019, ISBN: 9789386173348.	
4.	Ashok Namdev Kamthane, Amit Ashok Kamthane, “Programming and problem solving with Python”, McGrawHill, 2018, ISBN: 9789387067578.	
5.	Reema Thareja, “Python Programming Using Problem Solving Approach”, Oxford Higher Education, 2017, ISBN: 9780199480173.	
Recommended by Board of Studies		04-08-2023
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Course Code	PROGRAMMING IN PYTHON LAB	L	T	P	C
23CA2006		0	0	2	2
Course Objectives:					
Enable the student to: 1. Acquire skills in developing programs in Python. 2. Develop programs using object-oriented features. 3. Design graphical user interface-based applications.					
Course Outcomes:					
The student will be able to: 1. Experiment control and iterative statements in Python. 2. Experiment the data structures using Python. 3. Apply object-oriented programming in Python. 4. Apply functions and file handling operations. 5. Develop graphical user interface applications. 6. Develop database applications.					
LIST OF EXERCISES					
1. Implementation of Decision-making Statements. 2. Implementation of Iterative statement. 3. Create application using lists. 4. Manipulation of Tuple operations. 5. Perform various operations using set and dictionary. 6. Usage of user defined function. 7. Usage of Recursion. 8. Usage of Inheritance. 9. Create applications using files. 10. Implement Socket Programming. 11. Design GUI application. 12. Implementation of Database connectivity.					
Recommended by Board of Studies		04 Aug 2023			
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Course Code	COMPUTER NETWORKS			
23CA2007				
Course Objectives: Enable the student to: 1. Acquire the concepts of computer networks. 2. Describe different layers of networking. 3. Define and describe congestion control and quality of service in networking.				
Course Outcomes: The student will be able to: 1. Examine the necessity for computer networks. 2. Analyze the requirement of the physical layer. 3. Infer the essentials of data link layer. 4. Review the issues in the network layer.				

5. Express the need of transport and application layer.		
6. Identify the necessity for transition from ipv4 to ipv6 addressing.		
Unit: 1	Introduction to Computer Networks and its Physical Layer	7 Hours
Introduction: - Uses of Computer Networks - Network Hardware - Network Software - Example Networks: The Internet - Third Generation Mobile Phone Networks - The Physical Layer: Guided Transmission Media - Wireless Transmission - Communication Satellites - Digital Modulation and Multiplexing.		
Unit: 2	Data Link Layer	8 Hours
The Data Link Layer: Error Detection and Correction - Elementary Data Link Protocols - Sliding Window Protocols - The Medium Access Control Sublayer: The Channel Allocation Problem - Multiple Access Protocols - Ethernet - Wireless LAN's - Broadband Wireless - Data Link Layer Switching.		
Unit: 3	The Network Layer	10 Hours
The Network Layer: Network Layer Design Issues - Routing Algorithms: The Optimality Principle - Shortest Path Algorithm - Flooding - Distance Vector Routing - Congestion Control Algorithms – Subnetting - IP addressing - Classful and Classless addressing - NAT.		
Unit: 4	The Transport Layer and Application Layer	10 Hours
The Transport Layer: The Transport Service - Congestion Control - The Internet Transport Protocols - UDP - TCP, The Application Layer: Domain Name System - Electronic Mail - The World Wide Web - DNS - DHCP.		
Unit: 5	IPv4 versus IPv6	10 Hours
IPv4 versus IPv6 - Structure of IPv6 protocols - IPv6 Addressing - Networking concepts - routing protocols – Interoperability - Dual Stack Techniques -Tunneling Techniques - Network Address and Protocol Translation.		
Total Lectures		45 Hours
Text Book		
1.	Andrew S. Tanenbaum, Nickolas Feamsterl, David Wetherall, “Computer Networks”, Prentice Edition Limited, 6 th Edition, 2021, ISBN: 9781292374062.	
2,	Silvia Hagen, “IPv6 Essentials Integrating IPv6 Into Your IPv4 Network”, O’Reilly Media, 2014, ISBN: 9781449335267.	
Reference Books		
1.	Kurise James F and Ross Keith W, “Computer Networking”, Pearson, 6 th Edition, 2017, ISBN: 9789332585492.	
2.	Brijendra Singh, “Data Communications and Computer Networks”, Prentice Hall, 4 th Edition, 2014, ISBN: 8120349075.	
3.	William Stallings, “Data and Computer Communications”, Pearson, 10 th Edition, 2017, ISBN: 9789332586932.	
4.	Behrouz A Forouzan, “Data Communications and Networking”, McGraw Hill Education, 5 th Edition, 2017, ISBN: 1259064751.	
5.	Dhanashree K Toradmalle, “Computer Networks and Network Design”, Wiley India, 1 st Edition, 2020, ISBN: 9390395097.	
Recommended by Board of Studies		04 Aug 2023
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Course Code	OPERATING SYSTEM SECURITY	L	T	P	C
23CA2008		3	0	1	4
Course Objectives: Enable the student to: 1. Examine the concepts of system software. 2. Describe the functions of operating system. 3. Express operating system security policies.					

Course Outcomes:		
The student will be able to:		
1. Examine the operating system concepts. 2. Categorize the operating system structure and its storage hierarchy. 3. State the features of process management. 4. Recognize the capability in handling protection mechanism and storage. 5. Describe the operating system security and protection mechanism 6. Examine the possible vulnerabilities in kernel.		
Unit: 1	General Concepts	9 Hours
System software and application software, Assemblers- Design of assembler - System software and application software, Assemblers- Design of assembler- Buffer overflow attacks and Protections Control flow integrity techniques (CFI).		
Unit: 2	Operating System	9 Hours
Introduction to Operating System – Concept of Batch systems – Storage structure – Storage hierarchy – system components - Operating System services – Operating System structures - Case Study on Design and Implementation of Operating System - Introduction to containers and Sandboxing for process isolation.		
Unit: 3	Process Management and Storage Management	9 Hours
Process concept - process scheduling – IPC - CPU scheduling – semaphores –deadlocks: prevention, avoidance and detection. Memory management: contiguous memory allocation – paging - segmentation with paging - virtual memory - demand paging - page replacement - Disk Scheduling - File organization - allocation methods - Case Study on Memory Management Linux/Windows.		
Unit: 4	Operating System Security and Protection	9 Hours
Domain protection – Access matrix – Implementation of access matrix – Revocation of Access rights – Authentication – One-time passwords – Program threats – System threats – Threats monitoring – Computer Security Classification - Case Study on Operating System Security - Exploiting memory corruption vulnerabilities and Defenses - Security Consideration in Virtualized environments - Secure File Deletion.		
Unit: 5	Kernel Exploitation	9 Hours
Kernel Land Attack – Memory Corruption Vulnerabilities – Integer issues – Race Conditions – Logic Bugs – Architecture Level – Execution Step – The Triggering Step – The Information-Gathering Step – Attacking Remote Vulnerabilities – Executing the First Instruction –Remote Payloads – Kernel Attacks – Kernel Defense – Beyond Kernel Bugs: Virtualization - Operating System Hardening Techniques Bell–LaPadula Model (BLP) – BIBA - Role based Access Control.		
Total Lectures		45 Hours
Text Book		
1.	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (Addison Wesley), “Operating System Concepts: 9 th Edition, Wiley, ISBN: 9781118063330.	
2.	Achyut Godbole, Atul Kahate, “Operating Systems”, 3 rd Edition, McGraw Hill Education, ISBN: 9780070702035.	
Reference Books		
1.	Silberschatz, Galvin, Gagne, “Operating System Concepts”, John Wiley; 9 th edition, ISBN-10: 8126554274, ISBN: 9788126554270.	
2.	Michael Palmer, “Guide to Operating Systems Security”, Paperback – Import, Course Technology Inc, ISBN: 9780619160401.	
3.	Enrico Perla, Massimiliano Oldani, “A Guide to Kernel Exploitation: Attacking the Core”, Syngress; 1 st Edition, 2010, ISBN: 9781597494861.	
4.	William Stallings, “Operating Systems: Internals and Design Principles”, Pearson Education, New Delhi. 2009. ASIN: B07RY51L19.	

5.	Charles P Pfleeger and Shari Lawrence Pfleeger, “Security in Computing”, Prentice Hall, New Delhi, 2012, ASIN: B00S88TJV2.
Recommended by Board of Studies	04 Aug 2023
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Lab Exercises

1. User Account Management.
2. Group Policy.
3. Windows firewall Configuration.
4. Event Log and Registry Analysis.
5. File allocation and Organization strategy.
6. Memory allocation techniques.

Course Code	FUNDAMENTALS OF OBJECT-ORIENTED PROGRAMMING	L	T	P	C
23CA2009		3	0	0	3
Course Objectives: Enable the student to: 1. Compare object-oriented programming with other programming approaches. 2. Choose appropriate programming constructs for solving problems. 3. Apply object-oriented paradigm for problem solving.					
Course Outcomes: The student will be able to: 1. Describe the principles of object-oriented programming. 2. Develop programs using constructors, inheritance and polymorphism. 3. Construct java programs using packages and exception handling. 4. Examine multithreading concepts. 5. Apply I/O methods in applications. 6. Develop graphical user interface applications.					
Unit: 1	Introduction to OOPs	9 Hours			
Overview of OOP – object-oriented programming paradigms – Features of object-oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators- Control Statements- Programming Structures in Java – Defining classes in Java.					
Unit: 2	Constructors and Inheritance	9 Hours			
Constructors - Access specifiers - Static members - Java Doc comments - Overloading Methods - Static, Nested and Inner Classes- Inheritance: Basic - Types of Inheritance -Super keyword - final with Inheritance- Method Overriding - Dynamic Method Dispatch - Abstract Classes.					
Unit: 3	Packages, Exception and String Handling	9 Hours			
Packages and Interfaces: Packages - Packages and Member Access - Importing Packages - Interfaces - Exception Handling basics - Multiple catch Clauses - Nested try Statements - Java’s Built-in Exceptions - User defined Exception- Strings: Basic String class, methods and String Buffer Class.					
Unit: 4	Multithreading, Inter thread communication and I/O	9 Hours			
Multithreaded Programming: Java Thread Model - Creating a Thread and Multiple Threads - Priorities - Synchronization - Inter Thread Communication Suspending - Resuming, and Stopping Threads - Multithreading- I/O Basics - Reading and Writing Console I/O - Reading and Writing Files- Bounded Types.					
Unit: 5	Java Event Handling, Controls and Components	9 Hours			
Java Events and Controls: Event Basics - Handling Key and Mouse Events. Controls: Checkbox - ComboBox - List-Buttons – RadioButtons - ChoiceBox - Text Controls -ScrollPane – Layouts - Menus.					
Total Lectures					45 Hours
Text Book					

1.	Herbert Schildt, “Java: The Complete Reference”, McGraw Hill Edition, 11 th Edition, 2019, ISBN: 9789339212094.
Reference Books	
1.	James Gosling, Bill Joy, Guy L. Steele Jr., Gilad Bracha and Alex Buckley, “The Java Language Specification, Java SE 8 th Edition”, Addison-Wesley Professional, 2014, ISBN: 0133900797.
2.	Deitel H. M and Deitel P. J, “Java How to Program”, Prentice Hall India, 10 th edition, 2014, ISBN: 0131483986.
3.	K. Rajkumar, “Java Programming”, Pearson, First Impression 2013, ISBN:9788131799093.
4.	Pravin M Jain, “The class of Java”, Pearson, Third Impression 2011, ISBN:9788131755440.
5.	E. Balagurusamy, “Programming with Java –a Primer”, 4 th Edition 2010, ISBN: 9780070141698.
Recommended by Board of Studies	
04 Aug 2023	
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Course Code	OBJECT- ORIENTED PROGRAMMING LAB	L	T	P	C
23CA2010		0	0	2	2
Course Objectives:					
Enable the student to: 1. Articulate object-oriented concepts. 2. Implement applications using inheritance, packages and exception handling. 3. Develop applications using java AWT.					
Course Outcomes:					
The student will be able to: 1. Demonstrate the usage of input and output functions. 2. Implement the concepts of decision-making and iteration statements. 3. Experiment the usage of inheritance, exception handling and multithreading. 4. Design applications by incorporating packages. 5. Design applications using event-driven programming concepts. 6. Develop applications using java AWT.					
LIST OF EXERCISES					
1. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.					
2. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows: - First 100 units – Rs. 1 per unit 101-200 units – Rs. 2.50 per unit 201 -500 units – Rs. 4 per unit > 500 units – Rs. 6 per unit If the type of the EB connection is commercial, calculate the amount to be paid as follows: - First 100 units – Rs. 2 per unit 101-200 units – Rs. 4.50 per unit 201 -500 units – Rs. 6 per unit > 500 units – Rs. 7 per unit					
3. Write a java program to find the maximum value from the given type of elements.					
4. Write a java program to illustrate the concept of class and object creation.					
5. Write a java program to show the details of students using the concepts of inheritance.					
6. Write a program to demonstrate the implementation of an interface that contains two methods.					
7. Write a java program to demonstrate the concept of package.					
8. Write a java program to demonstrate exception handling in case of division by zero error.					
9. Write a java program to create multithreaded applications.					

10. Develop an applet in Java that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named “Compute” is clicked.
11. Design a calculator using event-driven programming paradigm of Java with the following options.
- Decimal manipulations
 - Scientific manipulations
12. Write a java program to implement AWT applications.

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Course Code	DATA STRUCTURES AND APPLICATIONS	L	T	P	C
23CA2011		3	0	0	3
Course Objectives: Enable the student to: 1. Interpret the different methods of organizing large amounts of data. 2. Classify the types of data structures. 3. Apply the suitable type of data structure to find the solution to the real-time problems.					
Course Outcomes: The student will be able to: 1. Illustrate the features of data structures and algorithms. 2. Organize data in arrays and perform operations. 3. Simulate stacks and queue concepts. 4. Develop applications using linked lists. 5. Experiment the usage of trees in developing programs. 6. Organize and visualize data in graphs.					
Unit: 1	Introduction to Data Structures and Algorithms				7 Hours
Introduction – Basic Terminology of Data Organization – Concept of a data type – Data Structure Defined – Description of Various Data Structures – Common Operations on Data Structures – Algorithm Defined – Algorithmic Notation – Control Structures – Algorithm Complexity – Big Oh Notation – Concept of Recursion – Examples of Recursive Functions.					
Unit: 2	Arrays and their Operations				11 Hours
Introduction – Linear Arrays – Representing Linear Arrays in Memory, Operations on Linear Arrays, Traversal Operations, Insert Operation, Delete Operation - Sorting and Searching - Linear Search, Binary Search, Bubble Sort, Insertion Sort, Quick Sort, Selection Sort, Shell Sort, Merge Sort, Radix Sort - Applications of Linear Arrays - Limitations of Linear Arrays – Two -dimensional arrays – Matrices.					
Unit: 3	Stacks and Queues				8 Hours
Introduction to Stacks – Operations on Stacks – Representation of a stack in Memory – Arithmetic Expressions – Application of Stacks – Introduction to Queues – Queues Defined – Operations on Queues – Representation of Queues in Memory – Dequeue – Priority of a Queue.					
Unit: 4	Linked Lists and their Operations				8 Hours
Introduction – Linked Lists – Linear Linked List – Doubly Linked List – More Types of Lists – Searching a Linked List – Sorting a Linked List - Applications of Linked Lists – Comparative view of Linked Lists and Arrays.					
Unit: 5	Trees and Graphs				11 Hours
Introduction to Trees – Trees Defined – Binary Trees – Binary Search Trees – Representation of a Binary and Binary Search Tree – Operations on Binary and Binary Search Trees – AVL Trees – B – Tree – Introduction to Graphs – Graph Terminology – Representation of Graphs – Operations on Graphs – Application of Graphs – Kruskal’s Algorithm.					
Total Lectures					45 Hours
Text Books					

1.	R.S. Salaria, “Data Structures - Theory, Problems and Algorithms”, 3 rd Edition, Khanna Book Publishing Co. (P) Ltd, 2017, ISBN: 9789386173966.
2.	Dr. R. B. Patel, “Expert Data Structures with C”, 4 th Edition, Khanna Book Publishing Co. (P) Ltd, 2018, ISBN: 9789386173690.
Reference Books	
1.	Shishir K Shandilya and N K Tiwari and Jitendra Agrawal, “Data Structures”, Wiley India, 2019, ISBN: 9789389520033.
2.	Dr. Besant Agarwal, Benjamin Baka, “Hands-on Data Structures and Algorithms with Python”, Second Edition, Packt Publishing, 2018, ISBN: 9781788995573.
3.	E. Balagurusamy, “Data Structures using C”, Sixth Reprint, Tata McGraw Hill Education (India) Pvt Ltd, 2015, ISBN: 9781259029547.
4.	Atul S. Khot, Raju Kumar Mishra, “Learning Functional Data Structures and Algorithms”, Packt Publishing, 2017, ISBN: 9781785888731.
5.	Narasimha Karumanchi, “Data Structures and Algorithms Made Easy”, 5 th edition, Careermonk Publications, ISBN 10: 819324527X.
Recommended by Board of Studies	
04 Aug 2023	
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25 Aug 2023	

Course Code	DATA STRUCTUES LAB	L	T	P	C
23CA2012		0	0	2	2
Course Objectives:					
Enable the student to:					
1. Interpret the different methods of organizing large amounts of data.					
2. Compare the types of data structures.					
3. Apply the suitable type of data structure to find the solution to the real-time problems.					
Course Outcomes:					
The student will be able to:					
1. Tabulate the ways of arranging and handling data.					
2. Organize data in arrays and perform operations.					
3. Create applications using stacks and queues.					
4. Develop applications using linked lists.					
5. Experiment the usage of trees in developing programs.					
6. Organize and visualize data in graphs.					
LIST OF EXERCISES					
1. Removing the duplicate elements from a 1-D array.					
2. Check whether the given matrix is symmetric or not using 2-D array.					
3. Implement Push and Pop operations of a stack.					
4. Evaluate an arithmetic expression given in postfix notation using Stack.					
5. Implement Enqueue and Dequeue operations of a Queue.					
6. Solve Josephus problem using Circular Queue.					
7. Insert new nodes at different positions of a linked list.					
8. Delete nodes of specific positions of a linked list.					
9. Perform Linear and Binary search of array elements.					
10. Sort the array elements using Quick and Merge sorting techniques.					
11. Pre-order, post-order and in-order Tree Traversal Operations.					
12. Depth First and Breadth First Graph operations.					
Recommended by Board of Studies		04 Aug 2023			
Approved by Academic Council		25 Aug 2023			

Course Code	FUNDAMENTALS OF GENERAL FORENSICS SCIENCE	L	T	P	C
23CA2013		3	0	0	3
Course Objectives:					
Enable the student to:					
1. Examine the basis of forensic sciences and classification of physical evidence.					
2. Interpret the types of crime scene from the collected evidence.					

3. Apply the methodology of collecting and interpreting data, avoiding contamination, and preservation of chain of custody and basics of digital crimes.		
Course Outcomes:		
The student will be able to:		
1. illustrate the foundation of the forensic sciences and evidence.		
2. define the roles of different types of professionals involved in evaluating a crime scene and collecting the evidence.		
3. Describe the components of the justice system.		
4. Tabulate the methodology used in collecting & interpreting data.		
5. define the importance pertaining to forensic examination.		
6. record the evidence in a professional court room setting.		
Unit: 1	Introduction to Forensic Science and physical evidence	9 Hours
History and Development of Forensic Science – Divisions and services of Forensic Science – Forensic Setup in India - Role of forensic expert in the court of law - Aspects of the Criminal Justice System - Aspects of Trials. Types of physical evidence at crime scenes: Transient evidence, Pattern evidence, Conditional evidence, Trace and Transfer evidence and Associative evidence - Stages in the Analysis of Physical evidence and Interpretation – Role of physical evidence in investigation and resolution of criminal activity.		
Unit: 2	Crime Scene Investigation	9 Hours
Nature and type of crime scene – Crime scene search methods: Recovery and packaging of evidence – Crime scene documentation - Preservation of evidences – National and International scenario on crime scene investigation – Nature and types of physical evidence at fire scenes – Collection and preservation of fire scene evidence – Laboratory Analysis of Fire Debris		
Unit: 3	Crime Scene Reconstruction (CSR) and Forensic Analysis	9 Hours
Importance and stages of CSR – Classification of reconstruction – Crime Scene and Laboratory procedures –Stages of reconstruction - Writing a reconstruction report – Correlation of crime scene analysis with behavioral analysis – Cases of special importance pertaining to forensic examination - Basics of Forensic Biology – Forensic Serology – DNA Typing – Forensic Chemistry – Forensic Toxicology – Forensic Medicine.		
Unit: 4	Cyber Crime & Computer Forensics	9 Hours
Introduction – Types of cybercrime - Processing the Electronic Crime Scene - Evidentiary Data – Computer Crime Scene Investigation – Computer Forensic Analysis – Network Forensic-Branches of digital forensics - Digital forensics techniques and tools - Exposure to Information Technology Act, 2000.		
Unit: 5	Emerging Cyber Crimes & Analytical Techniques	9 Hours
Cyber terrorism – Cyber defamation – Crime related to Intellectual Property Rights — Voice identification – Forensic Psychology – Polygraph - Narco analysis – Brain fingerprinting – Criminal profiling and their legal status in India.		
Total Lectures		45 Hours
Text Book		
1.	Deepak and Chaudhery, “Technology in forensic science: Sampling, Analysis, Data and Regulations”, Wiley, 2020, ISBN:9783527347629.	
2.	Henry C Lee, “Physical Evidence in Forensic Science”, 3 rd Edition, Lawyers & Judges Pub Co, ISBN:9781936360017.	
Reference Books		
1.	Safarstein R, “Criminalistics – An Introduction to Forensic Science”, Pearson, 2014, ISBN: 9781292062020.	
2.	Barry A. J. Fisher, David R. Fisher “Techniques of Crime Scene Investigation”, CRC Press, 2012, ISBN: 9781439810057.	
3.	Gardner, R., & Bevel, T, “Practical crime scene analysis and reconstruction”, Boca Raton, Florida: CRC Press, 2009, ISBN: 9781420065510.	

4.	James, S, “Forensic science: An introduction to scientific and investigative techniques”, 2 nd Edition, Boca Raton, Florida: CRC Press, 2015, ISBN: 9781439853832.	
5.	Marcella, “Cyber Forensics A Field Manual”, Auerbach Publication, ISBN: 9780849383281.	
Recommended by Board of Studies		04 Aug 2023
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Course Code	INFORMATION SECURITY		L	T	P	C
23CA2014			3	0	0	3
Course Objectives: Enable the student to: 1. Examine industry-standard tools and techniques to identify and mitigate security risks. 2. Identify the concepts and key issues in information security. 3. Apply industry-standard tools and techniques to identify and mitigate security risks.						
Course Outcomes: The student will be able to: 1. Illustrate the principles and concepts of information security. 2. Categorize various cryptographic algorithms. 3. Illustrate the principles and practices of access control. 4. Summarize the basics of network security protocols. 5. Analyse software flaws and malware. 6. Implement security measures through tools and technology.						
Unit: 1	Cryptography – Part I					9 Hours
Introduction to Information Security – The Cast of Characters – CIA Triad – Beyond CIA – Classic Cryptography: Introduction – How to speak Crypto – Classic Ciphers – Classic Crypto in History – Modern Crypto History – A Taxonomy of Cryptography – A Taxonomy of Cryptanalysis – Symmetric Ciphers: Stream Ciphers – Block Ciphers – Integrity – Quantum Computers and Symmetric Crypto.						
Unit: 2	Cryptography – Part II					9 Hours
Public Key Crypto: Introduction – Knapsack – RSA – Diffie-Hellman – Public Key Notation – Uses for Public Key Crypto – Certificates and PKI – Quantum Computers and Public Key – Crypto Hash Functions: Introduction to Cryptographic Hash Function – The Birthday Problem and Attack – Non-cryptographic hashes – SHA-3 – Cryptographic Hash Applications.						
Unit: 3	Access Control					9 Hours
Authentication: Introduction – Authentication Methods – Passwords – Biometrics – Something You Have - Two-factor Authentication – Single-sign-on and Web Cookies. Authorization: Introduction – Brief History – Access Control Matrix – Multi-level Security Models – Covert Channels – Inference Control – CAPTCHA.						
Unit: 4	Network Security					9 Hours
Network Security Basics: Introduction – Networking Basics – Cross-site Scripting Attacks – Firewalls – Intrusion Detection Attacks. Simple Authentication Protocols: Introduction – Simple Security Protocols – Authentication Protocols – “Authentication” and TCP – Zero Knowledge Proofs. Real World Security Protocols: Introduction – SSH – SSL – IPsec – Kerberos – GSM.						
Unit: 5	Software Flaws and Malware					9 Hours
Software Flaws and Malware: Introduction – Software Flaws – Malware – Software-based Attacks – Insecurity in Software: Introduction – Software Reverse Engineering – Software Development.						
Total Lectures						45 Hours
Text Book						
1.	Mark Stamp, “Information Security: Principles and Practice”, Wiley India, 2023, ISBN: 9789354644313.					
2.	Richard E Smith, “Elementary Information Security”, Jones & Bartlett Learning, 2013, ISBN: 9784435000.					

Reference Books	
1.	Michael E Whitman, Herbert J Mattord, “Principles of Information Security”, Course Technology Inc., 2017, ISBN: 9781337102063.
2.	Sanil Nadkarni, “Fundamentals of Information Security”, BPB, 2020, ISBN: 9789389328400.
3.	Timothy Shimeall, Jonathan Sprint, “Introduction to Information Security: A Strategic-based Approach”, Syngress, 2013, ISBN: 9781597499699.
Recommended by Board of Studies	
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Course Code	CYBER CRIMES AND CYBER SECURITY	L	T	P	C
23CA2015		3	0	0	3
Course Objectives: Enable the student to: 1. Classify cybercrimes and review the Indian cyber laws. 2. Recognize the need for cyber security. 3. Visualize the cyber security attacks.					
Course Outcomes: The student will be able to: 1. Differentiate between the nature of cybercrimes. 2. Interpret the significance of cyber security. 3. Identify the occurrence of cyber-attacks. 4. Examine the components of cyber security. 5. Choose the suitable cyber security measures. 6. Employ strategies for protecting against the cybercrimes.					
Unit: 1	Basic Introduction to cyber law and cyber crimes				7 Hours
Need for cyber law in India – History of cyber law in India – cybercrimes with safety tips – denial of service attacks – cyber pornography – email related Crimes – online shopping fraud – credit card fraud – call SMS forging – phishing – hacking – instant messaging – cyber stalking.					
Unit: 2	Current Perspectives On Cyber Security				9 Hours
‘Good Guy’ perspectives on security: security as an ongoing process – current perspective on technical computer security - current Perspective on cybercrimes and cyber ecurity – Touching upon Security Controls of Cyber Criminals – Computer Science and Engineering Literature – Social Science Literature – Legal Studies.					
Unit: 3	Cyber Security				9 Hours
Introduction to Cyber Security – What is Cyber Security – CIA Triad – Reasons of Cyber Crimes – Why we need cyber security – Damage to the organizations.					
Unit: 4	Cyber Security Components				10 Hours
OSI Layer – Zero Day Attacks – Types of Network Attacks – Application Security – End point Security – Identity and Access Management – Mobile Security – Data Security – Drive – by Download - Infrastructure Security – Disaster Recovery – End – User Education.					
Unit: 5	Fighting Cyber Attacks				10 Hours
Defense in depth - authentication – cryptography – Firewall – Data Loss Prevention – Antivirus Software – Virtual Private Network – Web Browsers – Data Backup.					
Total Lectures					45 Hours
Text Books					
1.	Akash Kamal Mishra, “An Overview on Cybercrime & Security, Volume – I”, XPress Publishing, 2020, ISBN:9781649836007.				
2.	Anand Shinde, “Introduction to Cyber Security”, Notion Press, 2021, ISBN:9781637816431.				
Reference Books					

1.	Dr. Erdal Ozkaya, “Cybersecurity: The Beginner's Guide”, Kindle Edition, Packt Publishing Limited, ISBN-10 – 1789616190.	
2.	Arun Soni, “The Cybersecurity Self – Help Guide”, First Edition, CRC Press, 2021, SBN:9781000454901.	
3.	Catherine D. Marcum, “Cyber Crime”, Second Edition, Aspen Publishing, 2019, ISBN 9781543809688.	
4.	Erik H.A. van de Sandt, “The Deviant Security Practices of Cyber Crime”, Brill Publishers, ISBN:9789004463189.	
5.	A. Gopala Krishna, “Be a Cyber Warrior”, eBooks2go Incorporated Publishers, 2019, ISBN:9781545743546.	
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Course Code	FUNDAMENTALS OF CYBER FORENSICS	L	T	P	C
23CA2016		3	0	0	3
Course Objectives: Enable the student to: 1. Acquire the knowledge about cybercrime and cyber forensics. 2. Interpret the digital evidence collection procedure and tools used for forensic investigation. 3. Practice analysis and documentation of evidence collection.					
Course Outcomes: The student will be able to: 1. Examine the basic knowledge about cybercrime, cyber forensics and its associated concepts. 2. Apply the digital evidence collection procedure and the obstacles to this process. 3. Apply the tools used for forensic investigation, namely free and open-source. 4. Exhibit the preliminaries of electronic evidence collection and handling. 5. Prepare the document of evidence to present in the court of law. 6. Create the cyber forensics analysis report.					
Unit: 1	Introduction to Cybercrime and Cyber Forensics	9 Hours			
Introduction – Role of Electronic Communication – Types of Cybercrime – Cybercrime against Individuals, Property and Nation – Execution and Tools used in Cybercrime – Cyber Forensics – Disk, Network, Wireless, Database, Mobile, Memory and Email Forensics.					
Unit: 2	Current Perspectives on Cyber Security	9 Hours			
Introduction to Digital Evidences and Evidence Collection Procedure – Source of Evidence – Digital Evidence from Standalone Computer/Electronic Communication Devices – Storage Medium – File System – Windows Artifacts – Linux Artifacts – Challenges with Digital Evidences.					
Unit: 3	Cyber Forensics - The Present and the Future	9 Hours			
Forensic Tools - Cyber Forensic Suite - Drive Imaging and Validation Tools - Forensic Tools for Data Recovery - Forensic Tools for RAM Analysis - Forensic Tools for Analysis of Registry - Forensic Tools for Encryption/Decryption - Forensic Tools for Password Recovery - Forensic Tools for Analysing Network - Forensic Hardware - Forensic Analysis Tools for Mobile Devices - Forensic Tools for Email Analysis - Need for Computer Forensic Investigators.					
Unit: 4	Acquisition and Handling of Digital Evidence	9 Hours			
Preliminaries of Electronic or Digital Evidence - Acquisition and Seizure of Evidence - Chain of Custody and Digital Evidence Collection Form - Fourth Amendment and Seizure - Acquisition of Computer and Electronic Evidence - Acquisition Procedure using Target Disk Mode from Apple Macintosh Computer - Acquisition of Evidence from Mobile Phone and PDA - Acquisition of Evidence from Optical and Removable Media, Digital Cameras - Challenges to Acquisition of Digital Evidence.					
Unit: 5	Analysis of Digital Evidence and Admissibility of Digital Evidence	9 Hours			

Introduction to Analysis of Digital Evidence - Capturing of Forensic Copy of Memory and Hard Drive with Toolkit Forensic Imager - RAM Analysis with Volatility - Analysing Hard Drive with WinHex - Working with Autopsy - Email Tracking and Tracing - Role of Forensic Analyst in Analysis – Introduction Digital Evidence - Electronic Record - Section 5 of ITA 2000—Legal Recognition of Digital Signatures - Presenting Digital Evidence.

Total Lectures	45 Hours

Text Books

1. Anand Shinde, “Introduction to Cyber Security”, Notion Press, 2021, ISBN:978163781643.
2. Cyber Forensics Deje, S. Murugan IPS – Oxford University Press, 2018, ISBN: 9780199489442.

Reference Books

1. Dr. Erdal Ozkaya, “Cybersecurity: The Beginner’s Guide”, Kindle Edition, Packt Publishing Limited, ISBN: 1789616190.
2. Arun Soni, “The Cybersecurity Self – Help Guide”, 1st Edition, CRC Press, 2021, SBN:9781000454901.
3. Catherine D. Marcum, “Cyber Crime”, 2nd Edition, Aspen Publishing, 2019, ISBN: 9781543809688.
4. Erik H.A. van de Sandt, “The Deviant Security Practices of Cyber Crime”, Brill Publishers, ISBN:9789004463189.
5. A. Gopala Krishna, “Be a Cyber Warrior”, eBooks2go Incorporated Publishers, 2019, ISBN:9781545743546.

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Course Code	CYBER FORENSICS LAB	L	T	P	C
23CA2017		0	0	2	2

Course Objectives:

Enable the student to:

1. Acquire skills for working with digital forensics.
2. Prepare effective digital forensics tools to identify, classify, locate and recover the evidence.
3. Practice emerging digital forensic trends and technologies.

Course Outcomes:

The student will be able to:

1. Apply the cyber forensics knowledge required for forensic analysis.
2. Extend scientific approaches to forensics that helps to identify, classify, locate and recover the evidence.
3. Choose and apply current cyber forensics tools investigation.
4. Develop network forensics analysis skills.
5. Identify the emerging forensic technology.
6. Expertise to become a proficient forensic investigator.

LIST OF EXERCISES

1. Perform Digital evidence identification and isolation.
2. Examination of windows event log and perform log correlation.
3. Perform forces analysis on last activity (LastActivityView).
4. Implement windows password cracking (Hiren's Boot).
5. Perform Mobile data analysis using forensics tool (SUNTOKU_0.5).
6. Perform USB and HDD write blocker for forensic acquisition.
7. Performing analysis on volatile memory using FTK imager.
8. Analysis on Digital photography image (<https://29a.ch>).
9. Creating MAC timeline of a directory (Mac-Robber).
10. Analyze the system using autopsy.
11. Processing and analysis of disk images using autopsy.
12. Information gathering for investigating task using maltego.

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Course Code	WEB DEVELOPMENT	L	T	P	C
23CA2018		3	0	0	3
Course Objectives: Enable the student to: 1. Acquire knowledge on web application development procedure. 2. Develop applications using Angular JS. 3. Create applications by validating forms and connect to database.					
Course Outcomes: The student will be able to: 1. Compile the concept of client-server communication protocols. 2. Develop web pages using markup languages. 3. Design and understand the concept of cascading style sheets. 4. Create web pages using XML. 5. Develop web applications using Angular JS. 6. Create forms, validate and connect to database.					
Unit: 1	Web Site Basics and HTML				9 Hours
Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols –The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: An Introduction to HTML History and Versions – Some Fundamental HTML elements - Lists-tables-Frames-Forms-Relative URLs – XHTML - Basic XHTML Syntax and Semantics.					
Unit: 2	Cascading Style Sheets, XML And XSL				10 Hours
Introduction to Cascading Style Sheets-Features-CSS Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties - CSS box model - positioning using CSS – Lists – Tables. XML documents, XML versions and XML declaration, XML namespaces, JavaScript and XML: Ajax - DOM based XML processing - Transforming XML documents - Introduction to XSL-XLS component overview- transforming with XSLT.					
Unit: 3	Client-Side Programming				8 Hours
The JavaScript Language-History and Versions - Introduction to JavaScript - JavaScript in Perspective - Syntax - Variables and Data Types – Statements - Operators – Literals – Functions -Objects – Arrays - Built-in Objects -JavaScript Debuggers.					
Unit: 4	Angular JS				9 Hours
What is Angular JS? Advantages of Angular, Angular JS MVC - Introduction to SPA - Setting up the environment, First App using MVC architecture - Understanding ng attributes - Expression and Data Binding - Working with directives - Angular Modules - Controller, Scope and View - Create Controller and Module, scope hierarchy.					
Unit: 5	Angular JS Filters and Forms				9 Hours
Filters - Built-in filters - upper case and lower case filters, date, currency and number formatting, orderBy - filter, custom filter - Angular JS Forms - Working with AngularJS forms, model binding, form controller - Using CSS classes, form events - custom model update triggers - custom validation-Database Connectivity.					
Total Lectures					45 Hours
Text Books					
1.	Jeffrey C. Jackson, "Web Technologies-A Computer Science Perspective", Pearson Education, 2011, ISBN:9780131856035.				
2.	Brad Dayley, “Node.js, MongoDB, and AngularJS Web Development”, Addison Wesley, 2014, ISBN:9780321833891.				
Reference Books					
1.	Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", 4 th Edition, Pearson Education, 2009. ISBN: 9788131725221.				

2.	Robert W. Sebesta, "Programming the World Wide Web", 4 th Edition, Pearson Education, 2011, ISBN:9788131764589.	
3.	Agus Kurniawan, “Angular JS Programming by Example”, Pearson Education, 2014, ASIN:B00JI0Y3PG.	
4.	Asim Hussian, “Angular: From Theory to Practice: Build the web applications of tomorrow using the Angular framework from Google”, 2017, ASIN:B01N9S0CZN.	
5.	Rodrigo Branas, “Angular JS Essentials ”, Packt Publishing, 2014, ISBN: 9781783980086.	
Recommended by Board of Studies		04 Aug 2023
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Course Code	WEB DEVELOPMENT LAB			L	T	P	C
23CA2019				0	0	2	2
Course Objectives:							
Enable the student to:							
1. Acquire the knowledge of creating web application. 2. Solve real time problems using servlet. 3. Exhibit the concepts of Java Server Pages.							
Course Outcomes:							
The student will be able to:							
1. Design simple web pages using markup languages. 2. Develop web pages using XML/XSLT. 3. Examine the concept of Cascading Style Sheets. 4. Implementation of programs using JavaScript. 5. Create applications using Angular JS. 6. Develop skills in developing websites.							
LIST OF EXERCISES							
1. Design a HTML code to demonstrate various types of list. a. Unordered List b. Ordered List c. Definition List d. Nested List 2. Develop a HTML code to demonstrate hyperlinks. a. Navigation from one page to another. b. Navigation within the page 3. Design and demonstrate Cascading Style Sheets. a. Embedded style sheets. b. External style sheets. c. Inline styles. 4. Develop an XML code to store the personal information and access the data using XSL. 5. Design an XML to store student information and extract the details using DOM. 6. Create a JavaScript for validating registration form. 7. Develop a JavaScript to design a simple calculator to perform basic arithmetic operations. 8. Create a simple servlet program that displays a message. 9. Create applications using Angular JS. 10. Create application and validate the form. 11. Develop application to Link Angular JS with HTML. 12. Create a database and retrieve the data.							
Recommended by Board of Studies				04 Aug 2023			
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Course Code	SECURITY ASSESSMENT OF INFORMATION SYSTEMS THROUGH ETHICAL HACKING	L	T	P	C
23CA2020		3	0	0	3
Course Objectives: Enable the student to: 1. Acquire knowledge on computer-based vulnerabilities.					

2. Interpret different foot printing, reconnaissance and scanning methods.		
3. Apply hacking options available in web and wireless applications.		
Course Outcomes:		
The student will be able to:		
1. Express knowledge on basics of computer-based vulnerabilities.		
2. Describe different foot printing, reconnaissance and scanning methods.		
3. Differentiate enumeration and vulnerability analysis methods.		
4. Apply hacking options available in web and wireless applications.		
5. Compare and analyze of log files.		
6. Examine the digital evidence.		
Unit: 1	Ethical Hacking Overview & Vulnerabilities	9 Hours
Understanding the importance of security-Concept of ethical hacking and essential Terminologies- Threat- Attack- Vulnerabilities- Target of Evaluation- Exploit. Phases involved in hacking. Malware Threats: Viruses and Worms, Trojans, Covert Communication, Keystroke Logging and Spyware, Malware Counter measures.		
Unit: 2	Footprinting Reconnaissance And Scanning Networks	9 Hours
Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall - Ping sweeps		
Unit: 3	Enumeration And Vulnerability Analysis	9 Hours
Enumeration Concepts - NetBIOS Enumeration – SNMP, LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities.		
Unit: 4	System Hacking	9 Hours
Aspect of remote password guessing- Role of eavesdropping -Various methods of password cracking- Keystroke Loggers- Understanding Sniffers - Comprehending Active and Passive Sniffing- ARP Spoofing and Redirection- DNS and IP Sniffing- HTTPS Sniffing- Session Hijacking - Types of Session Hijacking- Session Hijacking Tools.		
Unit: 5	Hacking Web Services and Wireless Networks	9 Hours
Hacking Web Servers - Web Application Components- Vulnerabilities – Web application vulnerabilities- Application coding errors- SQL injection into Back-end Databases- Cross-site scripting- Cross-Site request forging- Authentication bypass- Web services and related flaws-Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade – Introduction to 802.11-Role of WEP- Cracking WEP Keys- Sniffing Traffic.		
Total Lectures		45 Hours
Text Books		
1.	Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy, Syngress Media, 2 nd Edition, 2013, ISBN: 9780124116443.	
Reference Books		
1.	Michael Gregg, “Certified Ethical Hacker Version 9 Cert Guide, 2 nd Edition, Pearson IT Certification, ISBN: 9780789756916.	
2.	Michael T. Simpson, Kent Backman, and James E. Corley, “Hands-On Ethical Hacking and Network Defense”, Course Technology, Delmar Cengage Learning, 2010, ISBN:9781435486096.	
3.	Dafydd Stuttard and Marcus Pinto, “The Web Application Hacker’s Handbook: Finding and Exploiting Security Flaws”, John Wiley & Sons, 2011, ISBN: 9781118026472.	
4.	Kimberly Graves, "CEH Certified Ethical Hacker", Wiley India Pvt Ltd, 2010, ISBN: 9780470525203.	
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Course Code	SECURITY ASSESSMENT OF INFORMATION SYSTEMS THROUGH ETHICAL HACKING LAB	L	T	P	C
23CA2021		0	0	2	2
Course Objectives:					
Enable the student to:					
1. Solve problems by learning web application security, vulnerabilities and their exploitation techniques. 2. Acquiring knowledge about how a cyber-criminal can take advantage of security vulnerabilities. 3. Exhibit how a single user might fall victim to a cyber attack.					
Course Outcomes:					
The student will be able to:					
1. Identify the vulnerabilities/threats/attacks. 2. Practice the enumeration and vulnerability analysis methods 3. Apply penetration and security testing in web applications. 4. Identify the vulnerabilities associated with various network applications. 5. Design a computer against a variety of security attacks using various tools. 6. Gain knowledge on hacking options available in wireless applications.					
LIST OF EXERCISES					
1. Install Kali Linux / Metasploitable/ Windows XP. 2. Implement Footprinting and Reconnaissance using tools. 3. Implement Network Scanning using tools Advanced Port Scanner, Colasoft Ping Tool. 4. Perform Scanning using Nmap. 5. Implement Enumeration using tools. 6. Implement system hacking using tools. 7. View and capture network traffic using Wireshark. 8. Scan the target using tools like Nessus. 9. Web application hacking. 10. Wireless applications. 11. Dumping and cracking SAM hashes to extract plain text password 12. Social Engineering Tool Kit.					
Recommended by Board of Studies		04 Aug 2023			
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Course Code	DATABASE SECURITY	L	T	P	C
23CA2022		3	0	0	3
Course Objectives:					
Enable the student to: 1. Exhibit the issues that arise in securing database. 2. Design security policies and use tools to protect data loss and data theft. 3. Create database auditing, backup and recovery processes.					
Course Outcomes:					
The student will be able to: 1. Design and develop database. 2. Create efficient and complex queries. 3. Identify proper authentication and authorization techniques for database applications. 4. Design multilevel security scheme for database. 5. Employ strategies in database auditing and database performance tuning. 6. Perform database backup and recovery.					
Unit: 1	Database Design, Query Processing			9 Hours	
Database Concepts and Architecture - ER Relational Data Model and Relational Database Constraints, Normalization, Files structures - Hashing and Indexing – Case Study on Database Design- Indexing structure, Strategies of Query processing, Query Optimization.					
Unit: 2	Authentication & Authorization			9 Hours	

Introduction – Strong Authentication – Proxy Authentication & Proxy Authorization – Single sign – Profiles – Privileges – Roles - Case Study on Authentication Technologies in Banking /Healthcare industry.		
Unit: 3	Multilevel Security	9 Hours
Concepts of Database security, Multilevel Database Security basics and implementation - Fundamentals of Information Encryption - Encryption based Multilevel Database Model - - Case Study on Enterprise - Database Security.		
Unit: 4	Database Auditing	9 Hours
Auditing Techniques, Auditing Architectures, Auditing Models, Application Data Auditing, Auditing Database Activities.		
Unit: 5	Database Backup and Recovery	9 Hours
Backup and Recovery concepts, Recovery, Protecting Backup Environment, RAID, Replications, Mirroring.		
Total Lectures		45 Hours
Text Books		
1.	Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Pearson, 7 th Edition, 2015, ISBN: 9780133970777.	
2.	Osama S. Faragallah, El-Sayed M. El-Rabaie, Fathi E. Abd El-Samie, “Multilevel Security for Relational Databases”, Auerbach Publications, 1 st Edition, 2014, ISBN: 9781482205398.	
Reference Books		
1.	Michael Gertz, Sushil Jajodia, “Handbook of Database Security Applications and Trends”, Springer, ISBN: 9780387485324.	
2.	Michael J. Hernandez, “Database Design for Mere Mortals: A Hands-On Guide to Relational Database Design”, 3 rd Edition, 2013, Addison-Wesley Professional, ISBN: 9780321884497.	
3.	Preston de Guise, “Enterprise Systems Backup and Recovery: A Corporate Insurance Policy”, Auerbach Publications, 2017, ISBN: 9781138440425.	
4.	Rajiv Chopra, "Database Management System (DBMS)A Practical Approach", 2010, S. Chand Limited, ISBN: 9788121932455.	
5.	Mukesh Negi, "Fundamentals of Database Management System Learn Essential Concepts of Database Systems", 2019, BPB PUBN, ISBN:9789388176620.	
Recommended by Board of Studies		04 Aug 2023
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Course Code	DATABASE SECURITY LAB	L	T	P	C
23CA2023		0	0	2	2
Course Objectives:					
Enable the student to: 1. Examine the various issues that arise in securing database. 2. Design security policies and use tools to protect data loss and data theft. 3. Describe database backup and recovery and database auditing.					
Course Outcomes:					
The student will be able to: 1. Design and develop database. 2. Develop efficient and complex queries. 3. Identify proper authentication and authorization techniques for database applications. 4. Design multilevel security scheme for database. 5. Implement database auditing and database performance tuning. 6. Perform database backup and recovery.					
LIST OF EXERCISES					
1. Implement Table Management. 2. Create various types of Queries.					

3. Develop Packages. 4. Implement a code for Implicit Cursor. 5. Implement a code for Explicit Cursor. 6. Create Triggers for the event. 7. Design Index and Partitions. 8. Assign Roles and Privileges. 9. Export and Import data. 10. Create Query Optimization. 11. Design User Managed Recovery. 12. Perform Database Vault Administration.	
Recommended by Board of Studies	04 Aug 2023
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Course Code	INCIDENT RESPONSE MANAGEMENT	L	T	P	C
23CA2024		3	0	0	3
Course Objectives:					
Enable the student to: 1. Define the baseline of performing incident response and computer forensics. 2. Interpret and state how to obtain host-based information from live computer systems, collecting the volatile data from Unix and windows systems. 3. Discuss the unearthing and interpreting data on windows and Unix systems.					
Course Outcomes:					
The student will be able to: 1. Summarize the aspects of incident response process. 2. Describe data collection procedures. 3. Apply the art of data analysis. 4. Apply the investigating procedures to analysis hacker tools and routers. 5. Summarize about the computer forensic report writing. 6. Summarize about data recovery procedure.					
Unit: 1	Introduction to the Incident Response Process			9 Hours	
Real-World Incidents - Incident Response Process - Preparing for Incident Response - Preparing Individual Hosts - Preparing a Network - Establishing Appropriate Policies and Procedures - Creating a Response Toolkit - Establishing an Incident Response Team - After Detection of an Incident.					
Unit: 2	Data Collection			9 Hours	
Live Data Collection from Windows Systems - Live Data Collection from Unix Systems - Forensic Duplication - Collecting Network-based Evidence - Evidence Handling.					
Unit: 3	Data Analysis			9 Hours	
Computer System Storage Fundamentals - Data Analysis Techniques - Investigating Windows Systems - Investigating Unix Systems - Analyzing Network Traffic.					
Unit: 4	Investigating Hacker Tools and Routers			9 Hours	
How Files Are Compiled - Static Analysis of a Hacker Tool - Dynamic Analysis of a Hacker Tool - Obtaining Volatile Data Prior to Powering Down - Using Routers as Response Tools.					
Unit: 5	Writing Computer Forensic Reports			9 Hours	
What Is a Computer Forensics Report? - Report Writing Guidelines - A Template for Computer Forensic Reports.					
Total Lectures				45 Hours	
Text Books					
1.	Chris Prosise, Kevin Mandia, “Incident Response & Computer Forensics”, 2 nd Edition, Mcgraw-Hill. ISBN: 9780072226966.				

2.	Chris Prosise, Kevin Mandia, “Incident Response & Computer Forensics”, 3 rd Edition, Mcgraw-Hill, ISBN: 9780071798693.
Reference Books	
1.	Harlan Carvey, “Windows Forensics Analysis Toolkit: Advanced Analysis Techniques for Windows 8”, 4 th Edition, Syngress Publication, 2014, ISBN:9780124171572.
2.	Kevin Mandia, Chris Prosise, Matt Pepe, “Incident Response and Computer Forensics “, Tata McGraw -Hill, New Delhi, 2003, ISBN: 0072230371.
3.	Cory Altheide, Harlan Carvey, “Digital Forensics with Open-Source Tools: Using Open-Source Platform Tools for Performing Computer Forensics on Target Systems: Windows, Mac, Linux, Unix, etc”, Syngress; 1 st Edition, 2011, ISBN: 9781597495868.
Recommended by Board of Studies	
04 Aug 2023	
Approved by Academic Council	
25 Aug 2023	

Course Code	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE	L	T	P	C
23CA2025		3	0	0	3
Course Objectives:					
Enable the student to: 1. Describe the foundations of artificial intelligence and machine learning algorithms. 2. Simulate artificial intelligence-based implementations for real life applications. 3. Apply the concepts of neural networks.					
Course Outcomes:					
The student will be able to: 1. Summarize the foundations of artificial intelligence. 2. Apply artificial intelligence for problem solving. 3. Illustrate the role software agents in artificial intelligence. 4. Apply artificial intelligence to solve real world problems. 5. Outline the concepts of neural networks. 6. Analyze the working principles of recurrent neural networks.					
Unit : 1	Introduction				9 Hours
Introduction - Definition - Future of Artificial Intelligence – AI Components - Characteristics of Intelligent Agents-Typical Intelligent Agents - Problem Solving Approach to Typical AI Problems – Structure of AI – Data: Data Basics – Types of Data – Big Data – Databases and other tools – Data Process – Ethics and Governance – Data Terms and Concepts.					
Unit : 2	Problem Solving Methods				9 Hours
Problem Solving Methods – Search Strategies – Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraints Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games.					
Unit : 3	Software Agents & Machine Learning				9 Hours
Software Agents – Architecture for Intelligent Agents – Agent Communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent Systems. Machine Learning: Forms of Learning – Supervised & Unsupervised Learning – Learning Decision Trees – Model Selection and Optimization – Linear Regression and Classification – Ensemble Learning – Developing Machine Learning Systems.					
Unit : 4	AI Applications				9 Hours
AI Applications – Language Models – Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Physical Robots: Overview of Robots – Hardware – Perception – Planning – Moving – Industrial and Commercial Robots – Robots in the Real World – Humanoid and Customer Robots – The Three Laws of Robotics – The future of Robots.					
Unit : 5	Deep Learning				9 Hours

Deep Learning – Simple Feedforward Networks – Convolutional Networks – Generalization- Recurrent Neural Networks – Unsupervised Learning and Transfer Learning- Reinforcement Learning: Active Reinforcement Learning – Passive Reinforcement Learning – Generalization in Reinforcement Learning – Applications of Reinforcement Learning.

Total Lectures **45 Hours**

Text Books

1. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach”, Prentice Hall, 4th Edition, 2020, ISBN – 0-13-461099-7.
2. Tom Taulli, “Artificial Intelligence Basics”, Après, 2009, ISBN-13: 978-1-4842-5028-0.

Reference Books

1. M. Tim Jones, - Artificial Intelligence: A Systems Approach, Bartlett Publishers Inc.; First Edition, 2008, ISBN: 9780763773373.
2. Nils J. Nilsson, - The Quest for Artificial Intelligence, Cambridge University Press, 2010, ISBN: 9780521116398.
3. David L. Poole and Alan K. Mackworth, - Artificial Intelligence: Foundations of Computational Agents, Cambridge University Press, 2nd Edition, 2017, ISBN: 978110719539.

Recommended by Board of Studies 04 Aug 2023

Approved by Academic Council 25 Aug 2023

Course Code	INFORMATION SECURITY ETHICS	L	T	P	C
23CA2026		3	0	0	3

Course Objectives:

Enable the student to

1. Identify the necessity of professional ethics.
2. Examine the impact of applying information security principles in real life scenarios.
3. Apply ethical principles in professional environments.

Course Outcomes:

The student will be able to:

1. Represent the role of professional ethics in education.
2. Administer ethical reasoning in professional environments.
3. Apply the principles of ethics in real life scenarios.
4. Solve the conflicts of interests in professional environment.
5. Focus on the moral principles within an organization.
6. Prioritize the roles and responsibilities in an organization.

Unit: 1 **Professional Ethics and Value Education** **9 Hours**

Profession – Professional Ethics – Professional and Professionalism – Professional Responsibilities – Professional Accountability – Role of a Professional – Ethics and Image of a Profession – Hippocratic Oath – Professional Misconduct Defined – Corporate Social Responsibility – Whistle – blowing.

Unit: 2 **Overview of Ethics Reasoning** **9 Hours**

Defining Professional - Essential features - Common features, Role-based duties, Types of Professional - Client Relationships - Paternalistic (or parentalistic) - Contractual, Affinity, Fiduciary.

Unit: 3 **A Model of Ethics Reasoning** **9 Hours**

A Model of Ethics Reasoning: Relativism, Absolutism and Contextualism – Deontology – Utilitarianism – Ross and Pluralistic Deontology – Moral Principles.

Unit: 4 **Principles, and Norms within Professional Environments - I** **9 Hours**

Autonomy and Respect for Persons – Beneficence and Non - Maleficence – Confidentiality and Privacy – Conflicts of Interest.

Unit: 5 **Principles, and Norms within Professional Environments - II** **9 Hours**

Fidelity, Honesty and Role based duties: Promises, Moral foundations, Honesty, Professionals’ duty to be informed, Commission versus omission, Honesty and wisdom, Balancing duties, Honesty and roles –

Formal Justice - Bias and Allocation of Resources - Components of IPR and their importance – Patents – Trademark – Copyright.	
Total Lectures	45 Hours
Text Books	
1.	Premvir Kapoor, “Professional Ethics and Human Values”, 2019, Khanna Publishing House, ISBN:9789386173652.
2.	Christopher Meyers, “The Professional Ethics Toolkit”, Wiley Publication, 2018, ISBN:9781119045182.
Reference Books	
1.	Asha Vijay Durafe, Dhanashree K. Toradmalle, “Intellectual Property Rights”, Wiley Publishers, 2020, ISBN: 9789390395910.
2.	Emile Durkheim, Professional Ethics and Civic Morals, 2018, Taylor & Francis, ISBN:9780429841095.
3.	Dr. P.K. Varshney. Syad Abdul Wahid Shah, Deepak Kumar Sharma, “Human Values and Professional Ethics”, Ocean Publication, 2020, ISBN: 9788194355984.
4.	Satya Sundar Sethy, “Higher Education and Professional Ethics”, 2018, Taylor & Francis, ISBN:9781351173780.
5.	Tim Dare, W. Bradley Wendel, “Professional Ethics and Personal Integrity”, 2020, Cambridge Scholars Publishing, ISBN:9781527553361.
Recommended by Board of Studies	04 Aug 2023
Approved by Academic Council	25 Aug 2023

Course Code	CYBER SECURITY GOVERNANCE	L	T	P	C
23CA2027		3	0	0	3
Course Objectives:					
Enable the student to: 1. Observe the foundations of cyber security policy. 2. Examine effective cyber security governance to protect the information assets. 3. Select the appropriate control frameworks and standards.					
Course Outcomes:					
The student will be able to: 1. Summarize the foundations of cyber security governance. 2. Develop an information security strategy. 3. State the need for risk management. 4. Compare existing with emerging security strategy. 5. Select a governing control or standards framework. 6. Tabulate various compliance laws.					
Unit: 1	Cyber Security & Governance			9 Hours	
Introduction – Cyber Security analysis – Corporate Security and Corporate intelligence – Cyber Security threats – Enterprise Risk management – Issues Governance: Definition – Information Security Governance Outcomes of cyber-Security governance – Benefits- Governance, Risk and Compliance- Why Governance.					
Unit: 2	Legal and Regulatory requirements, Strategic context			9 Hours	
Legal and Regulatory requirements- roles and responsibilities- The Board of Directors- Executive Management- Security Steering Committee- The CISCO- Governance Objectives- Strategic Direction- Ensuring Objectives are Achieved- Risks Managed Appropriately- Verifying Resources are Used Responsibly.					
Unit: 3	Risk Management, Current State and Developing a Security strategy			9 Hours	
Determining Risk Management Objectives- Recovery Time Objectives- Current State of Security - Current State of Risk Management - Gap Analysis - Unmitigated Risk- SABSA- CMM – Developing a security strategy.					

Unit: 4	Security Governance objectives	9 Hours
Security Architecture – COBIT – Capability maturity model – ISO/ IEC 27001/ 27002– Other approaches.		
Unit: 5	Compliance Law	9 Hours
Civil law versus Criminal Law – Computer Security Act – Sarbanes Oxley Act – Gramm Leach Bailey Act – Health Insurance Portability and Accountability Act – Federal Information Security Management Act.		
Total Lectures		45 Hours
Text Books		
1.	Dr Peter Trim, Dr Yang-Im Lee, “Cyber Security Management: A Governance, Risk and Compliance Framework”, Routledge; 1 st Edition, 2014, ISBN: 9781472432094.	
2.	Krag Brotby, “Information Security Governance: A Practical Development and Implementation approach”, Wiley; 1 st Edition, 2009, ASIN: B074VDFVVT.	
Reference Books		
1.	Todd Fitzgerald, “Information Security Governance Simplified”, Taylor & Francis Group, 2012, ISBN: 9781439811658.	
2.	L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph Weiss “Cyber Security Policy Guidebook”, John Wiley & Sons., 2017, ISBN: 9788126569977.	
3.	Richard Phillips, Rayton R. Sianjina, “Cyber Security for Educational Leaders: A Guide to Understanding and Implementing Technology Policies”, Routledge; 1 st Edition, 2013, ASIN: B00EVWHRVI.	
4.	Amos N. Guiora, “Cybersecurity: Geopolitics, Law, and Policy”, Routledge; 1 st Edition, 2017, ISBN: 9781138033290.	
5.	James Graham, Ryan Olson, Rick Howard, “Cyber Security Essentials”, CRC Press, 2018, ISBN: 9780815351429.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	SECURITY OF WEB APPLICATIONS	L	T	P	C
23CA2028		3	0	0	3
Course Objectives:					
Enable the student to: 1. Articulate the concepts of web application security. 2. Identify and fix the vulnerabilities in an application. 3. Apply the security principles in developing web applications.					
Course Outcomes:					
The student will be able to: 1. Identify the vulnerabilities in web applications. 2. List the types of threats and mitigation measures of web applications. 3. Classify web application attacks. 4. State the importance of authentication and authorization. 5. Practice the skills in protecting the end user from attacks. 6. Apply various security principles in developing applications.					
Unit: 1	Web application security vulnerability			9 Hours	
Web Application Architecture components, Software components, Technologies, Security Development Life Cycle, Vulnerability Management, Web Application Scanning Flow, Features of Web Application Scanner.					
Unit: 2	Web Application Attacks			9 Hours	
Web Application Attacks Cross-site Scripting, Cross-Site request forgery, SQL Injection, Server Misconfiguration and Predictable Pages, Logic Attacks, Web Distrust, Security for Web Applications, Securing Web Services. Case studies on Web Application attacks.					

Unit: 3	Web browser Security & Attacks	9 Hours
Web Browser Hacking, Web Browser Security, Control Initiating Techniques, Attacking Users, Attacking Browsers, Attacking Plugins, Attacking Web Applications, Authentication & Authorization, Deploying SSL Server Certificates.		
Unit: 4	Privacy and Security	9 Hours
Privacy and Security for users Log Files, Understanding Cookies, Web Bugs, Picking Great Password, Avoiding Spam and Junk Email, Identity Theft, Blocking Ads and Crushing Cookies, Anonymous Browsing, Securing Email, Host Security for servers.		
Unit: 5	Security Principles	9 Hours
Browser security Principles: Same origin policy, Cross site scripting-Cross-site forgery-Database security principles-File Security principles.		
Total Lectures		45 Hours
Text Books		
1. Mike Shema, “Web Application Security for Dummies”, John Wiley & Sons, Ltd, ISBN: 9781119994879.		
2. Dafydd Stuttard, Marcus Pinto, The Web Application Hacker’s Handbook: Finding and Exploiting Security Flaws, 2ed, ISBN: 97881265334042011.		
Reference Books		
1.	Bryan Sullivan, Vincent Liu, “Web Application Security, A beginners guide”, McGraw-Hill Education Publication, 2011.	
2.	Dafydd Stuttard, Marcus Pinto, ”The Web Application Hacker’s Handbook: Finding and Exploiting Security Flaws”, 2 nd Edition, ISBN: 97881265334042011.	
3.	Andrew Hoffman, “Web Application Security Exploitation and Countermeasures for Modern Web Applications”, O’Reilly Media, Inc., 2020, ISBN: 9781492053101.	
4.	Wade Alcorn, Christian Frichot, Michele Orru, “The Browser Hacker’s Handbook”, ISBN: 9781118662090.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	FUNDAMENTALS OF CLOUD COMPUTING	L	T	P	C
23CA2029		3	0	0	3
Course Objectives:					
Enable the student to:					
1. Acquire the basic knowledge about cloud computing.					
2. Build a cloud network.					
3. Acquire knowledge about virtualization and cloud security.					
Course Outcomes:					
The student will be able to:					
1. Summarize the key concepts associated with cloud computing.					
2. Describe the building blocks of cloud networks.					
3. Apply the open-source tools used for virtualization.					
4. Discuss the preliminaries of cloud security.					
5. Describe how the cloud computing is used and managed by end users.					
6. Summarize about mobile operating system.					
Unit: 1	The Evolution of Cloud Computing			9 Hours	
Introduction – Hardware Evolution – Internet Software Evolution – Server Virtualization – CaaS – IaaS – MaaS – PaaS – SaaS.					
Unit: 2	Building Cloud Networks			9 Hours	
The Evolution from the MSP Model to Cloud Computing and Software-as-a-Service - The Cloud Data Center - Collaboration - Service - Oriented Architectures as a Step Toward Cloud Computing - Basic					

Approach to a Data Center-Based SOA - The Role of Open Source Software in Data Centers - Where Open Source Software Is Used.		
Unit: 3	Virtualization Practicum	9 Hours
Downloading Sun xVM VirtualBox – Installing Sun xVM VirtualBox – Adding a Guest Operating System to VirtualBox – Downloading FreeDOS as a Guest OS – Downloading the 7-Zip Archive Tool – Adding a Guest OS to Sun xVM VirtualBox – Presence and Privacy in the Cloud.		
Unit: 4	Security in the Cloud	9 Hours
Cloud Security Challenges – Software-as-a-Service Security – The Distributed Management Task Force – Standards for Application Developers – Standards for Messaging – Standards for Security.		
Unit: 5	End-User Access to Cloud Computing	9 Hours
YouTube – YouTube API Overview – Zimbra – Facebook – Zoho – Mobile Operating Systems for Smartphones – Mobile Platform Virtualization – Collaboration Applications for Mobile Platforms – Future Trends.		
Total Lectures		45 Hours
Text Books		
1.	John W. Rittinghouse, James F. Ransome, “Cloud Computing Implementation, Management and Security” CRC Press, Special Indian Edition, 2017, ISBN: 9781439806807.	
Reference Books		
1.	Ronald L Krutz and Russel Dean Vines, “Cloud Security: A Comprehensive Guide to Secure Cloud Computing”, 1 st Edition, Wiley India, New Delhi, ISBN: 9780470589878.	
2.	John W Rittinghouse and James F Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, Boca Raton, 2009, ISBN: 9781439806807.	
3.	Rajkumar Buyya, James Broberg and Andrzej Goscinski, “Cloud Computing: Principles and Paradigms”, John Wiley and Sons, New Jersey, ISBN: 9780470887998.	
5.	Ronald L Krutz and Russel Dean Vines, “Cloud Security: A Comprehensive Guide to Secure Cloud Computing”, 1 st Edition, Wiley India, New Delhi, ISBN: 9780470589878.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	LINUX ADMINISTRATION AND PROGRAMMING	L	T	P	C
23CA2030		3	0	0	3
Course Objectives:					
Enable the student to: 1. Practice basic configuration and Linux command-line experiments. 2. Recognize the usage of system commands. 3. Focus on process management and security.					
Course Outcomes:					
The student will be able to: 1. List various Linux commands and its flavours. 2. Examine the remote administration and secure system boot up process. 3. Relate process management, identity and security. 4. Apply network security policies. 5. Create and manage storage devices. 6. Examine the file system and storage management.					
Unit: 1	Introduction to Red Hat Enterprise Linux				9 Hours
Linux - Open Source and Red Hat - Origins of Linux - Distributions - Duties of Linux System Administrator Working with the Bash Shell - Getting the Best of Bash - Useful Bash Key Sequences - Working with Bash History - Performing Basic File System Management Tasks - Working with Directories - Piping and Redirection - Finding Files. Performing Job Management Tasks - System and Process Monitoring and Management - Managing Processes with ps - Sending Signals to Processes with the kill Command - Using top to Show Current System Activity - Managing Process Niceness					

- Scheduling Jobs - Mounting Devices - Working with Links - Creating Backups - Managing Printers - Setting Up System Logging - Setting Up Rsyslog - Common Log Files - Setting Up Logrotate.		
Unit: 2	Managing Software	9 Hours
Understanding RPM - Understanding Meta Package Handlers - Creating Your Own Repositories - Managing Repositories - Installing Software with Yum - Querying Software - Extracting Files from RPM Packages Working with Users - Groups - and Permissions: Managing Users and Groups - Commands for User Management - Managing Passwords - Modifying and Deleting User Accounts - Configuration Files - Creating Groups - Using Graphical Tools for User - and Group Management - Using External Authentication Sources - the Authentication Process - sssd - nsswitch - Pluggable Authentication Modules - Managing Permissions - the Role of Ownership - Basic Permissions: Read - Write - and Execute - Advanced Permissions - Working with Access Control Lists - Setting Default Permissions with umask - Working with Attributes.		
Unit: 3	Remote Administration and System Initialization	9 Hours
SSH v2 Connection Process - Connection via SSH - Manually Retrieve SSH Host Keys - Configure an SSH Server and Client - Create an SSH Key Pair - Upload Public Key to Server - Use the SSH Agent - Remote Management VNC Server - Configure a One Time VNC Session - Client Access – Boot Processes - GRUB2 Boot Loader - systemd initramfs - Advantages of UEFI - Secure Boot – Differences between GRUB Legacy and GRUB2 - Configuration File Structure - Edit Menu Entries During Boot - GRUB2 Commands - Set a Boot Password - systemd Basics - Unit File - systemctl - Manage Services - Target Units - Application: Remote Administration using VNC - Secure GRUB with a Password - Manage Services.		
Unit: 4	Process Management and Identity and Security	9 Hours
Processes Basics - View and Manage Processes - Processes Priority - Jobs and Processes - Pseudo TTYs and screen - Cron Jobs - at Daemon - User and Group Management - File Permissions and Ownership - File / Directory Modes - Modifying File / Directory Modes and Ownership - umask - Sticky Bit – Set Group ID and User ID - ACLs - ACL Check Algorithm - How Applications Handle ACLs – Privilege Delegation - Identity Switching Delegate Admin Privileges - Configure sudo.		
Unit: 5	Storage Management	9 Hours
Linux I/O Stack - Local Disks - MBR and GPT Device - Files for Hard Disks with MBR – Expert Partitioner in YaST - parted vs. fdisk - Manage Partitions with parted - Virtual Filesystem Switch - Create File Systems from the CLI - Mount File Systems - File System Health Tools - LVM – Software RAID - Monitor RAIDs - BtrFS - Network File System Basics - NFS Server Configuration – Configure an NFS Client - Application: Manage Partitions using parted and fdisk, Create and manage btrfs, LVM and RAID partitions, Configure and use NFS.		
Total Lectures		45 Hours
Text Book		
1.	SUSE Linux Enterprise Administration Lecture, SLE2001, Version 15.0.3, 2018.	
Reference Books		
1.	Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin, “UNIX and Linux System Administration Handbook”, Addison-Wesley Professional, 2017, ISBN: 9780134278292.	
2.	Tom Adelstein, Bill Lubanovic, “Linux System Administration”, O’Reilly Media Inc., 1 st Edition, 2007, ISBN :9780596009526.	
3.	Nicholas Wells, “The Complete Guide to LINUX System Administration”, Indian Edition, Cengage Learning, 2005, ISBN: 9788131506820.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	LINUX ADMINISTRATION AND PROGRAMMING	L	T	P	C
23CA2031	LAB	0	0	2	2

Course Objectives:	
Enable the student to:	
1. Acquire skills in Linux configuration. 2. Expertise in command line interface and VIM editor. 3. Manage different file permissions.	
Course outcomes:	
The student will be able to:	
1. Relate SSH utilities with public key authentication. 2. Manage services with the systemctl command. 3. Categorize process information using gnome-system-monitor and ps. 4. Create privileges to users and groups. 5. Manage software using rpm, zypper and zypper repositories. 6. Compile different file permissions.	
LIST OF EXERCISES	
1. Perform Linux configuration. 2. Explore Filesystem Hierarchy in the linux operating system. 3. Familiarize with the command line interface. 4. Create the VIM editor. 5. Perform remote administration. 6. Perform system initialization. 7. Experiment with process management. 8. Perform identity and security. 9. Install and Manage software. 10. Perform network management. 11. Create scripts. 12. Recover forgotten root user password.	
Recommended by Board of Studies	04-08-2023
Approved by Academic Council	25 Aug 2023

Course Code	BIOMETRIC SECURITY	L	T	P	C
23CA2032		3	0	1	4
Course Objectives:					
Enable the student to:					
1. Classify the types of biometric modalities and their characteristics.					
2. Identify the components and processes involved in biometric authentication and illustrate their working principles.					
3. Design and implement biometric authentication systems for specific use cases.					
Course Outcomes:					
The student will be able to:					
1. Describe the key concepts and principles of biometric identification and verification.					
2. Evaluate different physiological biometric modalities and their characteristics.					
3. Assess different behavioural biometric modalities and their characteristics.					
4. Analyze real-world case studies to understand the practical applications of biometric security.					
5. Examine the security and privacy implications of biometric systems and propose appropriate safeguards.					
6. Discuss the societal impact of biometric technologies and the importance of responsible use.					
Unit: 1		Biometric Fundamentals			7 Hours
Introduction - Benefits of Biometrics vs Traditional Authentication Methods – Benefits of Biometrics in Identification Systems – Evaluating the benefits of Biometric Systems – Key Biometric Terms and Processes – Verification and Identification – Logical vs Physical Access – Principle of Biometric Matching – Accuracy in Biometric Matching: False Match Rate – False Non-match Rate – False Non-Match Rate – Failure-to-Enroll Rate – Derived Metrics.					
Unit: 2		Physiological Biometric Modalities			15 Hours

Finger Scan: Components – How Finger Scan Technology Works – Competing Finger Scan Technologies – Finger Scan Strengths – Finger Scan Weaknesses. Facial Scan: Components – How Facial Scan Technology Works – Competing Facial Scan Technologies – Facial Scan Strengths – Facial Scan Weaknesses. Iris Scan: Components – How it Works – Iris Scan Strengths – Iris Scan Weaknesses. Other Physiological Biometrics: Hand Scan – Retina Scan – Automated Fingerprint Identification Systems (AFIS).		
Unit: 3	Behavioral Biometric Modalities.	7 Hours
Voice Scan: Components – How it Works – Voice Scan Strengths – Voice Scan Weaknesses – Signature Scan: Components – How it Works – Signature Scan Strengths – Signature Scan Weaknesses. Keystroke Scan: Components – How it works – Keystroke Scan Strengths – Keystroke Scan Weaknesses.		
Unit: 4	Biometric Applications	9 Hours
Citizen-facing Applications: Criminal Identification – Citizen Identification – Surveillance. Employee-facing Applications: PC/Network Access – Physical Access/Time and Attendance. Customer-facing Applications: E-Commerce/Telephony – Retail/ATM/Point of Sale.		
Unit : 5	Biometric Vertical Markets and Security	7 Hours
Five Primary Biometric Vertical Markets: Law Enforcement – Government Sector – Financial Sector – Healthcare – Travel and Immigration – Security of Biometric Systems: Adversary Attacks – Attacks on the User Interface – Attacks on Biometric Processing – Attacks on the Template Database.		
Total Lectures		45 Hours
Text Books:		
1.	Samir Nanavati, Michael Thieme, Raj Nanavati, Biometrics Identity Verification in a Networked World, Wiley India Pvt Ltd., 2012, ISBN: 9788126502738	
2.	Anil K. Jain, Arun A. Ross, Karthik Nandakumar, Introduction to Biometrics, Springer, 2011, ISBN: 9780387773254.	
Reference Books		
1.	Ravindra Das, The Science of Biometric Security Technology for Identity Verification, Taylor & Francis, 2019, ISBN: 9781498761246.	
2.	James Waymann, Anil K. Jain, Dario Maio, Davide Maltoni, Biometric Systems: Technology, Design and Performance Evaluation, Springer, 2011, ISBN: 9788132202523.	
3.	Melissa Stock, Biometric Data and New Technologies – The Law and Practical Issues on Technologies Such as CCTV, Facial Recognition and Drones, Law Brief Publishing, 2022, ISBN: 9781913715939.	
4.	Ravindra Das, Biometric Technology, CRC Press, 2014, ISBN: 9781466592469.	
5	Sinjini Mitra, Mikhail Gofman, Biometrics in a Data Driven World: Trends, Technologies and Challenges, CRC Press, 2017, ISBN: 9780367574079.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

List of Lab Exercises

1. User registration using Fingerprint and Face Traits in Biometric Attendance System.
2. Configuration of Biometric Device Settings.
3. Configuration of Biometric Communication Settings.
4. Setting Access Controls in Biometric Security Systems.
5. Transferring Data from Biometric Device to Disk.
6. Querying and Searching Data from Biometric Database.

Course Code	CYBER CRIMINOLOGY AND CRIMINAL JUSTICE ADMINISTRATION	L	T	P	C
23CA3001		3	0	0	3
Course Objectives:					
Enable the student to:					
1. Classify the various forms of cybercrimes.					
2. State cybercrime from a social, psychological and criminological perspective.					

3. Examine how criminal justice administration can combat cybercrimes.		
Course Outcomes:		
The student will be able to:		
1. Examine the concept of crimes and cyber criminology. 2. Classify the forms of cybercrime. 3. Identify the psychological aspects of cyber criminals. 4. State the significance of Information Technology Act and Indian Penal Code. 5. Describe the function of the criminal justice system in relation to cybercrime. 6. Analyze the legal restrictions on the applicability of the Information Technology Act and related laws.		
Unit: 1	Principles and Concepts of Cyber Criminology	9 Hours
Crime, Tort, Misdemeanour, Juvenile Delinquency, Conventional crimes Vs Cybercrimes, Economic Offences, Cyber Space, Cyber Crime, Cyber Crimes Against property, Person, Nation and Organizations, Information Security, Penetration Testing, Incident response, GRC, Cyber Criminology, Criminology theories and cybercrimes.		
Unit: 2	Forms of Crimes	9 Hours
Types of Cyber Crimes – Cyber Theft, Phishing, Denial of Service, Distributed Denial of Service, Malwares, Cyber Bullying, Cyber Stalking, Cyber Pornography, Cyber Espionage, Cyber Defamation, Web Defacement, Hacking, Cracking, Chat Room Crimes, Cyber Terrorism, Cyber Warfare, Data Theft, Data Diddling, Cyber Violence, Cyber Vandalism, Insider Threats, National and International Cyber Crimes, Cyber based Political Crimes, IPR related frauds, social engineering, types of cyber fraud.		
Unit: 3	Psychology of Cyber Criminals & Theoretical Perspectives of Cyber Crimes	9 Hours
Psychology of Cyber Criminals: Types of Cyber Criminals, Modus Operandi of Cyber Criminals, Profiling of Cyber Criminals, Tools and Techniques adopted by Cyber Criminals- Psychological theories relating to cyber criminals, Routine Activity theory, Social learning theory, Differential association theory, Differential Opportunity theory.		
Unit: 4	Significance of I.T. Act, IPC & IEA	9 Hours
Compensation & Crimes under I.T. Act, 2000, IPC, IT Act and its relation with Indian Penal Code, Case Studies and Case Laws, Relevant section of other Acts such as IPC, Indian Evidence Act, etc. Investigation procedures and issues in the investigation of cybercrimes and collection of digital evidence.		
Unit: 5	The role of Criminal Justice Administration and Cyber crimes	9 Hours
Introduction – Categories of Anomalies – Anomaly detection - Three styles of anomaly detection – Application – Traditional Methods of Anomaly Detection – Isolation Forest – One-class support vector Machine		
Total Lectures		45 Hours
Reference Books		
1.	Roger Hopkins Burke, "An introduction to Criminological Theory", Routledge; 3 rd Edition, 2009, ISBN:978184392407.	
2.	Dejey, Murugan, "Cyber Forensics", Oxford University Press: 1 st Edition, 2018, ISBN:9780199489442.	
3.	Larry J Siegel, "Criminology: Theories, Patterns and Typologies", Cengage Learning; 13 th Edition, 2017, ISBN: 9781337091848.	
4.	Katheine S Williams, "Textbook on Criminology", Oxford University Press; 7 th Edition, 2012, ISBN:9780199592708.	
5.	Aparna Vishwanathan, "Cyber Laws – Indian and International Perspectives on Key topics including Data Security, Commerce, Cloud Computing and Cyber Crimes, LexisNexis, 2012, ISBN: 9788180387395.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	WEB APPLICATION SECURITY	L	T	P	C
23CA3002		3	0	0	3
Course Objectives:					
Enable the student to: 1. Identify the vulnerabilities in web applications. 2. Classify the types of attacks. 3. Apply the security principles in developing reliable web applications.					
Course Outcomes:					
The student will be able to: 1. Identify the vulnerabilities in web applications. 2. Examine the security aspect of web applications. 3. Enumerate the top ten OWASP vulnerabilities. 4. Compare web authentication with authorization. 5. List the types of attacks in web applications. 6. Apply the security principles in developing a reliable web application.					
Unit: 1	Web application security vulnerability				9 Hours
Structure of a modern Web application- Identifying weak points in Application Architecture -Securing Application Architecture- Vulnerability management: Reproducing Vulnerabilities-Ranking vulnerability severity-Vulnerability scoring system-Advanced Vulnerability scoring.					
Unit: 2	Security fundamentals				9 Hours
Input Validation-Attack Surface Reduction-Classifying and Prioritizing Threats-STRIDE-IIMF-CIA-CWE-DREAD-CVSS- Finding vulnerabilities in Source code.					
Unit: 3	The OWASP Top Ten				9 Hours
Injection-Cross-site Scripting (XSS)-Broken authentication and session management-XML External Entities-Cross-site Request Forgery-Security Misconfiguration-Denial of Service (DoS)-Failure to redirect URL access-Insufficient Transport Layer protection-Unvalidated Redirects and Forwards-Wrapping Up the OWASP Top ten.					
Unit: 4	Attacks				9 Hours
Attacking users-Attacking Application Architecture-Attacking application Server-Attacking Browsers-Attacking Extension-Attacking Plugins.					
Unit: 5	Security Principles				9 Hours
Web browser security-Browser security Principles: Same origin policy, Cross site scripting-Cross-site forgery-Database security principles-File Security principles.					
Total Lectures					45 Hours
Reference Books					
1.	Bryan Sullivan, Vincent Liu, “Web Application Security, A beginners guide”, McGraw-Hill Education Publication, 2012, ISBN: 9780071776165.				
2.	Dafydd Stuttard, Marcus Pinto, “The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws”,2 nd Edition, ISBN: 97881265334042011.				
3.	Andrew Hoffman, “Web Application Security Exploitation and Countermeasures for Modern Web Applications”, O'Reilly Media, Inc., 2020, ISBN: 9781492053101.				
4.	Wade Alcorn, Christian Frichot, Michele Orru, “The Browser Hacker’s Handbook”, ISBN: 9781118662090.				
5.	Richa Gupta, “Hands -on Penetration testing for Web Applications, BPB Publishers, 2021, ISBN: 9789389328547.				
Recommended by Board of Studies				04 Aug 2023	
Approved by Academic Council				25 Aug 2023	

Course Code	WEB APPLICATION SECURITY LAB	L	T	P	C

23CA3003		0	0	2	2
Course Objectives:					
Enable the student to:					
1. Apply security skills in developing web applications. 2. Identify and fix the vulnerabilities in web applications. 3. Apply the security principles in developing a reliable web application.					
Course Outcomes:					
The student will be able to:					
1. Sketch the structure of web applications. 2. Identify and handle web Application attacks. 3. Classify the types of attacks in a web browser. 4. State the importance of web authentication and authorization. 5. Implement a tool to secure web applications. 6. Create a secure web application.					
LIST OF EXERCISES					
1. Installation of kali linux & basic commands. 2. Implement Password cracking with Kali Linux. 3. Download and install nmap. Use it with different options to scan open ports, perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, etc. 4. Use the Nessus tool to scan the network for vulnerabilities. 5. Install and execute Dalfox on kali linux. 6. Analyse Cross Site Scripting(XSS) Vulnerabilities using Dalfox. 7. Implement Penetration testing that allows to practise web app hacking and privilege escalation. 8. Implement a powerful network scanning tool Nmap. 9. Implement SQL Injection using Burp Suite platform. 10. Track the cookies information. 11. Use Metasploit tool to probe and exploit vulnerabilities on networks and servers. 12. Implement Malware Analysis Module to analyse malicious files to prevent malicious actions and identify attacks.					

Course Code	INFORMATION SECURITY MANAGEMENT	L	T	P	C
23CA3004		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire the need for security management. 2. Interpret various techniques and control mechanisms to safeguard information. 3. Establish safeguards to protect the organization’s information resources.					
Course Outcomes:					
The student will be able to: 1. Classify the fundamental concepts of information security. 2. Sketch the life cycle process. 3. Focus on how the organization has to equip itself for effective implementation of information security. 4. Relate the importance of privacy in information security. 5. State the purposes and significance of access controls. 6. Recommend suitable controls and procedures for ensuring security.					
Unit: 1	Introduction to Information Security				9 Hours
Introduction to Information and Cybersecurity- Information Sensitive classification – The computing environment – Security of various components in the environment – Information Security Department and roles: The SDLC and Information Security, Life Cycle Process, Operations, compliance/Governance, Cybersecurity Incidents.					
Unit: 2	Asset Security & Privacy concepts				9 Hours

Personnel security: Employees, Vendor, consultant and contractor control - compliance- governance - Information Rights Management: Overview - Evolution from Encryption to IRM - IRM Technology - Storage security - Storage Security Evolution - Modern storage security. Privacy Concepts - Privacy Principles and Policies - Authentication and Privacy - Data Mining -Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies - Case Studies on Privacy Concepts		
Unit: 3	Access Control	9 Hours
Access control –access control types – Authorization policies – Methods and guidelines for identification -Processes and requirements for authentication – Policies and procedures for accountability – Effects of breaches in access control – Centralized (RADIUS, TACACS, DIAMETER) and Decentralized Access control.		
Unit: 4	Risk Management	9 Hours
Risk Management concepts – Risk Terminology – Identify threats and vulnerabilities – Risk Assessment – Risk Assignment – Countermeasures selection and assessment – Implementation – Types of Control – Monitoring and Measurement – Asset valuation – Continuous Improvement – Risk framework.		
Unit: 5	Security Operations	9 Hours
Security Administration – Compliance – Infrastructure for an IT Security policy - Data classification standard – Configuration management – Change management – Applications software security – Software Development and Security.		
Total Lectures		45 Hours
Reference Books		
1.	David Kim, Michael G. Solomon, “Fundamentals of Information Systems Security”, 3 rd Edition, Jones & Bartlett Learning, 2018, ISBN: 9781284116458.	
2.	Michael Workman, "Information Security Management", Jones & Bartlett Learning, 2021, ISBN: 9781284211672.	
3.	Thomas R. Peltier, “Information Security Fundamentals”, Auerbach Publications; 2 nd Edition, 2017, ISBN: 9781138436893.	
4.	Umesha Nayak, Umesh Rao, “The InfoSec Handbook: An Introduction to Information Security”, Apress; 1 st Edition, 2014, ISBN: 9781430263821.	
5.	Jason Andress “The Basics of Information Security: Understanding the Fundamentals of InfoSec in Theory and Practice”, Syngress, 2 nd Edition, 2014, ISBN: 9780128007440.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	PYTHON AND SCRIPTING	L	T	P	C
23CA3005		3	0	0	3
Course Objectives:					
Enable the student to: 1. Classify the types of data structures in Python. 2. Expertise in Linux shell scripting. 3. Exhibit Python in the cyber environment.					
Course Outcomes:					
The student will be able to: 1. Administer the technical environment of Python. 2. Create interactive scripts using Linux Shell Scripting. 3. Simulate port scanning with Python. 4. Experiment Python in cyber space. 5. Expertise in working with files. 6. Create secured applications using Python.					
Unit: 1	Python Environment	9 Hours			
Working with Python Scripting: Technical Requirements – Learn about data structures and collections in Python – Working with files in Python – Python modules and packages – Managing dependencies and					

Virtual environment – Development environments for Python Scripting – Managing threads in Python – Multithreading and concurrency in Python.		
Unit: 2	Linux Shell Scripting	9 Hours
What and Why of Scripting with BASH - Creating Interactive Scripts - Conditions attached - Creating Code Snippets - Iterating with Loops - Creating Building Blocks with Functions - Introducing sed - Automating Apache Virtual Hosts - AWK Fundamentals – Regular expressions - Summarizing Logs with awk - A Better lastlog with Awk - Using Python as a BASH Scripting Alternative.		
Unit: 3	Server Scripting and Port Scanning with Python	9 Hours
Gathering information from servers with OSINT tools: Technical Requirements – Introducing Open-Source Intelligence – Getting information on DNS servers with DNS Python and DNS Recon – Getting vulnerable addresses in servers with fuzzing.		
Unit: 4	Python In Cyberspace	9 Hours
Fulfilling attack objectives: Active scanning – Search open technical databases – Gaining Initial Access: Valid accounts – Replication through removable media – Evading defences: Impair defences – Hide Artifacts – Accessing credentials: Credentials from password store - Network sniffing.		
Unit: 5	Working With Types of Files	9 Hours
Working with various files: Working with PDF files - Working with Excel Files - Working with CSV files - Working with Text files - Handling Emails using Python Scripting: Email Message format - Adding HTML and multimedia content – POP3 and IMAP servers.		
Total Lectures		45 Hours
Reference Books		
1.	Jose Manuel Ortega, “Python for Security and Networking”, Packt Publishing, 2023, 3 rd Edition, ISBN: 9781492083290.	
2.	Howard E. Poston, “Python for Cybersecurity”, Wiley Publication, 2022, ISBN: 9781119850656.	
3.	Ganesh Sanjiv Naik, “Mastering Python Scripting for System Administrators”, Packt Publishing, 1 st Edition, 2019, ISBN: 9781789133226.	
4.	Kenneth Reitz & Tanya Schlusser, “The Hitchhiker’s Guide to Python: Best Practices for Development”, 1 st Edition, O’Reilly, ISBN: 9781491933176.	
5.	Bassem Aly, “Hands – on Enterprise Automation with Python”, Packt Publishing, 2018, ISBN: 9781788992640.	
Recommended by Board of Studies		04-08-2023
Approved by Academic Council		25 Aug 2023

Course Code	PYTHON AND SCRIPTING LAB	L	T	P	C
23CA3006		0	0	2	2
Course Objectives:					
Enable the student to: 1. Acquire skills in Python scripting. 2. Create Graphical User Interface applications using Python. 3. Visualize the geometrical figures using Python packages.					
Course Outcomes:					
The student will be able to: 1. Simulate Python packages to create applications. 2. Develop chat applications using Python. 3. Administer web pages using Python. 4. Exhibit proficiency in applying test cases. 5. Experiment with Linux Shell Scripting. 6. Execute mathematical concepts using Python.					
LIST OF EXERCISES					
1. Developing a simple Client / Server application using Python.					

2. Developing an email application using Python.
3. Installing and exploring packages, requests, flasks.
4. Create a script that imports requests and fetch content from the page.
5. Demonstrate HTTP Response using simple HTML Page.
6. Implement program to visualize figures using turtle.
7. Implement File Processing using Python.
8. Practice Linux Shell Scripting.
9. Implement Exception handling in Python.
10. Develop Unicode Encoding technique.
11. Creating Virtual environment using Python.
12. Usage of Math functions.

Course Code	DIGITAL FORENSICS	L	T	P	C
23CA3007		3	0	0	3
Course Objectives:					
Enable the student to: 1. Define digital forensics and examine how it is being used in crime scene investigation. 2. Simulate how computers create and store digital information using appropriate digital forensics tools. 3. Discuss the emerging digital forensic trends and technologies.					
Course Outcomes:					
The student will be able to: 1. Analyze the technical aspects related to Digital Forensics. 2. Visualize the evidence acquisition system and its functions. 3. Apply forensic imaging in crime scene investigation. 4. Apply the art of evidence analysis. 5. Choose and apply ransomware incident preparation and response tools. 6. Create incident report.					
Unit: 1	Fundamentals of Digital Forensics	9 Hours			
An overview of forensic science - Locard’s exchange principle - Legal issues in digital forensics - Law and regulations - Rules of evidence - Forensic procedures in incident response - A brief history of digital forensics - The digital forensics process Types of incident investigation analysis - Functional digital forensic - investigation methodology - Identification and scoping - Collecting evidence - The initial event analysis - The preliminary correlation - Event normalization - Event deconfliction - The second correlation - The timeline - Kill chain analysis - Reporting -The cyber kill chain.					
Unit: 2	Evidence Acquisition	9 Hours			
Collecting Network Evidence - An overview of network evidence - Preparation - A network diagram - Configuration - Firewalls and proxy logs - Firewalls - Web application firewalls - Web proxy servers - NetFlow - Packet capture - tcpdump - WinPcap and RawCap - Wireshark - Evidence collection. Acquiring Host-Based Evidence - Preparation - Order of volatility - Evidence acquisition - Evidence collection procedures - Acquiring volatile memory - FTK Imager - WinPmem - RAM Capturer - Virtual systems - Acquiring non-volatile evidence - FTK obtaining protected files - The CyLR response tool - Kroll - Artifact Parser and Extractor Remote Evidence Collection Enterprise incident response challenges - Endpoint detection and response - Velociraptor Windows collector - Velociraptor scenarios - Velociraptor evidence collection - CyLR - Velociraptor overview and deployment - Velociraptor server – WinPmem.					
Unit: 3	Forensic Imaging	9 Hours			
Understanding forensic imaging - Image versus copy - Logical versus physical volumes - Types of image files - SSD versus HDD - Tools for imaging - Preparing a staging drive Using write blockers - Imaging techniques Dead imaging - Live imaging - Virtual systems - Linux imaging.					
Unit: 4	Evidence Analysis	9 Hours			

Analyzing Network Evidence - Network evidence overview - Analyzing firewall and proxy logs - SIEM tools - The Elastic Stack - Analyzing NetFlow - Analyzing packet captures - Command-line tools - Real Intelligence Threat Analytics - NetworkMiner - Arkime - Wireshark - Analyzing System Memory - Memory analysis overview - SANS six-part methodology - Network connections methodology - Memory analysis tools - Memory analysis with Volatility - Volatility Workbench Memory analysis methodology - Memory analysis with Strings - Installing Strings - Common Strings searches.

Analyzing System Storage: Forensic platforms - Autopsy - Installing Autopsy - Starting a case - Adding evidence - Navigating Autopsy -Examining a case - Master File Table analysis - Prefetch analysis - Registry analysis.

Analyzing Log Files: Logs and log management - Working with SIEMs - Splunk - Elastic Stack - Security Onion - Windows Logs - Windows Event Logs - Analyzing Windows Event Logs - Acquisition - Triage - Detailed Event Log analysis.

Writing the Incident Report - Documentation overview - What to document - Audience - Executive summary - Incident investigation report - Forensic report - Preparing the incident and forensic Report - Types of documentation – Sources - Note-taking - Report language.

Unit: 5	Ransomware Incident Preparation and Respons	9 Hours

History of ransomware - CryptoLocker - CryptoWall - CTB-Locker - TeslaCrypt - SamSam - Locky - WannaCry Ryuk - Conti ransomware case study - Background - Operational disclosure - Tactics and techniques - Exfiltration - Impact - Proper ransomware preparation - Ransomware resiliency - Prepping the CSIRT - Eradication and recovery - Containment - Eradication – Recovery Ransomware Investigations - Ransomware initial access and execution - Initial access - Execution Discovering credential access and theft - ProcDump - Mimikatz - Investigating post-exploitation - frameworks Command and Control - Security Onion - RITA - Arkime - Investigating lateral movement techniques.

Total Lectures	45 Hours

Reference Books

- Gerard Johansen, “Digital Forensics and Incident Response”, Packt Publishing Ltd, 2020, ISBN: 9781803238678.
- Dejey, Murugan, “Cyber Forensics”, 1st Edition, Oxford University Press, ISBN: 9780199489442.
- Bill Nelson Amelia Phillips Christopher Steuart, “Guide to Computer Forensics and Investigations: Processing Digital Evidence”, 5th Edition, Cengage Learning, ISBN: 9781285060033.
- Cory Altheide, Harlan Carvey, “Digital Forensics with Open-Source Tools”, 2011, Elsevier, ISBN: 9781597495868.
- John Vacca, “Computer Forensics: Computer Crime Scene Investigation”, Charles River Media; 2nd Edition, ISBN: 9781584503897.

Recommended by Board of Studies	04 Aug 2023

Approved by Academic Council	25 Aug 2023

Course Code	DIGITAL FORENSICS LAB	L	T	P	C
23CA3008		0	0	2	2
Course Objectives:					
Enable the student to:					
1. Develop proficiency with the use of various digital forensics technologies. 2. Examine digital forensic techniques including acquiring evidence, examining volatile memory, hard drive assessment, and network-based evidence. 3. Acquire skills in digital forensic trends and technologies.					
Course outcomes:					
The student will be able to:					
1. Articulate the technical aspects related to Digital Forensics. 2. Familiarize in working with windows operating system. 3. Devise network forensics, evidence collection and network forensics analysis.					

- Discover memory forensics techniques. - Analyze the volatile data from host-based systems and explore the fundamental concepts of digital imaging. - Report the findings either internally or in a courtroom.
LIST OF EXERCISES
- Implement Digital evidence identification and seizing. - Perform file recovery File recovery. - Perform Windows forensic using Sysinternals Suite. - Visualize Network forensics analysis using Wireshark. - Implement windows registry analysis (FRAT). - Perform Open sure forensics tool analysis using DEFT. - Demonstrate Mobile CRD Analysis. - Implement file carving using Foremost. - Implement data carving using SANS. - Editing and modifying of a raw disk or main memory (RAM) using hxd. - Perform Securely Erasing Disk Drives. - Perform Memory and file analysis Mandiant redline.

Course Code	CYBER SECURITY AUDIT AND COMPLIANCE	L	T	P	C
23CA3009		3	0	0	3
Course Objectives:					
Enable the student to: 1. Identify the importance of cyber security governance. 2. Examine the need of Information Security. 3. Compare the various auditing controls.					
Course Outcomes:					
The student will be able to: 1. State the importance of security governance. 2. Tabulate various Information Security governance policies. 3. Plan the Information Security Governance Audit. 4. Practice Information Security Policies. 5. Devise Information Security Incident Management act. 6. Administer the ISG Audit Controls.					
Unit: 1	Security Governance	9 Hours			
Introduction – Governance Perspectives – Security Program Evolution – Framing Governance – Security Governance fusion – Security Governance Insights – Security Governance Environment: Introduction – Entity – Centric Considerations – Entity Risk Determinants – Technology deployments.					
Unit: 2	Managing Security Governance	9 Hours			
Introduction – Planning – Organizing – Orchestrating – Directing – Controlling – Security Governance Processes: Introduction – Framing Information Security Governance.					
Unit: 3	Organizational Actors	9 Hours			
Organizational Employees: Introduction – Responsibility Delegation – Workspace Irregularities and Illegal Acts – IT Incident Response Team – IT Audit Team – External Organizational Actors: Introduction – Supply Chain Partners – Managed Service Providers – Service Provider Audit.					
Unit: 4	Information Security Governance Audit	9 Hours			
Introduction – ISG Audit Planning Process – ISG Audit Study and Evaluation of Controls - ISG Audit Testing and Evaluation of Controls – ISG Audit Control Reporting – ISG Audit Follow -up.					
Unit: 5	Implementing and Auditing Controls	9 Hours			
Information Security Policies – Organization of Information Security (ISO/ IEC 27001, A.6) - Human Resource Security (ISO/ IEC 27001, A.7) - Information Security Incident Management (ISO/ IEC 27001, A.16) – Compliance (ISO/ IEC 27001, A.18).					

Total Lectures		45 Hours
Reference Books		
1.	Robert E. Davis, “Auditing Information and Cyber Security Governance”, CRC Press. 2021, ISBN:9781000416084.	
2.	Bridget Kenyon, “ISO 27001 controls – A guide to implementing and auditing”, IT Governance Ltd, 2019, ISBN:9781787781450.	
3.	Regner Sabillon, “Cyber Security Auditing, Assurance, and Awareness Through CSAM and CATRAM”, IGI Global, 2020, ISBN:9781799841630.	
4.	Alan Calder, Steve Watkins, “Information Security Risk Management for ISO 27001/ISO 27002”, Third Edition, IT Governance Ltd, 2019, ISBN:9781787781375.	
5.	Alan Calder, “Nine Steps to Success an ISO 27001 Implementation Overview”, IT Governance Ltd, 2017, ISBN:9781849289528.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	NETWORK FORENSICS	L	T	P	C
23CA3010		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire the concepts of Network Forensics. 2. Analyze the various perspectives of network forensics. 3. Identify the emerging network forensics analysis tools and technologies.					
Course Outcomes:					
The student will be able to: 1. Apply the key concepts of network anomalies and behaviour. 2. Analyze the requirement of deep packet inspection. 3. Examine the need for investigating network behaviour and patterns in malware. 4. Classify various logs to aid network forensics. 5. Focus on developing methodologies to automate processing of large evidence set. 6. Examine the log files for investigations.					
Unit: 1	Computer Networks	9 Hours			
Uses of Computer Networks – Network Hardware – Network Software – Reference Models – The theoretical basics of data communication – Guided Transmission Media – Wireless Transmission – Communication Satellites.					
Unit: 2	Introducing Network Forensics	9 Hours			
Introduction - Network forensics investigation methodology - Source of network evidence - Wireshark essentials - Technical Concepts and Acquiring - The inter-networking refresher - Log-based evidence.					
Unit: 3	The Key Concepts	9 Hours			
Deep Packet Inspection - Protocol encapsulation - Analyzing packets on TCP, UDP and ICMP - Statistical Flow Analysis - the flow record and flow-record processing systems (FRPS) - Sensor deployment types - Combatting Tunneling and Encryption - Decrypting TLS using browsers..					
Unit: 4	Conducting Network Forensics	9 Hours			
Investigating Good, Known, and Ugly Malware - Dissecting malware on the network, Intercepting malware for fun and profit, Behavior patterns and analysis, Investigating C2 Servers, Decoding the Metasploit shell.					
Unit: 5	Investigating and Analyzing Logs	9 Hours			
Network intrusions and footprints, WLAN Forensics, the 802.11 standard - Identifying attacks - Packet types and subtypes - Locating wireless devices - Identifying rogue access points - Identifying attacks.					

Total Lectures		45 Hours
Reference Books		
1.	Nipun Jaswal, “Hands - on Network Forensics” Packt Publishing, 2019, ISBN: 9781789344523.	
2.	Curt M. White, “Data Communications & Networks – A Business User’s Approach”, 8 th Edition, Cengage Learning, 2016, ISBN: 9781305116634.	
3.	Jeffrey S. Beasley and Piyasat Nilkaew, “Practical Guide to Advanced Networking”, Pearson Education, 3 rd Edition, 2013, ISBN: 9780789749048.	
4.	Dhanashree K Toradmalle, “Computer Networks and Network Design”, Wiley India, 1 st Edition 2020, ISBN: 9390395097.	
5.	Nipun Jaswal, “Hands - on Network Forensics”, Packt Publishing, 2019, ISBN 9781789344523.	
Recommended by Board of Studies		04 Aug 2023
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Course Code	NETWORK FORENSICS LAB	L	T	P	C
23CA3011		0	0	2	2
Course Objectives:					
Enable the student to: 1. Analyze network traffic. 2. Simulate the aspects of routing. 3. Apply various principles of cryptosystems, hashing algorithms and digital signatures.					
Course Outcomes:					
The student will be able to: 1. Examine the concepts of protocols and their relationship. 2. Classify the networks, IP address, sub-netting, network address translations. 3. Identify the various TCP/IP protocols used for the networking application. 4. Demonstrate routing protocols for different networks. 5. Implement the cryptographic algorithms. 6. Administer the Internet security.					
LIST OF EXERCISES					
1. Analyze Network Traffic and Telnet Network Traffic. 2. Basic Network utilities and Configuring Windows Firewall. 3. Configuring IP table rules. 4. Preventing IP Spoofing. 5. Perform Static Routing. 6. Implement Dynamic routing using RIP protocol. 7. Implement Dynamic routing using EIGRP. 8. Implementing an IDS. 9. Enabling Bit Locker. 10. Encrypting a folder using EFS. 11. Implement Hashing algorithm. 12. Develop application to crack password.					

Course Code	DATABASE SECURITY MANAGEMENT	L	T	P	C
23CA3012		3	0	0	3
Course Objectives:					
Enable the student to:					
1. Acquire the knowledge of data modeling concepts. 2. Examine how to defend and recover data. 3. Develop and implement data security model.					
Course Outcomes:					
The student will be able to:					
1. Describe database concepts. 2. Summarize the operational threats and vulnerable points of accessing and assess them. 3. Propose plan to prevent data leakage and data breach.					

4. Protect personally identifiable information and other sensitive data from hackers. 5. Devise the schedule for database backup. 6. Develop security policy and perform database auditing.		
Unit: 1	Data Modeling	9 Hours
Data modeling Concepts – Data modeling Components – Normalization forms – Logical Design to Physical design – Database performance design – Denormalization- Conceptual Data Modelling- Transforming the conceptual model to SQL.		
Unit: 2	Privacy information & Data Leakage	9 Hours
Private information retrieval – FHE Based Private Information Retrieval – Private Data Warehouse Queries – Privacy- Preserving Location Based Queries - Case Study on Online Privacy. Data Leakage – Taxonomy Data Leakage Prevention Solutions – Data Leakage / Misuse scenarios - Privacy, Data Anonymization, and Secure Data Publishing – Case Study on Data loss Data Breach: An Overview of Data Breaches-Qualifying and investigating a Breach – Determining the scope of a Breach– Communicating Data Breach - Preparing for Data Breach litigation.		
Unit: 3	Database Security and Authorization	9 Hours
Database Security Models - Granting and Revoking Authority – Authorization Roles and Groups – Views -and Stored procedures - Encryption – SQL injection – External Security – Securing Database with Cryptography – Case study on database encryption- Security Violations- Authorization (Access Rights)- Granting of Privileges-Audit trials.		
Unit: 4	Database Backup and Recovery	9 Hours
The importance of backup and recovery- Preparing for problems-Image copy back- recovery-alternatives to backup and recovery.		
Unit: 5	Database Auditing	9 Hours
Database Application Security Models - Database Auditing Models - Application Data Auditing – Auditing Database Activities – Case study on outcomes of Database auditing.		
Total Lectures		45 Hours
Reference Books		
1.	Craig S. Mullins, “Database Administration: The Complete Guide to DBA Practices and Procedures”, 2 nd Edition, Addison-Wesley Professional, 2013, ISBN: 9780321822949.	
2.	Satinder Bal Gupta, Aditya Mittal, “Introduction to Database Management System”, 2 nd Edition, Laxmi Publications Pvt Ltd, ISBN: 9789381159316.	
3.	Kevvie Fowler, “Data Breach Preparation and Response: Breaches are Certain, Impact is Not”, 1 st Edition, Todd Green, 2016, ISBN: 9780128034514.	
4.	Xun Yi, Russell Paulet, Elisa Bertino, “Private Information Retrieval”, 3 rd Edition, 2013, ISBN: 9781627051538.	
5.	Alfred Basta, Melissa Zgola, “Database Security”, Cengage Learning, 1 st Edition, 2011, ISBN: 9781435453906.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	DATABASE SECURITY MANAGEMENT LAB	L	T	P	C
23CA3013		0	0	2	2
Course Objectives:					
Enable the student to:					
1. Simulate data model concepts and database architecture.					
2. Identify the threats and their recovery methods.					
3. Develop and implement data security model.					
Course Outcomes:					
The student will be able to:					
1. Generalize database concepts.					

2. Review operational threats and the vulnerable access points.
3. Plan to prevent data leakage and data breach.
4. Protect personally identifiable information and other sensitive data from hackers.
5. Devise the schedule for database backup.
6. Develop security policy and perform database auditing.

LIST OF EXERCISES

1. Create different types of databases.
2. Perform Normalization.
3. Perform data migration.
4. Managing Users.
5. Create Tablespace and schema Objects.
6. Perform table management and materialized view.
7. Implement Encryption.
8. Develop indexes for tables.
9. Create Cluster.
10. Administer views, sequences and synonyms.
11. Maintain Redo logs.
12. Perform Backup and Recovery.

Course Code	FORENSICS OF EMBEDDED SYSTEM	L	T	P	C
23CA3014		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire the fundamentals of embedded device forensics. 2. Compute forensic analysis on smart devices and gadgets. 3. Visualize the working of various tools and techniques in forensic analysis.					
Course Outcomes:					
The student will be able to: 1. Identify different PCB concepts. 2. Acquire data from smart devices. 3. Perform forensic analysis on embedded devices. 4. Acquire and analyze smart device internal memory. 5. Analyze the ingredients of firmware forensics analysis. 6. Examine the usage of various forensic tools and techniques.					
Unit: 1	Fundamentals of embedded system	10 Hours			
Introduction to embedded systems: Classification, Characteristics and requirements, embedded device market growth, Gordon Moore's Law, PCB Concepts, PLC Fundamentals, Flash File Systems, Chip-off concepts - Memory Fundamentals of digital forensics.					
Unit: 2	Embedded System Forensic Analysis	7 Hours			
Embedded System analysis, Physical Data Acquisition, Boot Loaders, disordering, Reverse Engineering, Disassembler tools IDA Pro & Practices, Sketching a Forensic Reverse Engineering Methodology.					
Unit: 3	Smart Devices Forensics	8 Hours			
Smart Phone device forensics, Smart device Acquisition, Smart Device internal memory acquisition and analysis, Firmware Forensics Analysis, Firmware tools, Gadgets forensics, Basics of SCADA Systems, Stuxnet Case Study.					
Unit: 4	iOS forensics	10 Hours			
Challenges in mobile forensics-The mobile phone evidence extraction process-Practical mobile forensic approaches-Potential evidence stored on mobile phones-Examination and analysis-Operating modes of iOS devices-Logical acquisition - File system acquisition-Physical acquisition.					
Unit: 5	Database Auditing	10 Hours			

Simulink, Emulation of devices, Router Forensics, Data Card Dongles Firmware analysis, ICS (Industrial Control Systems) concepts, Raspberry Pi, ARM Instruction set & Fundamentals.

Total Lectures **45 Hours**

Reference Books

1. Rohit Tamma, Oleg Skulkin, Heather Mahalik, Satish Bommisetty, "Practical Mobile Forensics", Packt Publishing, 2018, ISBN: 9781788839198.
2. Eoghan Casey, "Handbook of Digital Forensics and Investigation", Elsevier Science, 2010, ISBN: 9780080921471.
3. Vahid, "Embedded System Design: A Unified Hardware/Software Introduction", 2006, Wiley India Pvt. Limited, ISBN: 9788126508372.
4. Nitesh Dhanjani, "Abusing the Internet of Things Blackouts, Freakouts, and Stakeouts", 2015, O'Reilly Media, ISBN: 9781491902936.
5. David Kleidermacher, Mike Kleidermacher, "Embedded Systems Security Practical Methods for Safe and Secure Software and Systems Development", 2012, Elsevier Science, ISBN 9780123868862.

Recommended by Board of Studies 04 Aug 2023

Approved by Academic Council 25 Aug 2023

Course Code	ARTIFICIAL INTELLIGENCE SECURITY	L	T	P	C
23CA3015		3	0	0	3

Course Objectives:

Enable the student to:

1. Interpret Artificial Intelligence approaches to detect the attacks.
2. Identify the unusual and suspicious patterns and attacks for developing strong network security defences using AI.
3. Discuss AI techniques which can automatically scan unknown malware, based on certain features and behaviour.

Course Outcomes:

The student will be able to:

1. Acquire the fundamental concepts of Artificial Intelligence.
2. Categorize the different approaches of automated learning in the field of cyber security.
3. Compare the current level of interconnection with different devices.
4. State the important role in terms of the protection of sensitive user related information.
5. Identify the security attacks and data breaches.
6. Discuss the strategic defense mechanism for malware, addressing cybercrime, and assessing vulnerabilities to yield proactive rather than reactive countermeasures.

Unit: 1 **Introduction** **8 Hours**

Evolution in AI – Approaches of AI - AI tools used: phone, personal and business use, developers, healthcare – Advantages and limitations of AI – Challenges in AI - AI in Cyber Security.

Unit: 2 **Machine Learning** **8 Hours**

Defining Machine Learning – Types of Machine Learning – Prediction – Classification – Understanding datasets – Feature selection – Feature Normalization – Data cleaning - Training – Testing and validation sets – Hyper parameters – Measuring performance – Accuracy and loss – Under-fitting and Over-fitting.

Unit: 3 **Neural Network** **12 Hours**

Understanding biological brain – Defining and building a perceptron – feed forward – back propagation – Defining Artificial Neural Network (ANN) – Single layer and multiple layer ANNs – Building an ANN model – Activation and Loss functions – Compiling and evaluating a model – CNN – RNN – LSTM - Types of Auto encoder - Deep Recurrent Network - Recursive Neural Network

Unit: 4 **Securing user authentication and Network anomaly detection** **8 Hours**

Authentication practices – Spotting fake logins – Choosing the right features – Preventing fake account creation – classifying suspicious user activity – Advantages and is advantages of Supervised learning –

User authentication with keystroke recognition – Biometric authentication with facial recognition - Network anomaly detection techniques – Network attacks – Botnet detection – Algorithms used in botnet detection.		
Unit: 5	Security Attacks, Data Breaches and Ontologies	9 Hours
Fraud detection and prevention - Dealing with credit card fraud - Case Studies on Security Attacks and Data Breaches - Intrusion Detection ontology – Malware classification and Malware behavior ontology – Cyber security threat intelligence ontology – ontology for Digital forensics – Ontology for describing cyber-attacks and their impact.		
Total Lectures		45 Hours
Reference Books		
1.	Robert J.Schalkoff, “Pattern Recognition: Statistical, Structural and Neural Approaches, JohnWiley& Sons Inc., New York, 2007, ISBN: 9788126513703.	
2.	Trevor H, Robert T, Jerome Friedman, “The Elements of Statistical Learning”, Springer Series, 2017, ISBN: 9780387848570.	
3.	Christopher M Bishop, “Pattern Recognition and Machine Learning”, Springer, 2011, ISBN: 9781493938428.	
4.	Ted Dunning, Ellen Friedman, “Practical Machine Learning –A new look at Anomaly Detection”, O’Reilly, 2014, ISBN: 9781491911600.	
5.	Laurent Gil and Allan Liska, “Security with AI and Machine Learning”, O’Reilly, 2019, ISBN: 9781492043126.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	MALWARE ANALYSIS AND FORENSICS	L	T	P	C
23CA3016		3	0	0	3
Course Objectives:					
Enable the student to: 1. Analyze malware using various analysis techniques. 2. Identify and control the relevant aspects of malicious program behaviour. 3. Propose reverse engineering for malware analysis.					
Course Outcomes:					
The student will be able to: 1. Classify the types of malwares and its analysis techniques. 2. Compare the malware samples and extract strings, functions, and metadata associated with the file. 3. Simulate various analysis tools to understand the functioning of malware. 4. Dissect and reverse engineering malware. 5. Identify and correlate all the log data generated by analysis tools to process a malware. 6. Discuss the challenges encountered in malware analysis.					
Unit: 1	Introduction to malware and its types				10 Hours
Malware – Malware Analysis – Why malware analysis - Malware categories - Significant Malware Propagation Techniques, Modern Malware Propagation Techniques, Malware Propagation Injection Vectors, Malware Functions - Identifying installed malware - Modifying Timestamps, Affecting Processes, Disabling Services, Modifying the Windows Registry.					
Unit: 2	Static Analysis				7 Hours
Basic static analysis - Antivirus scanning - Malware hashing - Malware string - Detects malware packer/obfuscated - Inspect Portable Executable (PE) Header - Exploring Dynamic Link Library (DLL).					
Unit: 3	Dynamic Analysis				8 Hours
Dynamic analysis-Sandboxing-Dynamic analysis tools-Running malware-Malware runtime analysis-Malware Runtime Analysis-Process monitor-Process explorer-Snapshot-Network monitoring-Network packet sniffing-Fake services.					

Unit: 4	Assembly language and windows DLLs	10 Hours
Basics of x86 Assembly Language - CPU Registers - Arithmetic Instructions - Data Movement Instructions - Control Flow Instructions - Basic Blocks and Control Flow Graphs- IDA Pro to dissect malware, Windows API - File system functions-Windows registry - DLL Exception-Malware Behavior-Malware Functionalities - HTTP Command and Control - Custom Command and Control - Custom C2 Sample - PowerShell Command-How Attackers Use PowerShell - PowerSHell Attack - Persistence Mechanism - Run Registry Key-Schedule Tasks - Start Up Folder - Windows Registry Entry - AppInit_DLLs - Privilege Escalation.		
Unit: 5	Dissemble code	10 Hours
Code debugging, Breakpoints, Exception, Modify program execution, User/kernel mode, Malware debugging with OllyDbg, Code execution, Run/step Into/step over Breakpoints - Loading DLLKernel debugging with WinDbg - Setup kernel debugging - VM setup - Using WinDbg - Reading from memory		
Total Lectures		45 Hours
Reference Books		
1.	Monnappa K A, “Learning Malware Analysis”, Packt Publishing Ltd, 2018, ISBN: 9781788392501.	
2.	Aaron LeMasters, Michael A. Davis, Sean Bodmer, Christopher C. Elisan, “Hacking Exposed Malware & Rootkits: Security Secrets and Solutions”, McGraw Hill Professional, 2016, ISBN: 9780071591195.	
3.	M. Sikorski and A. Honig, “Practical Malware Analysis: The Hands-on Guide to Dissecting Malicious Software”, No Starch Press Publisher, 2012, ISBN: 9781593272906.	
4.	Michael Hale Ligh, Steven Adair, Blake Hartstein, Matthew Richard, “Malware Analyst’s Cookbook and DVD: Tools and Techniques for Fighting Malicious Code”, Wiley Publishing, 2011, ISBN: 9780470613030.	
5.	Chris Eagle,”The IDA Pro Book: The Unofficial Guide to the World's Most Popular Disassembler”, No Starch Press, 2011, ISBN:9781593273750.	
Recommended by Board of Studies	04 Aug 2023	
Approved by Academic Council	25 Aug 2023	

Course Code	MALWARE ANALYSIS AND FORENSICS LAB	L	T	P	C
23CA3017		0	0	2	2
Course Objectives:					
Enable the student to: 1. Acquire skills to identify the malware. 2. Dissect and analyze malware using advanced tools. 3. Perform reverse engineering for malware analysis.					
Course Outcomes:					
The student will be able to: 1. Summarize the usage of different tools for malware analysis. 2. Create a virtual, safe, and isolated environment to analyze malware. 3. Classify and compare the malware samples and extract strings, functions, and metadata associated with the file. 4. Perform network analysis to detect functioning of malware. 5. Use python to extract and detect malware formats. 6. Dissect and reverse engineering malware to identify and eradicate the functioning of malware.					
LIST OF EXERCISES					
1. Perform static analysis using VirusTotal. 2. Create virtual environment for dynamic analysis. 3. Perform Network traffic analysis using Wireshark. 4. Analyze PE header format and string format using Python. 5. Analyze ELF file format. 6. Analyze Malicious Windows Programs using OllyDbg. 7. Debugging using WinDbg.					

8. Investigate malware using REMnux.
9. Configuration of IDA Pro.
10. Dissect malware using IDA Pro.
11. Configuration of Ghidra toolkit.
12. Perform reverse engineering using Ghidra.

Course Code	MODERN CRYPTOGRAPHY AND STEGANOGRAPHY		L	T	P	C
23CA3018			3	0	0	3
Course Objectives:						
Enable the student to: 1. Examine the importance of cryptography. 2. Classify the types of encryptions. 3. Interpret the various categories of Steganography.						
Course Outcomes:						
The student will be able to: 1. Review the principles of modern cryptography. 2. Illustrate the types of encryptions. 3. Select the security standards for modern cryptography. 4. Distinguish between the types of cryptanalysis system. 5. Deploy the suitable tools and methods of steganography. 6. Represent the types of steganography in modern day scenario.						
Unit: 1	Introduction to Cryptography				9 Hours	
Introduction – Cryptography and Modern Cryptography – The setting of Private – Key Encryption – Historical Cipher and their cryptanalysis – Perfectly Secret Encryption – Definition – The One – Time Pad – Limitations of Private Secrecy – Shannon’s Theorem.						
Unit: 2	Types of Encryptions				9 Hours	
Symmetric Encryption: Evolution of symmetric encryption – symmetric algorithms – Block and Stream ciphers – Asymmetric Encryption: Understanding cryptographic requirements – Comparing public key algorithms – Examining hash algorithms: Describing a hash algorithm – Comparing common hash algorithms.						
Unit: 3	Cryptography in Today’s World				9 Hours	
The Basic Principles of Modern Cryptography – Security Standards for Modern Cryptography – Overview of Cryptanalysis – Types of Cryptanalysis systems – Types of Cryptanalytic attacks – Blockchain – Bitcoin.						
Unit: 4	Steganography				9 Hours	
Introduction – What is Steganography - Historical Steganography – Methods and Tools – Current Uses of Steganography – Steganalysis – Distributed Steganography.						
Unit: 5	Types of Steganography				9 Hours	
Digital Steganography : Modern Day data hiding techniques – Image Steganography : Recent Trends and Techniques – Advances in Text Steganography – Quantum Steganography.						
Total Lectures					45 Hours	
Reference Books						
1.	William Easttom, “Modern Cryptography”, Springer International Publishing, 2022, ISBN:9783031123047.					
2.	Jonathan Katz, Yehuda Lindell, “Introduction to Modern Cryptography”, CRC Press, ISBN:9781351133029.					
3.	Pramanik, Sabyasachi, Ghonge, Mangesh Manikrao, Ravi, Renjith V, “Multidisciplinary Approach to Modern Digital Steganography”, IGI Global Publishing, 2021, ISBN:9781799871620.					
4.	Lisa Bock, “Modern Cryptography for Cybersecurity Professionals”, Packt Publishing, 2021, ISBN:9781838647797.					

5.	Rajkumar Banoth, Rekha Regar, "Classical and Modern Cryptography for Beginners", Springer Nature Publisher, 2023, ISBN:9783031329593.
Recommended by Board of Studies	04 Aug 2023
Approved by Academic Council	25 Aug 2023

Course Code	ETHICAL HACKING		L	T	P	C
23CA3019			3	0	0	3
Course Objectives:						
Enable the student to: 1. Practice the concept of hacking. 2. Identify and analyze various hacking types. 3. Acquire knowledge on detection, analysis, understanding of various attacks.						
Course Outcomes:						
The student will be able to: 1. Perform ethical hacking and penetration testing. 2. Identify various types of attacks, security threats and vulnerabilities present in the computer system. 3. Examine different vulnerabilities, threats and attacks to information systems and recommend the countermeasures. 4. Apply the techniques and ethical issues in the domain of ethical hacking. 5. Examine how social engineering can be done by attacker to gain access to useful and sensitive information. 6. Relate web application attacks and Wi-Fi attacks.						
Unit: 1	Introduction					8 Hours
Introduction - Professions for Hackers - Black Hat vs White Hat - History of Hacking - Legal Consequences - Essential Skills - Fundamental Skills - Intermediate Skills - Intangible Skills - Essential Tools - The Hacker Process – Fingerprinting - Passive Reconnaissance - Active Reconnaissance - Password Cracking – Exploitation - Post Exploitation - Covering Tracks.						
Unit: 2	Cracking Passwords					10 Hours
Passive Reconnaissance - Google Hacking – Netcraft – Whois – Shodan – DNS - p0F – Active Reconnaissance – Nmap – Hping – Whatweb – Builtwith - Vulnerability Scanning - Finding the EternalBlue - Vulnerability - Nessus - OWASP-ZAP - Password Cracking - Password Cracking Strategy - Cracking Passwords with john - Creating Custom Password Lists – Hashcat - Windows Password Hashes - Remote Password Cracking with Medusa.						
Unit: 3	Creating Malicious File					10 Hours
Metasploit Exploitation - Keywords and Commands - Strategy for Finding the Proper Module - Directory Structure of Metasploit - Reconnaissance with Metasploit - Vulnerability Scanning - Exploitation with EternalBlue - Adding a New Module - Creating a Malicious File with msfvenom - Using msfvenom for Exploitation when You have Physical Access – Sniffing with tcpdump - Sniffing with Wireshark - Wireshark Analysis of EternalBlue - Sniffing and Protocol Analysis - Post-Exploitation - Post Exploitation Metasploit Modules – IdleTime – Hashdump - Web Cams – Keylogger – Microphone – Mimikatz – Arpscaner - MySQL Post Exploitation.						
Unit: 4	Web Hacking					10 Hours
Web Hacking - Approaches to Web Hacking - Website Vulnerabilities - SQL Injection - Attacking WordPress Sites - Evading Anti-Virus (AV) - Metasploit’s Evasion Modules - How Anti-Virus Software Works - What is Shellcode - OWASP-ZSC - Covering Your Tracks – Covering Your Tracks with the meterpreter - wevutil to Delete Logs – Timestamp - Covering Tracks on Linux Systems - Removing Command History - Shredding Command History.						
Unit: 5	Social Engineering Attacks					7 Hours
Wi-Fi Hacking - Wi-Fi Basics – Terminology - Security Protocols - Wi-Fi Adapter for Hacking - Attacking Wi-Fi Aps - WPA2-PSK - WPS Attack - Evil Twin Attack – AP DoS Attack - PMKID Attack						

- Social Engineering - What is Social Engineering in Cyber Security? - Social Engineering Vectors - Social Engineering Concepts and Strategies - Social Engineering Tools and Technologies - Social Engineering with Metasploit.

Total Lectures 45 Hours

Reference Books

1. Dr. Allen Harper, Daniel Regalado, Ryan Linn, Stephen Sims, grey hat hacking: the ethical hackers handbook, McGraw Hill, 2020, ISBN: 9789390385294.
2. Kent Peterson, "Cybersecurity, Cyberwar and Cyberweapon: A Beginner's guide to understanding cyber security and how it affects you", Independently published, 2021, ISBN: 9798465930819.
3. Peter Kim, "The Hacker Playbook 2: Practical Guide to Penetration Testing Paperback", Createspace Independent Pub, 2015, ISBN: 9781512214567.

Recommended by Board of Studies 04 Aug 2023

Approved by Academic Council 25 Aug 2023

Course Code	ETHICAL HACKING LAB	L	T	P	C
23CA3020		0	0	2	2

Course Objectives:

Enable the student to:

1. Perform data gathering, foot printing and system hacking.
2. Practice using tools and techniques to carry out a penetration testing.
3. Exhibit proficiency in detection, analysis, understanding of various attacks.

Course Outcomes:

The student will be able to:

1. Discover target domains.
2. Identify various vulnerabilities present in the target system and domain.
3. Examine different vulnerabilities, threats and attacks to information systems and recommend the countermeasures.
4. Apply the techniques and ethical issues in the domain of ethical hacking.
5. Practice post exploitation.
6. Exhibit web application attacks and Wi-Fi attacks.

LIST OF EXERCISES

1. Perform Reconnaissance on target domains.
2. Schedule Vulnerability Scanning.
3. Implement Password Cracking.
4. Use Metasploit framework for exploitation.
5. Perform Sniffing and Protocol Analysis.
6. Practice post- exploitation.
7. Implement necessary tools to cover tracks.
8. Perform Web Hacking.
9. Exhibit Wi-Fi Hacking.
10. Implement social engineering attacks.
11. Perform session hijacking.
12. Evading IDS and Firewalls.

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Course Code	SOCIAL MEDIA CRIMES	L	T	P	C
23CA3021		3	0	0	3

Course Objectives:

Enable the student to:

1. Acquire knowledge of the needs, trends, and usage of social media on different platforms.
2. Identify the different kinds of social media crimes.
3. Develop best practices for privacy and understand the role of criminal justice system.

Course Outcomes:		
The student will be able to:		
1. Acquire social media knowledge and differentiate between social networking sites. 2. Analyze the usage of social media on different platforms. 3. Identify the causes, consequences, and countermeasures of Social Media Crimes against Women and Children. 4. Categorize the other forms of social media crimes. 5. Design best practices for privacy on social networking sites. 6. Examine the role of the criminal justice system in social media crimes.		
Unit: 1	Introduction to social media	9 Hours
Definitions – Social Media, Social Network, Social Networking Sites, Digital Identify, Types of Social Media, History of Social Media – Genesis of Internet, WWW, Emergence of Social Networking Sites, Web 2.0 & Web 3.0 – Current Social Media and Social Networking Usage in various countries – Trends in Social Media – Effects on the Society - Social Activism – Social Media's dark side – Civic engagement in the social world – Internet Vigilantism and Related Concepts – Digital Privacy and Privacy Issues - Types of social networking sites, - Profile, Content, White label, Mobile, Community-based SNS - Types and their vulnerabilities - Other forms of SNS – List of Social Networking Sites, Applications and their history.		
Unit: 2	Social Media Services	9 Hours
Types of services of social media – Usage of social media – Friending, Trending, Chatting, Wall Posts, Tweets, Selfies, Forwards, Community networking, Gaming, Memes, Talent displays - Use of social networking sites for small businesses – Use of social networking sites for large scale businesses – Use of social media in Politics – social media as other advertisement platforms – Different types of Promotions through social media.		
Unit: 3	Social Media Crimes against women and Children	9 Hours
Types of Social Media Crimes against Women and Children - causes, consequences and countermeasures – Pornography – Child Pornography – Non-Consensual Pornography – Revenge Porn - Indecent Representation of Women – Insult to Modesty of Women - Online Violence – Cyber/virtual Rape - Online Harassment – Cyber Bullying – Cyber Stalking – Chat room based crimes – Emotional Targets – Toxic contents – Causing Disrespect - Online Predators – Abuse of Children online – Patterns of women and child sexual victimization – Trends and Analysis.		
Unit: 4	Other forms of Social Media Crimes	9 Hours
Online Frauds – Frauds targeting children, women, youngsters, and senior citizens – Business-related frauds – Hacking – Cyber Defamation – Cyber Terrorism – Financial Frauds – Fake News – Fake Memes – Online challenges, Selfie, Facebook, WhatsApp victimization – Digital Cloning Frauds – Morphing – Identity Theft – Data Theft – Human Flesh Search Engine – Intellectual Property Related Crimes in social media.		
Unit: 5	Identity and Access Management	9 Hours
Identity and Access Management: Lifecycle for Identity and Access – Authentication – Authorization – Network Security: Concepts and Definitions – Sample Application.		
Total Lectures		45 Hours
Reference Books		
1.	Catherine D. Marcum, George E. Higgins, “Social Networking as a Criminal Enterprise”, Routledge, 1 st Edition, 2016, ISBN: 9781138141902.	
2.	Adam Ali.Zare Hudaib, “Social media Cyber Crimes and XKeyscore Espionage Technologies”, LAP Lambert Academic Publishing, 2015, ISBN: 9783659636462.	
3.	Joshua Brunty, Katherine Helenek, “Social Media Investigation for Law Enforcement”, 1 st Edition, Anderson Publisher, 2012, ISBN: 9781455731626.	

4.	Venessa Garcia, Samantha G. Arkerson “Crime, Media, and Reality: Examining Mixed Messages About Crime and Justice in Popular Media”, Rowman & Littlefield Publishers, 2017, ISBN: 9781442260818.
5.	Rebecca M. Hayes, Kate Luther, Crime: social media, Crime, and the Criminal Legal System (Palgrave Studies in Crime, Media and Culture)”, Palgrave Macmillan,1 st Edition, 2018, ASIN: B07GTH57P3.
Recommended by Board of Studies	
04 Aug 2023	
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25 Aug 2023	

Course Code	SECURITY IN THE CLOUD	L	T	P	C
23CA3022		3	0	0	3
Course Objectives:					
Enable the student to: 1. Develop a comprehensive understanding of cloud security principles and concepts. 2. Evaluate and implement cloud security controls and best practices. 3. Apply risk management and compliance frameworks in cloud security.					
Course Outcomes:					
The student will be able to: 1. Demonstrate a solid understanding of the concepts and principles of cloud computing. 2. Identify and address cloud security and privacy issues. 3. Implement intrusion detection systems and techniques in the cloud. 4. Develop the ability to manage and protect cloud assets, including virtual machines, data storage and network resources. 5. Implement identity and access management in the cloud. 6. Assess and enhance cloud security posture.					
Unit: 1	Fundamentals of Cloud Computing and Security				9 Hours
Introduction to Cloud Computing: History and Underlying Technologies – Definitions and Characteristics – Cloud Service Models – Cloud Deployment Models – Cloud Service Platforms – Challenges – Introduction to Cloud Security: Cloud Security Concepts – Cloud Security Standards - CSA Cloud Reference Models – NIST Cloud Reference Model.					
Unit: 2	Cloud Security and Privacy Issues				9 Hours
Cloud Security and Privacy Issues: Introduction – Cloud Security Goals and Concepts – Cloud Security Issues – Security Requirements for Privacy – Privacy Issues in Cloud. Threat Model and Cloud Attacks: Introduction – Threat Model – Taxonomy of Attacks – Features for Attack Analysis, a Case Study.					
Unit: 3	Intrusion Detection Systems and Techniques				9 Hours
Classification of Intrusion Detection Systems in Cloud: Introduction – TVM-based Intrusion Detection System – Hypervisor-based Intrusion Detection System – Network-based Intrusion Detection System – Distributed Intrusion Detection System - Intrusion Detection Techniques in Cloud: Introduction – Taxonomy of IDS Techniques.					
Unit: 4	Cloud Asset Management and Protection				9 Hours
Data Asset Management and Protection: Data Identification and Classification – Data Asset Management in the Cloud – Protecting Data in the Cloud. Cloud Asset Management and Protection: Types of Cloud Assets – Asset Management Pipeline – Tagging Cloud Assets.					
Unit: 5	Identity and Access Management				9 Hours
Identity and Access Management: Lifecycle for Identity and Access – Authentication – Authorization – Network Security: Concepts and Definitions – Sample Application.					
Total Lectures					45 Hours
Reference Books					
1.	Preeti Mishra, Emmanuel S. Pilli, R C Joshi, “Cloud Security: Attacks, Techniques, Tools, and Challenges”. CRC Press, 2022. ISBN: 9781003004486.				

2.	Chris Dotson, “Practical Cloud Security: A Guide for Secure Design and Deployment”, O’Reilly, 2019, ISBN: 9781492037514.	
3.	Ronald L Krutz, Russel Dean Vines, “Cloud Security: A Comprehensive Guide to Secure Cloud Computing”, Wiley, 2010, ISBN: 9780470938942.	
4.	Imad M. Abbadi, “Cloud Management and Security”, Wiley, 2014, ISBN: 9781118817070.	
5.	John R. Vacca, “Cloud Computing Security: Foundations and Challenges”, CRC Press, 2020, ISBN: 9780429619649.	
Recommended by Board of Studies		04 Aug 2023
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Course Code	SECURITY IN THE CLOUD LAB			L	T	P	C
23CA3023				0	0	2	2
Course Objectives:							
Enable the student to:							
1. Develop practical skills in implementing and managing cloud security controls. 2. Examine security assessments and audits in a cloud environment. 3. Illustrate access control in a cloud environment.							
Course Outcomes:							
The student will be able to:							
1. Establish and manage firewalls. 2. Employ access controls and Identity access. 3. Apply security monitoring and logging. 4. Examine incident response and recovery strategies. 5. Build and deploy serverless functions. 6. Evaluate a cloud environment’s compliance posture.							
LIST OF EXERCISES							
1. Virtual Machine Firewall Configuration. 2. Identity and Access Management (IAM) Roles and Permissions. 3. Utilizing Key Management Service (KMS) to encrypt data at rest in storage buckets. 4. Setting up a VPC network and subnets, configuring network access controls, and securing communication between subnets using firewall rules. 5. Web Application Firewall (WAF) Configuration 6. Security Monitoring and Logging with Cloud Logging. 7. Incident Response Simulation. 8. Evaluating a Cloud environment's compliance posture with relevant regulations. 9. Implement access controls, object versioning, and lifecycle management policies on Cloud Storage. 10. Container Security with Kubernetes Engine. 11. Building and deploying serverless functions using Cloud functions 12. Secure Network Communication using Virtual Private Network.							

Course Code	CYBER SECURITY	L	T	P	C
23CA3024		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire adequate knowledge about the libraries used in Python for data analysis. 2. Exhibit the basics of networking with python. 3. Apply penetration testing in a network environment.					
Course Outcomes:					
The student will be able to: 1. Exhibit proficiency for working with libraries in Python. 2. Examine the scope of penetration testing in networking. 3. Implement a network sniffer using python. 4. Observe the process of penetration testing. 5. Classify the types of SQL injection attacks.					

6. Implement machine learning concept in cyber security.		
Unit: 1	Introduction to Python Libraries	10 Hours
Data Analysis and processing-An overview of the libraries in data analysis-Numpy arrays-Array functions- Data processing using arrays- Linear algebra with Numpy- Numpy random numbers- An overview of the pandas package- The pandas data structure- The essential basic functionality- Indexing and selecting data- Computational tools- Working with missing data- Advanced uses of pandas for data analysis.		
Unit: 2	Python with Penetration Testing and Networking	10 Hours
Introducing the scope of pentesting- Approaches to pentesting-Network sockets- Server socket methods- Client socket methods-General socket methods-Ping sweep- The TCP scan concept and its implementation using a python script-How to create an efficient IP scanner-The concept of a port scanner-How to create an efficient port scanner.		
Unit: 3	Sniffing and Penetration Testing	10 Hours
Introducing a network sniffer-Implementing a network sniffer using Python-Learning about packet crafting- Introducing ARP spoofing and implementing it using python – Testing the security system using custom packet crafting-Wireless SSID finding and wireless traffic analysis by Python-Detecting clients of an AP- Wireless attacks.		
Unit: 4	DDoS Attacks, Pentesting of SQLI and XSS	8 Hours
Introducing client-side validation – Tampering with the client parameter with Python-Effects of parameter tampering on business- Introducing DoS and DDoS- Introducing the SQL injection attack-Types of SQL injections- Understanding the SQL injection attack by a Python script- Learning about Cross-Site scripting.		
Unit: 5	Machine Learning and Cyber Security	7 Hours
Machine Learning – Regression based machine learning models – Classification modes- Natural language processing.		
Total Lectures		45 Hours
Reference Books		
1.	Mohit, “Python Penetration testing essentials”, Packt Publishing, 2015, ISBN: 9781784398583.	
2.	Furqan Khan, “Hands-on Penetration testing with python”, Packt Publishing, 2019, ISBN: 9781788990820.	
3.	Samuel Bowne, “Hands-On Cryptography with Python: Leverage the power of Python to encrypt and decrypt data”, Packt Publishing, 1 st Edition, 2018, ASIN: B07F73GW7Y.	
4.	Rohan Chopra, Aaron England and Mohammed Noordeen Alauddeen “Data Science with Python”, Packt Publishing, 2019, ISBN: 9781838552862.	
5.	Christian Martorella, “Learning Python Web Penetration Testing: Automate web penetration testing activities using Python”, Packt Publishing, 2018, ISBN: 9781789533972.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	CYBER SECURITY LAB	L	T	P	C
23CA3025		0	0	2	2
Course Objectives:					
Enable the student to:					
1. Acquire skills in working with python libraries for data analysis.					
2. Practice network programming with python.					
3. Apply penetration testing in a network environment.					
Course Outcomes:					
The student will be able to:					
1. Practice the basic libraries used in python.					
2. Apply penetration testing in networking.					

- Implement a network sniffer using python. - Perform web crawling using scrapy. - Experiment the types of SQL injection attacks. - Implement machine learning concept in cyber security.
LIST OF EXERCISES
- Implement Data Integration checking using hashing. - Implement code to crack passwords. - Interacting with a web app using the requests library. - Scanning networks with scrapy. - Web crawling using scrapy. - Implementing Port Scanning. - Perform Brute Forcing a login page using Burp Suite. - Implement Machine Learning in Cyber Security. - Implement a program to hack wifi password. - Implement ARP spoofing. - Implement a program to control the device. - Implement a program to identify the hidden vulnerabilities.

Course Code	INTERNET OF THINGS SECURITY	L	T	P	C
23CA3026		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire the knowledge on IoT security. 2. Sketch secure design in IoT devices. 3. Apply cryptographic concepts in IoT.					
Course Outcomes:					
The student will be able to: 1. Exhibit IoT concepts. 2. Visualize the secure design of IoT devices. 3. Relate cryptography and security concepts in IoT. 4. Classify the types of privacy challenges. 5. Illustrate about security in Cloud. 6. Implement privacy challenges.					
Unit: 1	Introduction to IoT				10 Hours
IoT – IoT ecosystem – Common IoT attacks and countermeasures – Threat modelling an IoT system – IoT system architecture - Details of the IoT architecture layer - Fundamental IoT cloud architecture.					
Unit: 2	Secure Design of IoT Devices				10 Hours
Security architecture - Design principles of security architecture - Cloud architecture - Cloud enables and scales IoT security - Configuring gateway and network security – Managing Keys and Certificates – Managing accounts – Monitoring – Managing compliance and incidents.					
Unit: 3	Cryptography and Security in IoT				10 Hours
Connectivity in IoT - IoT communication protocols - Network security for IoT - Security analysis for protocols - Cryptography role in securing the IoT – Cryptographic key management – Cryptography controls for IoT protocols – Identity life cycle – Authentication credentials – IoT IAM infrastructure – Authorization and access control.					
Unit: 4	Privacy challenges				8 Hours
Privacy challenges in IoT – guide to performing an IoT - PIA – Privacy engineering recommendations – Privacy controls - IoT compliance – Complex compliance environment.					
Unit: 5	Security in IoT Cloud integration				7 Hours

The major types of change introduced by IoT - Evolving cyber-threat landscape - Emergent future of cloud computing - Infrastructure as code - Serverless Architecture - Elastic Container based Cloud - Autoscaling - Security advantage of emergent trends in cloud computing.

Total Lectures	45 Hours

Reference Books

1.	J. Craig Wheeler, David M. Wheeler, Damilare D. Fagbemi, "The IoT Architect's Guide to Attainable Security and Privacy", CRC Press, 2019, ISBN: 9781000762617.
2.	Amita Kapoor, "Hands-on Artificial Intelligence for IoT", Packt Publishing, 2019, ISBN: 9781788836067.
3.	Brian Russell, Drew Van Duren, "Practical Internet of Things Security: Design a security for Internet connected ecosystem", 2 nd Edition, Packt Publishing, 2018, ISBN: 9781788625821.
4.	Pethuru Raj Anupama C. Raman, "The Internet of Things Enabling Technologies, Platforms, and Use Cases", Taylor & Francis Group, 2017, ISBN: 9781498761284.
5.	Mohammad Abdur Razzaque, Md. Rezaul Karim, Hands-on Deep Learning for IoT, Packt Publishing, 2019, ASIN: B07TP7ZRC7.

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23CA3027	ARTIFICIAL INTELLIGENCE TECHNIQUES	3	0	0	3
Course Objectives:					
Enable the student to:					
1. Acquire an extensive knowledge in Artificial Intelligence concepts.					
2. Interpret the methods of searching and formulating the problems.					
3. Apply meticulous logical thinking for AI by learning calculus.					
Course Outcomes:					
The student will be able to:					
1. Differentiate various approaches and thinking capabilities of AI.					
2. Interpret different agents and its behaviour.					
3. Solve different kinds of problems using searching methods.					
4. Apply logical thinking in implementing AI.					
5. Examine various architectures and knowledge base.					
6. Compare different mechanisms in implementing the concepts of AI.					
Unit: 1	Introduction and Stimulus Response	9 Hours			
AI: Acting Humanly, thinking humanly, thinking rationally, acting rationally - Approaches to Artificial Intelligence – The History of AI – Stimulus-Response Agents: Perception and Action, Representing and Implementing Action Functions.					
Unit: 2	Intelligent Agents	9 Hours			
Agents and Environments – Good Behavior: The Concept of Rationality – The Nature of Environments – The Structure of Agents: Agent programs, Simple reflex Agents, Model-based reflex agents, Goal-based agents, Utility-based Agents, Learning Agents.					
Unit: 3	Formulating The Problem	9 Hours			
Tower of Hanoi - Backtracking: N-Queens – Depth-First-Search – Breadth-First-Search –Annealing – Min-Max Algorithm – Gaming – PAEAS.					
Unit: 4	Propositional Calculus and Predicate Calculus	9 Hours			
Propositional Calculus: The Language – Rules of Inference – Semantics – A New Rule of Inference: Resolution, Predicate Calculus: The language and its Syntax – Quantification – Semantics of Quantifiers – Predicate Calculus as a Language for Representing Knowledge.					
Unit: 5	Agent Architectures and Representing Commonsense Knowledge	9 Hours			

Three-level Architectures – Goal Arbitration – The Triple Tower Architecture – Bootstrapping – The Commonsense World – Knowledge representation by Networks.

Total Lectures

45 Hours

Reference Books

1. Prateek Joshi, “Artificial Intelligence with Python”, Packt Publishing, 2017, ISBN: 978-1-78646-439-2.
2. Stuart Russell and Peter Norving, “Artificial Intelligence a Modern Approach”, Pearson Education, 2014, ISBN: 9789332518698.
3. Nils J. Nilsson, “Artificial Intelligence A New Synthesis”, Morgan Kaufmann Publishers, 2014, ISBN: 9788181471901.
4. Denis Roathman, “Artificial Intelligence by Example”, Packt Publishing, 2020, ISBN: 9781839211539.
5. Deepak Khemani, “A First Course in Artificial Intelligence”, McGraw Hill, 2018, ISBN: 978-1-25-9029-981

Recommended by Board of Studies 04 Aug 2023

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Course Code	ARTIFICIAL INTELLIGENCE TECHNIQUES LAB	L	T	P	C
23CA3028		0	0	2	2
Course Objectives:					
Enable the student to: 1. Apply various problem-solving techniques used in AI. 2. Develop the concept of searching and pruning algorithms. 3. Implement algorithms to solve real world problems.					
Course Outcomes:					
The student will be able to: 1. Explore various problem-solving techniques. 2. Apply various algorithms used in AI. 3. Design and solve several searching techniques. 4. Design and develop pruning strategies. 5. Interpret the skill in design of PEAS. 6. Develop various methods for formulating the problems.					
LIST OF EXERCISES					
1. Implement Tower of Hanoi. 2. Develop gaming. 3. Implement Travelling Salesman Techniques. 4. Perform Backtracking (N-Queen Problem) algorithm. 5. Implement Depth first search algorithm. 6. Implement Breadth First Search algorithm. 7. Solve Monkey and Banana problem. 8. Implement Alpha- Beta Pruning. 9. Simulate Annealing technique in AI. 10. Implement Water- Jug Problem. 11. Develop Minimax Algorithm. 12. Formulate the problem and give PEAS Description.					

Course Code	PYTHON FOR DATA SCIENCE	L	T	P	C
23CA3029		3	0	0	3
Course Objectives:					
Enable the student to:					
1. Acquire knowledge in python programming.					
2. Perform data preprocessing techniques.					
3. Analyze data using numpy and pandas library.					
Course Outcomes:					

The student will be able to:		
1. Develop programs to solve computational problems. 2. Apply various data structures to effectively manage data. 3. Perform data transformation to convert data to machine readable form. 4. Evaluate the performance measures of a machine learning model. 5. Visualize data to solve real-time problems. 6. Create data visualization for effective interpretations and insights of data.		
Unit: 1	Basics of Python Programming	10 Hours
Features of python-Identifiers-Reserved Keywords-variables-Comments and indentation-Multiline and multiple statements- Input, output and import functions- Operators-Decision Making- Loops-Nested loops- Control statements- Types of loops- Function definition – Function calling- Function Arguments- Recursive functions.		
Unit: 2	Collections in Python	10 Hours
Lists: Introduction- Creating lists- Accessing the elements of a list- Negative list indices-Slicing-List Operator-List Comprehensions- List methods- Lists and Strings- Splitting a String in List-Passing List to a function-Returning List from functions-Introduction to Tuples: Creating tuples- Indexing and Slicing- Operations – Passing variable length arguments to tuples- List and tuples – Sets: Creating sets- Set in and not in operator- Set Operations- Dictionaries- Creating dictionary- Adding and replacing dictionary- Retrieving values- Formatting Dictionaries- Deleting items- Comparing two dictionaries- Methods of dictionary class.		
Unit: 3	Data Analysis and Libraries	10 Hours
Data Analysis and processing-An overview of the libraries in data analysis-Numpy arrays-Array functions- Data processing using arrays- Linear algebra with Numpy- Numpy random numbers- An overview of the pandas package- The pandas data structure- The essential basic functionality- Indexing and selecting data- Computational tools- Working with missing data- Advanced uses of pandas for data analysis.		
Unit: 4	Data Science and Data Pre-Processing	8 Hours
Road map for building machine learning models- Data Representation-Independent and target- Feature matrix and target vector-Loading dataset and creating the Feature Matrix and target matrix-Data cleaning- Removing missing data-Imputing missing data- Finding and removing outliers in data- Data Integration- Data transformation-Handling categorical data-Using one hot encoding- Data in different scale- Implementing scaling using standard and minmax scalar method, Data discretization – Train and test data- Supervised learning- Unsupervised learning- Reinforcement learning- Performance Metrics.		
Unit: 5	Data Visualization	7 Hours
Visualization using Matplotlib – accessories for charts - scatter plot- line plot - pie plot - bar plot - histogram plot- Bubble plot- pandas plotting - Advanced visualization using the sea born package - lm plots - bar plots- distribution plots – box plots- kde plots-violin plots - count plots - join plots – heat map – pair plot.		
Total Lectures		45 Hours
Reference Books		
1.	Jeeva Jose, “Taming Python by Programming”, Khanna Publishing, 2021, ISBN: 9789386173348.	
2.	Ashok Namdev Kamthane, Amit Ashok Kamthane”, Programming and Problem Solving with Python”, Mc Graw Hill, 2019, ISBN: 9789387067578.	
3.	Phuong Vo. T. H, Martin Czygan, Ashish Kumar, Kirthi Raman, “Python: Data Analytics and Visualization, Packt Publishing Ltd, 2017, ISBN: 9781788290098.	
4.	Rohan Chopra, Aaron England and Mohammed Noordeen Alauden “Data Science with Python”, Packt Publishing, 2019, ISBN: 9781838552862.	
5.	Avinash Navlani, Armando Fandango, Ivan Idris, “Python Data Analysis”, Packt, 2021, ISBN: 9781789955248.	

6.	Samir Madhavan, “Mastering Python for Data Science”, Packt Publishing, 2015, ISBN: 9781784390150.
Recommended by Board of Studies	04 Aug 2023
Approved by Academic Council	25 Aug 2023

Course Code	PYTHON FOR DATA SCIENCE LAB	L	T	P	C
23CA3030		0	0	2	2

Course Objectives:

Enable the student to:

1. Acquire skills in developing programs.
2. Analyze the input datasets using Python libraries.
3. Interpret the data using visualization package in python.

Course Outcomes:

The student will be able to:

1. Apply the concepts of conditional statements, looping and functions.
2. Develop programs using collections in python.
3. Analyze the dataset and generate the knowledge.
4. Analyze various statistical tests.
5. Perform basic statistical and probability measures for data science.
6. Visualize data using visualization package in python.

LIST OF EXERCISES

1. Consider the price list of various items in the retail store. The customer wants to know the
 - a. Average price of items in the retail shop
 - b. Price of costliest item sold in the retail shop
 - c. Display the item price list in increasing order
 Implement the solution using user defined and built in functions to accomplish the above-mentioned business requirement.
2. Develop a program to create book details and manipulate them using list operations.
 - a. Create an empty list.
 - b. Add book details.
 - c. Print book details.
 - d. Sort the list.
 - e. Search for a book.
 - f. Insert book details to the list by reading its position.
 - g. Remove book details from the list.
3. Given a dictionary of elements representing a computational problem. Develop a program to perform different operations.
4. Develop a program for exploratory data analysis and data cleaning.
5. Develop a program to perform various statistical tests that can be used to test a hypothesis.
6. Develop a program to manipulate data frames using pandas library.
 - a. Index objects and labeled data.
 - b. Hierarchical indexing.
 - c. pivoting data frame.
7. Develop a program to create basic and customizing plot using python libraries.
8. Develop a program to interact with databases
 - a. Interacting with data in text format
 - b. Interacting with data in binary format
9. Develop a program to create interactive data visualization charts.
10. Create a program for interactive visualization of data across time.
11. Develop a program to explore text data and unstructured data.
12. Develop a program to analyze geospatial data.

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Course Code	CLOUD COMPUTING	L	T	P	C
23CA3031		3	0	0	3
Course Objectives:					
Enable the student to: 1. Examine the principles and paradigms of cloud computing. 2. Apply cloud computing technologies and programming models to real-world scenarios. 3. Evaluate and propose solutions for challenges in cloud computing.					
Course Outcomes:					
The student will be able to: 1. Summarize the fundamental concepts and paradigms of cloud computing. 2. Develop scalable applications using cloud computing technologies and tools. 3. Evaluate security and privacy challenges in cloud computing critically. 4. Analyze performance optimization techniques for cloud-based applications. 5. Assess the economic aspects of cloud computing, including cost models, pricing strategies, and cost optimization techniques. 6. Exhibit solutions for emerging challenges and trends in cloud computing.					
Unit: 1	Foundations of Cloud Computing				9 Hours
Introduction to Cloud Computing - Historical Developments - Building Cloud Computing Environments - Principles of Parallel and Distributed Computing - Elements of Parallel Computing - Elements of Distributed Computing - Technologies for Distributed Computing.					
Unit: 2	Virtualization and Cloud Computing Architecture				9 Hours
Introduction to Virtualization - Characteristics of Virtualized Environments - Taxonomy of Virtualization Techniques - Virtualization and Cloud Computing - Pros and Cons of Virtualization - Virtualization Technology Examples - Introduction to Cloud Computing Architecture - The Cloud Reference Model - Types of Clouds - Economics of the Cloud - Open Challenges.					
Unit: 3	Cloud Application Programming				9 Hours
Overview of Aneka Framework - Anatomy of Aneka Container - Building Aneka Clouds - Cloud Programming and Management - Concurrent Computing - Parallelism for Single - Machine Computing - Programming Applications with Threads - Techniques for Parallel Computation with Threads - Multithreading with Aneka.					
Unit: 4	High Throughput Computing				9 Hours
Task Computing - Task based Application Models - Aneka Task - based Programming - Data Intensive Computing - Technologies for Data intensive Computing - Aneka Map Reduce Programming.					
Unit: 5	Industrial Platforms and Applications				9 Hours
Cloud Platforms in Industry - Amazon Web Services - Google AppEngine - Microsoft Azure - Cloud Applications: Scientific Applications - Business and Consumer Applications.					
Total Lectures					45 Hours
Reference Books					
1.	Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”, McGrawHill Education, 2017, ISBN: 9781259029950.				
2.	Kumar Saurabh, “Cloud Computing: Architecting Next-Gen Transformation Paradigms”, Wiley, Fourth Edition, 2017, ISBN: 9788126570966.				
3.	Sunilkumar Manvi, Gopal Shyam, “Cloud Computing: Concepts and Technologies”, CRC Press, 2021, ISBN: 9780367554590.				
4.	Rajiv Misra, Yashwant Singh Patel, “Cloud and Distributed Computing: Algorithms and Systems”, Wiley, 2020, ISBN: 9788126520275.				
5.	Mehul Mahrishi, Kamal Kant Hiran, Ruchi Doshi, Fagbola Temitayo, “Cloud Computing”, BPB Publications, 2020, ISBN: 978-9388511407.				
Recommended by Board of Studies			04 Aug 2023		
Approved by Academic Council			25 Aug 2023		

Course Code	BIG DATA TECHNOLOGIES	L	T	P	C
23CA3032		3	0	0	3
Course Objectives:					
Enable the student to: 1. Expertise in big data concepts. 2. Acquire the knowledge in Hadoop and MapReduce paradigms. 3. Apply various features of Hive.					
Course Outcomes:					
The student will be able to: 1. Summarize the fundamental of Big Data. 2. Expertise in big data techniques/tools. 3. Acquire knowledge in Hadoop. 4. Illustrate the role of MapReduce programming in various scenarios. 5. Develop solutions to problems using Big Data. 6. Expertise in Big data and Spark.					
Unit: 1	Introduction to Big Data				9 Hours
Introduction to Big Data: Types of Digital Data-Characteristics of Data – Evolution of Big Data – Definition of Big Data – Challenges with Big Data – 3Vs of Big Data – Non-Definitional traits of Big Data – Business Intelligence vs. Big Data – Data warehouse and Hadoop environment – Coexistence. Big Data Analytics: Classification of analytics – Data Science – Terminologies in Big Data – CAP Theorem – BASE Concept.					
Unit: 2	Hadoop				9 Hours
Introduction to Hadoop: Features – Advantages – Versions – Overview of Hadoop Eco systems – Hadoop distributions – Hadoop vs. SQL – RDBMS vs. Hadoop – Hadoop Components – Architecture – HDFS – Map Reduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.					
Unit: 3	Databases				9 Hours
No SQL databases: Mongo DB: Introduction – Features – Data types – Mongo DB Query language – CRUD operations – Arrays – Functions: Count – Sort – Limit – Skip – Aggregate – Map Reduce. Cursors – Indexes – Mongo Import – Mongo Export. Cassandra: Introduction – Features – Data types – CQLSH – Key spaces – CRUD operations – Collections – Counter – TTL – Alter commands – Import and Export – Querying System tables.					
Unit: 4	Hadoop				9 Hours
Hadoop Eco systems: Hive – Architecture – data type – File format – HQL – SerDe – User defined functions – Pig: Features – Anatomy – Pig on Hadoop – Pig Philosophy – Pig Latin overview – Data types – Running pig – Execution modes of Pig – HDFS commands					
Unit: 5	Overview of Big Data and Spark				9 Hours
Gentle Overview of Big Data and Spark: What is Apache Spark-History of Spark-The Present and Future of Spark-Downloading Spark Locally-A Gentle Introduction to Spark:Spark’s Basic Architecture-Spark Applications-Spark API’s-The SparkSession- Partitions-Lazy Evaluation-DataFrames and SQL.					
Total Lectures					45 Hours
Reference Books					
1.	Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley Publication, 2016, ISBN: 9788126554782.				
2.	Judith Hurwitz, Alan Nugent, Dr. Fern Halper, Marcia Kaufman, “Big Data for Dummies”, John Wiley & Sons, Inc., 2013, ISBN: 978118504222.				
3.	Tom White, “Hadoop: The Definitive Guide”, O’Reilly Publications, 2011. ISBN: 9781935182870.				
4.	Kyle Banker, “Mongo DB in Action”, Manning Publications Company, 2012.				
5.	Russell Bradberry, Eric Blow, “Practical Cassandra A Developers Approach”, Pearson Education, 2014, ISBN: 9780321933942.				

Recommended by Board of Studies	04 Aug 2023
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Course Code	BIG DATA TECHNOLOGIES LAB	L	T	P	C
23CA3033		0	0	2	2

Course Objectives:

Enable the student to:

1. Acquire skills in working with Hadoop.
2. Apply Map Reduce Technique.
3. Create applications using MongoDB, Hive, Cassandra, pig and spark.

Course Outcomes:

The student will be able to:

1. Execute the commands in Hadoop.
2. Implement Map Reduce in Hadoop.
3. Execute queries in MongoDB.
4. Execute queries in Hive.
5. Execute queries using Pig and Spark.
6. Implement queries in Cassandra.

LIST OF EXERCISES

1. Installation of Hadoop.
2. Develop file management tasks in hadoop.
3. Perform word count program using map reduce.
4. Design map reduce program that mines weather data.
5. Installation of mongoDB.
6. Perform NoSQL database using mongodb.
7. Installation of hive.
8. Create queries using hive.
9. Installation of pig.
10. Develop pig scripts to sort, group, join, project, and filter your data.
11. Installation of Cassandra.
12. Create DDL & DML comments using Cassandra.

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Course Code	DATA WAREHOUSING AND DATA MINING	L	T	P	C
23CA3034		3	0	0	3

Course Objectives:

Enable the student to:

1. Acquire the knowledge in data warehousing.
2. Interpret the frequent patterns, associations, and correlations.
3. Apply mining algorithms to solve machine learning problems.

Course Outcomes:

The student will be able to:

1. Summarize the warehouse strategy, process, design and implementation.
2. Sketch the architecture of data warehouse and OLAP operations.
3. Identify the key processes of data mining, data warehousing.
4. Choose the datamining algorithms for various applications.
5. Apply data mining techniques to solve problems.
6. Implement various supervised machine learning algorithms

Unit: 1	Data Warehouse Process and Technology	9 Hours
Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and implementation, Hardware and Operating Systems for Data Warehousing, Warehousing Software, Warehouse Schema Design.		
Unit: 2	Data Warehousing and Online Analytical Processing	9 Hours
Introduction, Motivation for Data Warehouse, Multitier Architecture, ETL process, Multidimensional Data Model, Schemas for Multidimensional Data Models, Data Warehouse Models - Enterprise Warehouse, DataMart, and Virtual Warehouse, The Role of Concept Hierarchies, OLAP Server, Typical OLAP Operations, Dimensional analysis.		
Unit: 3	Mining Frequent Patterns, Associations, and Correlations	9 Hours
Market Basket Analysis, Association Rules, Multidimensional & Multilevel association rules, Frequent Itemset, Frequent Itemset Mining Methods Apriori algorithm, Improved Apriori algorithm, Pattern-Growth Approach: FP-growth, Generating Association Rules from Frequent Itemset, Interesting Pattern Evaluation Methods, Correlation analysis.		
Unit: 4	Classification	9 Hours
Classification vs. prediction, Supervised learning, Approach to Classification: Decision and Selection, Advanced Classification Methods		
Unit: 5	Applications of mining	9 Hours
Introduction to spatial mining, multimedia mining, temporal mining, text mining and web mining with related algorithms.		
Total Lectures		45 Hours
Reference Books		
1.	Mark Humphries, Michael W. Hawkins, Michelle C. Dy, "Data Warehousing: Architecture and Implementation", Pearson Education, ISBN: 0130809020.	
2.	Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques" 3 rd Edition, ISBN: 9780123814791.	
3.	Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2 nd Edition, 2006, ISBN: 9780123814807.	
4.	Margaret H. Dunham, S. Sridhar, "Data Mining: Introductory and Advanced Topics" Pearson Education ISBN: 9789332526631.	
5.	Margaret H Dunham, "Data Mining Introductory and Advanced topics", PEA, ISBN: 9788177587852.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	MACHINE LEARNING LAB	L	T	P	C
23CA3035		0	0	2	2
Course Objectives:					
Enable the student to:					

1. Perform data preprocessing techniques. 2. Solve the real-world problem using weka. 3. Implement clustering techniques	
Course Outcomes:	
The student will be able to: 1. Implement data preprocessing techniques for the input dataset. 2. Analyze machine learning algorithms. 3. Implement classification techniques 4. Implement dimensionality reduction techniques. 5. Create data warehouse using tools. 6. Implement association rule mining.	
LIST OF EXERCISES	
1. Create data warehouse using pentaho data integration tool. 2. Perform data preprocessing. 3. Implement Linear Regression. 4. Implement Association rule mining. 5. Apply Classification on the input datasets. 6. Perform clustering on the input datasets. 7. Implement Ensemble learning. 8. Predict weather forecasting 9. Detect Spam. 10. Perform Time series analysis. 11. Predict Diabetic disease dataset. 12. Analyze Agriculture dataset.	
Recommended by Board of Studies	04 Aug 2023
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Course Code	DATA ANALYTICS AND VISUALIZATION	L	T	P	C
23CA3036		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire the principles and guidelines for better data visualization. 2. Visualize various charts to represent data. 3. Perform visualization approach for quality analysis.					
Course Outcomes:					
The student will be able to: 1. Examine principles of data visualization. 2. Interpret the insights of data using various charts. 3. Sketch timeline and distribution charts. 4. Classify the types of charts and their usage. 5. Interpret timeline and geospatial charts. 6. Visualize qualitative data.					
Unit: 1	Principles of Data Visualization				10 Hours
Introduction- Visual processing and perceptual rankings- Anscombe’s Quartet- Gestalt principles of visual perception- Preattentive processing- Five guidelines for better data visualization- Show the data, Reduce the clutter, Integrate the graphics and text, Avoid the spaghetti chart, start with gray-Forms and function: Let your audience’s need drive your data visualization choices.					
Unit: 2	Basic Charts				7 Hours
Comparing Categories: Bar Charts-Paired bar- Stacked bar-Diverging bar-Dot plot-Marimekko and Mosaic charts - Unit, Isotype, and waffle charts – Heatmap - Bullet charts - Bubble comparison and nested bubbles - Sankey diagram – Waterfall chart.					
Unit: 3	Timeline and Distribution Charts				10 Hours

Line chart - Circular line chart - Slope chart – Sparklines - Bump chart- Cycle chart - Area chart - Stacked area chart – Streamgraph - Horizon chart - Gantt chart - Flowcharts and timeline - Connected scatterplot – Histogram - Pyramid chart - Visualizing statistical uncertainty with charts - box and whisker plots - Candlestick chart- Violin chart- Ridgeline plot- Visualizing uncertainty by showing the data – Stem and leaf plot.		
Unit: 4	Geospatial and Relationship Charts	9 Hours
- Choropleth map – Cartogram – Proportional symbol and Dot density maps – flow map – Scatterplot- Parallel Coordinates plot- Radar charts- Chord diagram – Arc chart- Correlation matrix- Network diagrams- Tree diagram- Pie charts- Treemap- Sunburst diagram- Nightingale chart- Voronoi diagram.		
Unit: 5	Exploring Qualitative data	9 Hours
Icons- Word clouds and specific words- Word trees- specific words- quotes- Coloring Phrases- Matrices and Lists – Ten Guidelines of better tables- The Anatomy of a graph- Color palettes- Defining fonts for the style guide.		
Total Lectures		45 Hours
Reference Books		
1.	Jonathan Schwabish, “Better Data Visualizations”, Columbia University Press, 2021, ISBN:9780231550154.	
2.	Jaemin Hwang, Youngjin Yoon, “Data Analytics and Visualization in Quality Analysis Using Tableau”, CRC Press, 2022, ISBN:9780367744168.	
3.	Claus Wike, “Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures”, O’Reilly, 2019, ISBN: 9781492031086.	
4.	Jack Dougherty, “Hands-on Data Visualization: Interactive Storytelling from Spreadsheets to Code, O’Reilly, 2021, ISBN:9789391043032.	
5	Sharada Sringswara, Purvi Tiwari, U. Dinesh Kumar, “Data Visualization: Storytelling Using Data”, Wiley, 2022, ISBN: 9789354643132.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	DATA ANALYTICS AND VISUALIZATION LAB	L	T	P	C
23CA3037		0	0	2	2
Course Objectives:					
Enable the student to:					
1. Examine, navigate and learn to use various features of visualization.					
2. Assess the quality of the data and perform exploratory analysis.					
3. Create and design visualizations and dashboards.					
Course Outcomes:					
The student will be able to:					
1. Assess the quality of the data and perform exploratory analysis.					
2. Analyze the datasets and create various charts.					
3. Create dates using calculated fields.					
4. Create and design visualizations that work best for the target audience.					
5. Analyze concepts and techniques for compelling storytelling with data.					
6. Create reports and build interactive dashboards.					
LIST OF EXERCISES					
1. Connect Data Sources.					
2. Creating a view.					
3. Exploratory Analysis.					
4. Create basic charts.					
5. Create Calculated field.					
6. Design interactive visualizations.					
7. Creating a filter and URL action.					
8. Create Analytics and perform cluster analysis.					

9. Design maps and Geospatial Visualization. 10. Create dashboards and story points. 11. Perform Extraction, Transformation and Loading. 12. Design data visualization and generate report based on data warehouse data.	
Recommended by Board of Studies	04 Aug 2023
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Course Code	ADVANCED DATABASE TECHNOLOGIES	L	T	P	C
23CA3038		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire knowledge in recovery system. 2. Examine database concepts, data warehouse and data mining. 3. Explore XML, spatial and temporal data.					
Course Outcomes:					
The student will be able to: 1. Acquire the knowledge in recovery system. 2. Expertise in parallel database, distributed database, data mining and data warehousing. 3. Design the information retrieval system and speciality database. 4. Develop advanced application for real world. 5. Create XML document. 6. Facilitate the concept of transaction processing, spatial and temporal data.					
Unit: 1	Recovery System, Parallel Databases				9 Hours
Failure classification, Storage, Recovery and automicity, Recovery algorithm, buffer management, Failure with loss of non-volatile storage, Early lock release and logical undo operations- Aries- Remote backup systems- Introduction to parallel databases- I/O Parallelism- Interquery Parallelism- Intra query Parallelism- Inter operation- Intra operation Parallelism- Query Optimization- Design of Parallel Systems- Parallelism on multicore Processors.					
Unit : 2	Distributed Databases, Data Warehousing Data Mining				9 Hours
Homogenous and Heterogenous Databases- Distributed Data Storage- Distributed Transactions- Commit Protocols- Concurrency Control in Distributed databases- Availability- Distributed Query Processing- Heterogenous Distributed Databases- Cloud Based Databases- Directory System. Decision Support System- Data warehousing- Data Mining – Classification- Association rules- Other types of Association- Clustering- Other forms of data mining.					
Unit: 3	Information Retrieval and Speciality Databases				9 Hours
Information retrieval overview- Relevance ranking using terms, hyperlinks, Synonyms, homonyms and ontologies- Indexing of documents-Measuring Retrieval effectiveness- Crawling and indexing the web- Information retrieval beyond ranking of pages- Directories and categories. Overview of Object based databases- Complex Data types- Structured types and inheritance in SQL- Table inheritance- Array and multiset types in SQL- Object identity and reference types in SQL- Implementing O-R features- Persistent programming languages- Object oriented mapping- Object oriented verses object relational mapping.					

Unit: 4	XML and Advanced Application Development	9 Hours
XML Motivation- Structure of XML data- XML document schema- Querying and Transformation- Application programming interfaces to XML- storage of XML data- XML applications- Performance tuning- Performance benchmarks- Other issues in application development- Standardization.		
Unit: 5	Spatial and temporal data and mobility, Advanced transaction processing	9 Hours
Motivation- Time in Databases- Spatial and Geographic data- Multimedia databases- Mobility and personal databases- Advanced Transaction Processing- Transaction processing monitors- Transactional workflows- E- commerce- Main memory databases- Real time transaction systems- long duration transactions.		
Total Lectures		45 Hours
Reference Books		
1.	Henry F. Korth, S. Sudarshan, Abraham Silberschatz, Database System Concepts, 2013, ISBN: 9789332901384.	
2.	Prashant D. Somwanshi, Mrs. Mrunal P. Fatangare, Prashant B. Jawalkar, " Advanced Database Management Systems", 1 st Edition, 2019, Nirali prakasan, ISBN: 9789389406313.	
3.	Ivan bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB Publications, 2010, ISBN: 9788176569644.	
4.	Jeffrey A. Hoffer, Mary B. Prescott, and Fred R. McFadden, "Modern Database Management", 8 th Edition, 2007, Prentice-Hall, ISBN: 9780132212113.	
5	Elmasri, R. and S. B. Navathe, "Fundamentals of Database Systems", 6 th Edition, Pearson, 2010, ISBN: 9780136086208.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	HUMAN CENTERED COMPUTING	L	T	P	C
23CA3039		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire the basics of interaction. 2. Design the human computing process and models. 3. Apply various interfaces in the applications.					
Course Outcomes:					
The student will be able to: 1. Interpret necessity of human computer interaction. 2. Identify the suitable design process for developing an interaction model. 3. Classify types of design models. 4. Devise strategies for deployment of interaction models. 5. Choose the right type of interaction model.					

6. Compare different kinds of human computer interaction models.		
Unit: 1	Fundamentals of Interaction	9 Hours
The Interaction: Introduction - Models of Interaction - Ergonomics - Interaction Styles - Elements of the WIMP Interface - Interactivity. Paradigms: Paradigms for Interaction.		
Unit: 2	Design Process	9 Hours
Interaction Design Basics: Introduction to Design - The Process of Design - User Focus - Navigation Design – Screen Design and Layout - Iteration and Prototyping. HCI in the software process: The Software Lifecycle – Usability Engineering - Iterative Design and Prototyping - Design Rationale.		
Unit: 3	Design Principles	9 Hours
Implementation Support: Elements of Windowing Systems - Programming the Application - Using toolkits – User Interface Management Systems. Universal Design: Universal Design Principles - Multi-modal Interaction – Designing for Diversity.		
Unit: 4	Design Models	9 Hours
Cognitive Models: Goal and Task Hierarchies - Linguistic Models - The Challenge of Display-based Systems -Physical and Device Models - Cognitive Architectures. Communication and Collaboration Models: Face-to-face Communication - Conversation - Text-based Communication - Group Working. Dialog Notations and Design: What is Dialog? - Dialog Design Notations - Diagrammatic Notations - Textual Dialog Notations.		
Unit: 5	Advanced Interfaces	9 Hours
Groupware: Groupware Systems - Computer-mediated Communication - Meeting and Decision Support Systems - Shared Applications and artifacts - Frameworks for Groupware - Ubiquitous Computing and Augmented Realities: Ubiquitous Computing Applications Research - Virtual and Augmented Reality - Information and Data Visualization. Hypertext, Multimedia and the World Wide Web: Understanding Hypertext - Finding Things - Static Web Content - Dynamic Web Content.		
Total Lectures		45 Hours
Reference Books		
1.	Dr. Samit Bhattacharya, “Human – Computer Interaction: User-centric Computing for Design”, McGraw Hill, 2019, ISBN: 9789353168049.	
2.	Kent L. Norman, Jurek Kirakowski, “The Wiley Handbook of Human Computer Interaction”, John Wiley & Sons Ltd, 2018, ISBN:9781118976135.	
3.	Turgut Ozseven, “Human-computer interaction”, 2020, Nova Science Publishers, ISBN: 9781536164961.	
4.	Rajendra Kumar, “Human Computer Interaction”, 2017, Laxmi Publications, ISBN: 978-8131802809.	
5	Nirmalya Thakur, Parameshachari B.D.,” Human-Computer Interaction and Beyond:”, 2022, ISBN: 9789815036404.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	MODELLING TECHNIQUES IN PREDICTIVE ANALYTICS	L	T	P	C
23CA3040		3	0	0	3
Course Objectives:					
Enable the student to:					
1. Interpret the fundamentals of predictive analytics. 2. Apply machine learning techniques for predictive analytics. 3. Choose predictive analysis models for solving problems.					
Course Outcomes:					
The student will be able to:					
1. List the steps involved in predictive analytics and modeling. 2. Apply data cleaning procedures and preprocessing techniques.					

3. Examine association rule mining and descriptive modeling for prediction. 4. Apply Machine learning in predictive analytics. 5. Discover the role of ensembles and text mining methods. 6. Apply predictive modeling for solving real world problems.		
Unit: 1	Overview of Predictive Analytics and Setting up the problem	9 Hours
Difference between analytics and Predictive analytics - Predictive Analytics vs. Business, Statistics and Data Mining - Challenges in Using Predictive Analytics - Predictive Analytics Processing Steps: CRISP-DM - Business Understanding - Defining Data for Predictive Modeling - Defining the Target Variable - Defining Measures of Success for Predictive Models - Doing Predictive Modeling.		
Unit: 2	Data Understanding and Preparation	9 Hours
Single and multiple variable summaries – Data Visualization - Data Preparation: Variable Cleaning – Feature Creation – Measuring of Interesting rules – Problems with Association Rules.		
Unit: 3	Descriptive Modeling and Predictive Modeling	9 Hours
Descriptive Modeling: PCA – Clustering Algorithms – Standard cluster Model Interpretation - Predictive Modeling: Decision Trees – Logistic Regression – Neural Networks – Batch Approach to model assessment.		
Unit: 4	Model Ensembles and Deployment	9 Hours
Motivation of Ensembles – Boosting – Improvements to bagging and boosting – Model ensembles and Occam’s Razor – General Deployment considerations.		
Unit: 5	Application of Predictive Analytics to solve Problem	9 Hours
Case Studies: Survey Analysis – Help Desk.		
Total Lectures		45 Hours
Reference Books		
1.	Dean Abbot, “Applied Predictive Analysis”, Wiley, 2014, ISBN: 9781118727966.	
2.	Eric Siegel, Predictive Analytics, Wiley, Kindle Edition, ASIN: B019HR9X4U.	
3.	Daniel T. Larose, Chantal T. Larose, Data Mining and Predictive Analytics, Wiley, 2015, ISBN: 9781118116197.	
4.	Anasse Bari, Mohamed Chaouchi, Tommy Jung, Predictive Analytics for Dummies, 2nd Edition, Kindle Edition, For Dummies, ASIN: B01LWWNQFK.	
5.	Kjell Johnson, Max Kuhn, Applied Predictive Modeling, Springer, 2016, ISBN: 9781461468486.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	PREDICTIVE ANALYTICS LAB	L	T	P	C
23CA3041		0	0	2	2
Course Objectives:					
Enable the student to: 1. Apply SPSS in business problem. 2. Evaluate and solve the business problems logically. 3. Solve risks and spot opportunities in environment.					
Course Outcomes:					
The student will be able to: 1. Compare various data sets and types 2. Develop applications in advance excel, SPSS and E-views. 3. Differentiate various sets of data with the help of different Statistical software's. 4. Apply appropriate software for analyzing the different set of data. 5. Solve hypothesis for various business problems. 6. Develop analysis techniques.					
LIST OF EXERCISES					
1. Perform Sorting File, Split File, Compute File, Recode File and Select Cases using SPSS.					

2. Perform Chi- Square Test (Parametric and Non-Parametric Test) 3. Analyze Exploratory Factor Analysis. 4. Perform Cluster Analysis. 5. Apply Logistic Regression algorithm. 6. Perform Discriminant Analysis. 7. Apply Confirmatory Factor Analysis. 8. Apply Conjoint Analysis. 9. Execute Time Series analysis. 10. Implement MANOVA. 11. Perform Decision Tree Analysis. 12. Create Survey Analysis.	
Recommended by Board of Studies	04 Aug 2023
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Course Code	INTERNET OF THINGS AND BLOCKCHAIN TECHNOLOGY	L	T	P	C
23CA3042		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire knowledge in IoT and blockchain. 2. Analyze and visualize IoT data. 3. Apply the concept of IoT and bitcoin in real-world scenarios.					
Course Outcomes:					
The student will be able to: 1. Analyze various IoT protocols. 2. summarize the various cloud data analytic services to IoT. 3. Deploy IoT applications and connect to the cloud. 4. summarize the fundamentals of blockchain. 5. Build bitcoin wallets for ecommerce. 6. Analyze the applications of IoT and bitcoin in real-world scenarios.					
Unit: 1	Introduction to IoT and Data Analytics				8 Hours
IoT Devices, networking connectivity protocols, networking data messaging protocols, defining IoT Analytics, IoT analytics challenges, building elastic analytics, elastic analytics concepts, designing for scale, cloud security analytics.					
Unit: 2	Cloud Analytics for IoT				9 Hours
AWS overview, Microsoft Azure overview, ThingWorx overview, AWS cloud formation overview, AWS VPC, designing data processing for analytics, applying big data technology to storage, Apache Spark for data processing.					
Unit: 3	Exploring and Visualizing IoT Data				9 Hours
Tableau overview, Techniques to understand data quality, basic time series analysis, R language, the hierarchy of questions method, designing visual analysis of IoT data, creating a dashboard with Tableau, Creating and Visualizing alerts.					
Unit: 4	Blockchain Fundamentals				10 Hours
Blockchain technology and bitcoin beginnings, need of blockchain and cryptocurrency, evolution, Computer system architecture, Forking and open-source technology, blockchain structure, core concepts of blockchain cryptography, hashing function and merkle tree, Proof of work and consensus in blockchain, benefits of blockchain technology, blockchain and world economy, blockchain earning mechanisms.					
Unit: 5	Bitcoin				9 Hours

Introduction to bitcoin, Solo mining and Pool mining, bitcoin wallets, bitcoin selling buying and exchanges, transition from bitcoin-to-bitcoin cash, dash, Litecoin (LTC), Ethereum, Ripple and Monero, Creating Wallet and Personalized bitcoin address.

Total Lectures **45 Hours**

Reference Books

1. Andrew Minter, "Analytics for the Internet of Things (IoT)", Packt publishing, 2017, ISBN: 9781787120730.
2. Kai Hwang, Min Chen, "Big-Data Analytics for Cloud, IoT and Cognitive Computing", Wiley, 2017, ISBN: 9781119247029.
3. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Venkatraman Ramakrishna, Anthony O'Dowd, "Hands-On Blockchain with Hyperledger" Packt Publishing, 2018, ISBN: 9781788996044.
4. Anshul Kaushik, "Block Chain & Crypto Currencies", Khanna book publishing, 2023, ISBN: 109386173727.

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Course Code	IMAGE PROCESSING AND COMPUTER VISION	L	T	P	C
23CA3043		3	0	0	3

Course Objectives:

Enable the student to:

1. Acquire the fundamental concepts of image processing.
2. Build image processing applications using OpenCV.
3. Apply the concepts of neural networks and augmented reality.

Course Outcomes:

The student will be able to:

1. Summarize the fundamental concepts of image processing.
2. Utilize OpenCV for processing images.
3. Apply image processing techniques in real life situations.
4. Apply image search techniques using OpenCV.
5. Demonstrate object detection and tracking techniques.
6. Summarize the importance of neural networks and Augmented Reality in image processing.

Unit: 1 **Image Processing Concepts** **10 Hours**

Image Processing Concepts: Fundamentals of Image processing - Image Transforms - Image Filtering - Color Image Processing - Image Segmentation - Image Descriptors and Features: Texture Descriptors - Color Features - Edge Detection - Object Boundary and Shape Representations.

Unit: 2 **Image Restoration and Reconstruction** **7 Hours**

Noise Models-Restoration in the Presence of Noise only-Spatial filtering-Periodic Noise Reduction by Frequency Domain filtering-Linear, Position-Invariant Degradation- Estimating the Degradation function-Inverse Filtering-Minimum Mean Square Error Filtering-Geometric Mean Filter-Image Reconstruction from Projections.

Unit: 3 **Image Segmentation** **10 Hours**

Depth Estimation and Segmentation: Creating Modules - Capturing Frames from a DepthCamera - Conversion of Images - Creating a Mask - Modifying the Application - Depth Estimation with a Normal Camera - Foreground Detection - Image Segmentation - Detecting and Recognizing of Faces: Conceptualizing Haar Cascades - Getting Haar Cascade Data - Face Detection using OpenCV - Swapping Faces in the Infrared.

Unit: 4 **Object Detection and Tracking** **9 Hours**

Building Custom Object Detectors: HOG Descriptors - NMS - SVMs - Detecting People with HOG Descriptors - Creating and Training an object Detector - Detecting Cars. Tracking Objects: Detecting Moving Objects with Background Subtraction - Tracking Colorful Objects using MeanShift and CamShift - Finding Trends in Motion using the Kalman Filter.

Unit: 5	Introduction to OpenCV	9 Hours
Introduction to OpenCV - Handling Files, Cameras and GUIs: Basic I/O Scripts - Processing Images with OpenCV: Converting images between different color models - Exploring the Fourier Transform - Creating Modules - Edge Detection - Custom Kernels - Modifying the Application - Edge Detection with Canny - Contour Detection - Detecting Shapes.		
Total Lectures		45 Hours
Reference Books		
1.	Manas Kamal Bhuyan, “Computer Vision and Image Processing, Fundamentals and Applications”, CRC Press, 2019, ISBN: 9780367265731.	
2.	Rafael C. Gonzalez Lez, Richard E. Woods, “Digital Image Processing”, 4 th Edition, Pearson, 2017, ISBN: 9789353062989.	
3.	David A Forsyth, Jean Ponce, “Computer Vision: A Modern Approach”, Pearson Publications, ISBN: 9789332550117.	
4.	S. Jayaraman, S. Esakkirajan, T. Veerakumar, “Digital Image Processing”, McGraw Hill, ISBN: 9789389811926.	
5	Aditya Sharma, Vishwesh Ravi Shrimali, Michael Beyeler, “Machine Learning for OpenCV4”, Packt Publishing, ISBN: 9781789536300.	
Recommended by Board of Studies		04 Aug 2023
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Course Code	MACHINE LEARNING OPERATIONS	L	T	P	C
23CA3044		3	0	0	3

Course Objectives:

Enable the student to:

1. Acquire the knowledge of MLOps and its features.
2. Represent data for different ML model types.
3. Interpret model predictions for stakeholders and ensure models are treating users fairly.

Course Outcomes:

The student will be able to:

1. Interpret the MLOps and the role of ML experts.
2. Identify and mitigate common challenges when training, evaluating and deploying ML models.
3. Discover the risks associated with ML model and provide security solutions.
4. Devise strategies for deployment and monitoring of ML models.
5. Choose the right model type for specific problems.
6. Deploy scalable ML systems that you can retrain and update to reflect new data.

Unit: 1	Introduction to MLOps	Hours 9
Defining MLOps and its challenges – MLOps to mitigate risks – MLOps for scale – People of MLOps : Subject Matter Experts – Data Scientists – Data Engineers – Software Engineers – DevOps – Model Risk Manager/Auditor – Machine Learning Architect.		
Unit: 2	Key MLOps Features	Hours 9
A Primer on Machine Learning – Model Development – Productionalization and Deployment – Monitoring – Iteration and Life Cycle – Governance – Developing Models : What is a Machine Learning Model – Data Exploration – Feature Engineering and Selection – Experimentation – Version Management and Reproducibility - Evaluation and Comparing Models - Preparing for Production – Runtime Environments – Model Risk Evaluation – Quality Assurance for Machine Learning – Reproducibility and Auditability – Machine Learning Security – Model Risk Mitigation.		
Unit: 3	Production and Monitoring	Hours 9
Deploying to Production: CI /CD Pipeline – Building ML Artifacts – Deployment Strategies – Containerization – Scaling Deployments – Requirements and Challenges – Monitoring and Feedback Loop – Scaling Deployments – Requirements and Challenges – Monitoring and Feedback loop – How		

often should models be retrained – Understanding Model degradation – Drift Detection in Practice - The Feedback loop.

Unit: 4	Model Governance	Hours 9

Who decides what Governance the organization needs – Matching Governance with risk level – Current regulations driving MLOps governance – The New Wave of AI – specific regulations – The Emergence of Responsible AI – Key elements of Responsible AI – A Template for MLOPs governance.

Unit: 5	Real - World Examples	Hours 9

MLOps in Practice: Consumer Credit Risk Management – Model Development – Model Bias Considerations - Prepare for Production – Deploy to Production - Marketing Recommendation Engines – The Risk of Recommendation Engines – Data Preparation – Design and Manage Experiments – Model Training and Deployment – Pipeline Structure and Deployment Strategy – Monitoring and Feedback - Consumption Forecast – Power Systems - Data Collection – Problem Definition : Machine Learning or not Machine Learning – Spatial and Temporal Resolution – Implementation – Modeling – Deployment - Monitoring

Total Lectures	45 Hours

Reference Books

1.	Mark Treveil & the Dataiku Team, “Introducing MLOps”, O’Reilly, 1 st Edition, 2020, ISBN: 9781492083290.
2.	Noah Gift & Alfredo Deza, “Practical MLOps: Operationalizing Machine Learning Models”, 1 st Edition, 2021, O’Reilly, ISBN: 9781098103019.
3.	Mark Treveil, Nicolas Omont, Clement Stenac, “Introducing MLOps”, O’Reilly, 1 st Edition, 2020, ISBN :9781492083290.
4.	Valliappa Lakshmanan, Sara Robinson, Michael Munn, “Machine Learning Design Patterns”, O’Reilly, 2020, ISBN: 9789385889219.
5.	Emmanuel Raj, “Engineering MLOps”, Packt Publishing Limited, 2021, ISBN: 978800562882.

Recommended by Board of Studies	04 Aug 2023

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Course Code	MACHINE LEARNING OPERATIONS LAB	L	T	P	C
23CA3045		0	0	2	2
Course Objectives:					
Enable the student to: 1. Examine the basics and techniques of MLOps tools. 2. Infer cloud environment for solving practical problems. 3. Visualize ML optimization.					
Course Outcomes:					
The student will be able to: 1. Simulate and configure ML environment. 2. Develop mlops related applications for real – world scenario. 3. Administer Cloud shell management. 4. Test mlops interoperability. 5. Illustrate automl. 6. Solve Math concepts using ML.					
LIST OF EXCERCISES					
1. Configuring and setting up the Python environment. 2. MLOps infrastructure and tooling. 3. Accessing, editing, training and testing a Dataset. 4. Configuring Cloud Shell Management. 5. Deploying AutoML system. 6. Perform Hyper parameter tuning. 7. Data Labelling. 8. Web deployment.					

9. Text/Paragraph recognition.
10. Testing and Integration.
11. Descriptive Statistics using ML.
12. ML optimization.

Course Code	DEEP LEARNING TECHNIQUES	L	T	P	C
23CA3046		3	0	0	3
Course Objectives:					
Enable the student to:					
1. Examine the foundations of neural networks.					
2. Build applications using different types of deep neural networks.					
3. Create deep learning applications in cloud and mobile.					
Course Outcomes:					
The student will be able to:					
1. Summarize the fundamental concepts of neural networks.					
2. Illustrate the concepts of convolutional neural networks.					
3. Create generative adversarial networks.					
4. Apply recurrent neural networks for solving applications.					
5. Demonstrate the applications of reinforcement learning.					
6. Application of deep learning in cloud and mobile applications.					
Unit: 1	Image Processing Concepts				10 Hours
Neural network Foundations with TensorFlow 2.0: TensorFlow - Keras - Introduction to Neural Networks - Perceptron - Multilayer Perceptron - Regularization - Sentiment Analysis - Hyperparameter Tuning and AutoML - Predicting output - Practical Overview of Back Propagation - Towards a Deep Learning Approach. TensorFlow : TensorFlow 1.x - TensorFlow 2.x - Keras - Regression : What is Regression? - Prediction using Linear Regression - TensorFlow Estimators - Classification Tasks and Decision Boundaries - Logistic Regression.					
Unit: 2	Convolution Neural Network				7 Hours
Convolutional Neural Networks: Deep Convolutional Neural Networks - Very Deep Convolutional Neural Networks for Large-scale Image Recognition - Advanced Convolutional Neural Networks: Computer Vision - Deep Inception-v3 Net used for Transfer Learning - Transfer Learning for Classification of Horses and Humans - Application Zoos with tf.keras and TensorFlow Hub - Other CNN Architectures - Classifying Videos with Pre-trained nets - Using a CNN for Sentiment Analysis - CNNs for Audio and Music - Convolution Operations - Capsule Networks.					
Unit: 3	Generative Adversarial Network				10 Hours
Generative Adversarial Networks: What is a GAN? - Deep Convolutional GAN - GAN Architectures - Word Embeddings: Origins and Fundamentals - Distributed Representations - Static Embeddings - Creating and Exploring Embedding Space - Using Word Embeddings for Spam Detection - Neural Embeddings - Character and Subword Embeddings - Dynamic Embeddings - Sentence and Paragraph Embeddings - Language Model Based Embeddings.					
Unit: 4	Recurrent Neural Network				9 Hours
Recurrent Neural Networks: The Basic RNN Cell - RNN Cell Variants - RNN Variants - RNN Topologies - Encoder-Decoder Architecture - Attention Mechanism - Transformer Architecture. AutoEncoders : Introduction - Vanilla Autoencoders - Sparse Autoencoder - Denoising Autoencoder - Stacked Autoencoder.					
Unit: 5	Reinforcement Learning				9 Hours
Reinforcement Learning: Introduction - OpenAI Gym - Deep Q-Networks - Deep Deterministic Policy Gradient. TensorFlow and Cloud: Deep Learning on Cloud - Virtual Machines on Cloud - Jupyter Notebooks on Cloud.					
Total Lectures					45 Hours

Reference Books	
1.	Antonio Gulli, Sujit Pal, “Deep Learning with TensorFlow2 and Keras”, Packt Publishing, ASIN: B082MBMFVF.
2.	Pramod Singh, Avinash Manure, “Learn TensorFlow 2.0”, Apress, ISBN: 9781484255605.
3.	Dan Van Boxel, “Hands-on Deep Learning with TensorFlow”, Packt Publishing, ISBN: 978787282773.
4.	Sudharson Ravichandiran, “Hands on Deep Learning Algorithms with Python”, Packt Publishing, ASIN: B07LH43V8P.
5	S. Lovelyn Rose, L. Ashok Kumar, D. Karthika Renuka, “Deep Learning using Python”, Wiley, ISBN: 9788126579914.
Recommended by Board of Studies	
04 Aug 2023	
Approved by Academic Council	
25 Aug 2023	

Course Code	DEEP LEARNING TECHNIQUES LAB	L	T	P	C
23CA3047		0	0	2	2
Course Objectives:					
Enable the student to: 1. Acquire skills in creating applications using neural networks. 2. Build applications using different types of deep neural networks. 3. Create deep learning applications in cloud and mobile.					
Course Outcomes:					
The student will be able to: 1. Summarize the fundamental concepts of neural networks. 2. Illustrate the concepts of convolutional neural networks. 3. Explore generative adversarial networks. 4. Apply recurrent neural networks for solving applications. 5. Demonstrate the applications of reinforcement learning. 6. Create application of deep learning in cloud and mobile applications.					
LIST OF EXERCISES					
1. Prediction of House Price using Linear Regression. 2. Classification of Handwritten Digits using Logistic Regression. 3. DCNN : LeNet. 4. Recognizing CIFAR-10 Images with Deep Learning. 5. Classifying Fashion-MNIST with tf.keras - estimator Model. 6. Sentiment Analysis using CNN. 7. Recognizing Cats with very deep Convolutional Neural Networks. 8. Classification of Horses and Humans using Transfer Learning. 9. Classification of Handwritten Digits using Deep Convolutional GAN. 10. Generation of Text. 11. Reconstruction of Handwritten Digits using Autoencoder. 12. Perform Object Detection.					
Recommended by Board of Studies		04 Aug 2023			
Approved by Academic Council		25 Aug 2023			

Course Code	ROBOTIC PROCESS AUTOMATION	L	T	P	C
23CA3048		3	0	0	3
Course Objectives:					
Enable the student to: 1. Acquire the foundation of Robotic Process Automation. 2. Classify the different paradigms used in RPA.					

3. Acquire the knowledge in ROS and UiPath.		
Course Outcomes:		
The student will be able to: 1. Summarize the techniques used in RPA. 2. Understand the software's that used to implement RPA. 3. Acquire knowledge about different technology used in AI Robotics. 4. Learn the methodology used in AI Robotics. 5. Navigate and Manipulate data. 6. Summarize data manipulation Techniques.		
Unit: 1	Introduction	8 Hours
History, Present status and future trends – Robot Kinematics and Dynamics – Functions of drive systems – pump classification – Introduction to pneumatic systems – DC motors, AC motors and transfer functions – Actuators – Grippers – Types of Sensors – Robot Vision Systems.		
Unit: 2	AI Robotics	8 Hours
Robot Languages – Classification of Robot Languages – Computer Control and Robot Software – VAL System and Language – Flexible automation technology – The Hierarchical paradigm – The Reactive Paradigm: Attributes – Subsumption Architecture – Potential Field Methodologies – Behaviors as objects in OOP –Assemblages of Behaviors.		
Unit: 3	Navigation and Metric path Planning	8 Hours
Topological path planning – Case study of Topological Navigation with a Hybrid Architecture – Cspace Representations – Graph Based Planners – Wave front Based Planners		
Unit: 4	Robotic Process Automation	8 Hours
Techniques of automation – Robotic process automation: Components of RPA – RPA platforms – UiPath – UiPath stack – Uipath Studio – Task recorder – Step-by-Step examples using the recorder – Sequencing the work flow: activities – control flow, various types of loops and decision making – Step-by-step example using sequence and flowchart - Step-by-step example using sequence and control flow.		
Unit: 5	Data Manipulation and control of the controls	8 Hours
Variables and scope – Arguments – Data table usage with examples – Finding and attaching windows – Finding the control – Techniques for waiting for a control – Act on controls: mouse and keyboard activities - Working with UiExplore – Handling events – Revisit recorder – Screen Scraping – Avoiding typical failure points		
Total Lectures		45 Hours
Reference Books		

1.	Alok Mani Tripathi, “Learning Robotic Process Automation” Packt Publishing, 2018, ISBN:9781788470940.	
2.	S.R. Deb, “Robotics Technology and Flexible Automation”, Tata McGraw Hill, 2013, ISBN: 9780070077911.	
3.	Lentin Joseph, “Mastering ROS for Robotics Programming”, Packt Publishing, 2015, ISBN: 9781783551798.	
4.	Ted Dunning Ellen Friedman, “Practical Machine Learning - A new look at Anomaly Detection”, O’Reilly, 2014, ISBN: 9781491911600.	
5	Trevor H, Robert T, Jerome Friedman, “The Elements of Statistical Learning”, Springer Series, 2017, ISBN: 9780387848570.	
Recommended by Board of Studies		04 Aug 2023
Approved by Academic Council		25 Aug 2023

Course Code	ROBOTICS PROCESS AUTOMATION LAB	L	T	P	C
23CA3049		0	0	2	2
Course Objectives:					
Enable the student to: 1. Acquire the knowledge of simulation. 2. packages that support automation process. 3. Classify the concepts of ROS and UiPath.					
Course Outcomes:					
The student will be able to: 1. Improve the knowledge about manipulating data in memory. 2. Handling various controls. 3. Creating and managing events. 4. Applying simulation and 3D Vision. 5. Constructing a robot model. 6. Understanding the methods of formulating the problems.					
LIST OF EXCERCISES					
1. Apply techniques to use memory with variables and use data tables to store and manipulate data in memory. 2. Create a clipboard and manage the activities of a clip board. 3. Apply techniques for waiting for a control (element vanish, image vanish and wait attribute), Mouse activity and keyboard activities. 4. Handling user events and assistant bots. 5. Apply exception handling, debugging and logging. 6. Implement robot modeling with URDF. 7. Simulate the robotic arm using ROS. 8. Adding Sensors into a Gazebo simulation. 9. Apply ROS moveIt. 10. Create a robot model for the differential drive mobile robot. 11. Add a 3D vision sensor to Gazebo. 12. Simulating a differential wheeled robot in Gazebo.					
Recommended by Board of Studies					04 Aug 2023
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Course Code	NATURAL LANGUAGE PROCESSING	L	T	P	C

23CA3050		3	0	0	3
Course Objectives:					
Enable the student to:					
1. Perform Regular Expressions and N-gram Language Models.					
2. Familiarize on Vector Semantics, Sequence Labeling, Machine Translation and Constituency Grammars.					
3. Acquire knowledge in parsing, logical representation and word senses.					
Course Outcomes:					
The student will be able to:					
1. Understand about regular expressions.					
2. Develop N-gram language models.					
3. Acquire knowledge about vector semantics.					
4. Summarize about sequence Labeling and machine translation.					
5. Demonstrate about parsing techniques.					
6. Illustrate about logical representation and word senses.					
Unit: 1	Introduction to NLP				10 Hours
NLP in the real world - Machine Learning, Deep Learning and NLP - An Overview – Approaches to NLP – Data acquisition - Text Extraction and Cleanup- Preprocessing – Feature Engineering – Modeling – Evaluation – Post Modeling Phases.					
Unit: 2	Text Processing				7 Hours
Text representation: Vector Space Model - Basic Vectorization Approaches - Distributed Representation - Universal Text Representation - Text classification: A pipeline for building Text classification systems - Using Neural embeddings in Text Classification - Deep Learning for Text classification - Interpreting Text classification models.					
Unit: 3	Machine Translation and Constituency Grammars				10 Hours
Machine Translation and Encoder-Decoder Models - Language Divergences and Typology - The Encoder - Decoder Model – Encoder - Decoder with RNNs - Attention - Beam Search - Encoder - Decoder with Transformers - Some practical details on building MT systems - MT Evaluation - Bias and Ethical Issues - Constituency Grammars - Constituency - Context-Free Grammars - Some Grammar Rules for English Treebanks - Grammar Equivalence and Normal Form - Lexicalized Grammars.					
Unit: 4	Constituency Parsing and Dependency Parsing				9 Hours
Constituency Parsing - Ambiguity - CKY Parsing: A Dynamic Programming Approach - Span-Based Neural Constituency Parsing - Evaluating Parsers - Partial Parsing - CCG Parsing - Dependency Parsing - Dependency Relations - Dependency Formalisms - Dependency Treebanks - Transition-Based Dependency Parsing - Graph-Based Dependency Parsing - Evaluation.					
Unit: 5	Word Senses and Semantic Roles				9 Hours
Word Senses and WordNet - Word Senses - Relations Between Senses - WordNet: A Database of Lexical Relations - Word Sense Disambiguation - Alternate WSD algorithms and Tasks - Using Thesauruses to Improve Embeddings - Word Sense Induction - Semantic Role Labeling - Semantic Roles - Diathesis Alternations - Semantic Roles: Problems with Thematic Roles - The Proposition Bank - FrameNet - Semantic Role Labeling - Selectional Restrictions - Primitive Decomposition of Predicates.					
Total Lectures					45 Hours
Reference Books					
1.	Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana, “Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems”, 2020, ISBN:9781492054023.				
2.	Daniel, Jurafsky, James H. Martin, “Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson, 2020, ISBN: 9780131873216.				

3.	Honson Lane, Hannes Hapke, Cole Howard, “Natural Language Processing in Action: Understanding, analyzing, and generating text with Python”, Manning Publications, 2019, ISBN: 9781617294631.
4.	Sohom Ghosh, Dwight Gunning, “Natural Language Processing Fundamentals: Build intelligent applications that can interpret the human language to deliver impactful results”, Packt Publishing Limited, 2013, ISBN: 9781789954043.
5	Delip Rao, Brian McMahan, “Natural Language Processing with PyTorch: Build Intelligent Language Applications Using Deep Learning”, O’Reilly Media, 2013, ISBN: 978-1491978238.
Recommended by Board of Studies	
04 Aug 2023	
Approved by Academic Council	
25 Aug 2023	

**DEPARTMENT OF
DIGITAL SCIENCES**

LIST OF NEW COURSES

S. No.	Course Code	Course Title	Credits [L:T:P:C]
1	22CA2001	Web Analytics	3:0:0:3
2	22CA2002	IoT Analytics	3:0:0:3
3	22CA2003	Software Engineering and Testing	3:0:0:3
4	22CA2004	Mobile Application Development	3:0:0:3
5	22CA2005	Mobile Application Development Lab	0:0:2:2
6	22CA2006	Deep Learning and Computer Vision	3:0:0:3
7	22CA2007	Healthcare Analytics	3:0:0:3
8	22CA2008	Web Development	3:0:0:3
9	22CA2009	Web Development Lab	0:0:2:2
10	22CA2010	Emerging Technologies in Computing	3:0:0:3
11	22CA2011	System Administration	3:0:0:3
12	22CA2012	System Administration Lab	0:0:2:2
13	22CA2013	Block Chain Technology	3:0:0:3
14	22CA2014	Artificial Intelligence for Security	3:0:0:3
15	22CA2015	Mobile Hacking	3:0:0:3
16	22CA2016	Web Application Security	3:0:0:3
17	22CA2017	Web Application Security Lab	0:0:2:2
18	22CA2018	Entrepreneurship	3:0:0:3
19	22CA2019	Web Development and Analytics	3:0:0:3
20	22CA2020	Sustainable Water Management using Artificial Intelligence	3:0:0:3
21	22CA2021	Project Preparation and Documentation	2:1:0:3
22	22CA3001	Cyber Security Investigation Trends	3:0:0:3
23	22CA3002	Research Methodology and Documentation	3:0:0:3
24	22CA3003	Docker Deep Dive	3:0:0:3
25	22CA3004	Deep Learning in Cyber Security	3:0:0:3

List of Revised Courses

Sl. No.	Course Code	Course Title	Credits [L: T:P:C]
1	22CA2022	Security Investigation and Report Writing	3:0:0:3
2	22CA2023	Preserving and Recovering Digital Evidence	3:0:0:3
3	22CA2024	Trust Management in E-commerce	3:0:0:3
4	22CA3005	Intellectual Property Rights	3:0:0:3

22CA2001	Web Analytics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the basics of web analytics.
2. To explore the idea of learning about users.
3. To analyze how users navigate between pages.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate the basics of web analytics.
2. summarize about web analytics approach.
3. apply web analytics in traffic.
4. analyze the page movement.
5. construct web segmentation.
6. develop pairing analytics.

Unit I: Introduction to Web Analytics

(7 Hours)

Introduction- What is Web Analytics? - User Experience and Web Analytics Questions - Web Analytics and User Experience: A Perfect Fit - Google Analytics - Web Analytics Approach -Introduction - Get to know your Website - A Model of Analysis - Showing your work - Context Matters -Sometimes the Data Contradict you.

Unit II: How web analytics works
(8 Hours)

How Web Analytics Works - Introduction - Log File Analysis - Page Tagging - Metrics and Dimensions
 Interacting with Data in Google Analytics – Goals – Introduction - What Are Goals and Conversions? -
 Conversion Rate - Goal Reports in Google Analytics - When Do You Use These Reports? - Finding The
 Right Things to Measure as Key Performance Indicators -What Can You Measure on A Website That Can
 Constitute a Goal? - Going Beyond the Website -Tying It Together.

Unit III: Learning about users through Web Analytics
(10 Hours)

Learning about Users -Introduction - Visitor Analysis - Traffic Analysis: Learning How Users Got to Your
 Website- Introduction - Source and Medium (Dimensions) - Organic Search -Search Query Analysis -
 Referral Traffic - Direct Traffic - Paid Search Keywords.

Unit IV: Analyzing How People Use Your Content
(10 Hours)

Analyzing How People use your Content – Introduction -Website Content Reports – Click -Path Analysis -
 Introduction - Focus on Relationships Between Pages - Navigation Summary - “Visitors Flow” Report -
 Analyzing how users move from one page type to another.

Unit V: Segmentation and Pairing Analytics
(10 Hours)

Segmentation- Introduction - Why Segment Data? -How to Segment Data - What are the Ways You Can
 Segment Data? - Useful Ways to Segment for UX Questions - The Tip of The Iceberg - Pairing Analytics
 Data with UX Methods -Introduction - Personas - Usability Testing -Usability Inspection – Design
 Objectives.

Text Book:

Michael Beasley, “Practical Web Analytics for User Experience”, Elsevier, 2013, ISBN: 9780124046948.

Reference Books:

1. Avinash Kaushik, “Web Analytics 2.0”, Wiley, 2010, ISBN: 9780470529393.
2. Eric T. Peterson, “Web Analytics Demystified”, Celilo Group Media and CafePress, 2004, ISBN: 0974358428
3. Brain Clifton,” Advanced Web Metrics with Google Analytics”, Wiley, 2010, ISBN: 9780470562314.
4. Brent Dykes, “Web Analytics Action Hero”, Peachpit, 2012, ISBN:9780132837941.
5. Jason Burby & Shane Atchison, “Actionable Web Analytics”, Wiley, 2007, ISBN:9780470124741.
6. Anteneh Ayanso, Kaveepan Lertwachara, “Harnessing the Power of Social Media and Web Analytics”, IGI Global, 2014, ISBN: 9781466651944.

22CA2002	IoT Analytics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the challenges of IoT data.
2. To familiarize about network protocol strategies.
3. To explore data science for IoT analytics.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the basics about IoT analytics.
2. illustrate about network protocols.
3. infer about IoT analytics for the cloud.
4. explore on AWS cloud.
5. design visual analysis for IoT data.
6. explore data science for IoT analytics.

Unit I: IoT analytics and Networking
(7 Hours)

Defining IoT Analytics- IoT analytics challenges- IoT devices- Networking basics- IoT networking
 connectivity protocols- IoT networking data messaging protocols.

Unit II: Data messaging protocols
(8 Hours)

Message Queue Telemetry Transport-Hyper Text Transport Protocol- Constrained Application Protocol-
 Data Distribution Services.

Unit III: IoT Analytics for the cloud
(10 Hours)

Building elastic analytics- Elastic analytics concepts-Designing for scale- cloud security and analytics- AWS
 Overview-Creating an AWS Cloud Analytics Environment.

Unit IV: Creating an AWS
(10 Hours)

The AWS CloudFormation overview-The AWS Virtual Private Cloud (VPC) set up walk-through-Designing data processing for analytics-Applying big data technology to storage-Apache spark for data processing.

Unit V: Data Science for IoT Analytics

(10 Hours)

Exploring and visualizing data- Adding internal and external data-Designing visual analysis for IoT data- Creating a dashboard with Tableau-Creating and visualizing alerts. Machine Learning- Feature Engineering with IoT data- validation methods- understanding the bias-variance tradeoff-Comparing different modules to find the best fit using R- Random Forest modules- Gradient Boosting Machines –Anomaly detection- Forecasting using ARIMA- Deep learning.

Text Book:

Andrew Minter, “Analytics for the Internet of Things”, Packt Publishing Ltd, 2017, ISBN: 9781787120730.

Reference Books:

1. Geng, Hwaiyu, “Internet of Things and Data Analytics Handbook”, Wiley Publication, 2017, ISBN: 9781119173649.
2. Pethuru Raj Anupama C. Raman, “The Internet of Things Enabling Technologies, Platforms, and Use Cases”, Taylor & Francis Group, 2017, ISBN: 9781498761284.
3. Mohammad Abdur Razzaque, Md. Rezaul Karim, “Hands-on Deep Learning for IoT”, Packt Publishing, 2019, ASIN: B07TP7ZRC7.
4. Amita Kapoor, “Hands-on Artificial Intelligence for IoT”, Packt Publishing, 2019, ISBN: 9781788836067.
5. Brian Russell, Drew Van Duren, “Practical Internet of Things Security: Design a security for Internet connected ecosystem”, 2nd edition, Packt Publishing, 2018, ISBN-13: 9781788625821.
6. Harry G. Perros, “An Introduction to IoT Analytics”, CRC Press, 2021, ISBN:9780367687823.

22CA2003	Software Engineering and Testing	L	T	P	C
		3	0	0	3

Course Objectives:

1. To illustrate the methodology of software analysis and planning.
2. To identify suitable methods to develop a software application.
3. To test the software project and validate its readiness for usage.

Course Outcomes:

By learning the course, the students will be able to

1. define software development life cycle for a project.
2. analyze the requirements and preparing a software requirements specification document.
3. apply appropriate design principles to Software project development and check its feasibility.
4. apply principles and guidelines in programming the software.
5. testing the software before the release.
6. develop software engineering process steps on a real-time application.

Unit I: Introduction to Software Process

(7 Hours)

Introduction - Software Processes: Desired characteristics of software process - software development process models. An agile view of process: Agile process models.

Unit II: Software Requirement Analysis

(12 Hours)

Software requirements analysis and specifications: Requirement Process, Requirements Specification, Functional Specification with Use Cases, Validation and other approaches. Software Architecture: Role – Architecture Views – Documenting Architecture Design. Planning a Software project: Project Schedule and Staffing, Risk Management and Project Monitoring Plan.

Unit III: Software Design

(8 Hours)

Design: Concepts - Function Oriented Design – Object Oriented Design – Conducting Component-level Design – User Interface Analysis and Design - Webapp Design – Software Quality – Review Techniques and Metrics.

Unit IV: Coding Principles

(8 Hours)

Coding and Unit Testing: Programming Principles and Guidelines - Incrementally Developing Code - Managing Evolving Code - Unit Testing - Code Inspection – Metrics.

Unit V: Testing

(10 Hours)

Testing: Testing Concepts - Testing Process - Verification and Validation - Black-Box Testing - White-Box Testing – Other types of testing – The art of debugging – Usability tests – Security Testing.

Text Book:

1. Pankaj Jalote, “Software Engineering: A Precise Approach”, Wiley India Pvt. Ltd, 3rd Edition, 2010, ISBN: 9788126523115.
2. Roger S. Pressman and Bruce R. Maxim, “Software Engineering, a Practitioner’s Approach”, Tata McGraw Hill Publication, 8th Edition, ISBN: 9780078022128.

Reference Books:

1. Shari Lawrence Pfleeger, Joanne M. Atlee, “Software Engineering, Theory and Practice”, Pearson Education, 2009, ISBN: 9780136061694.
2. Kassem A Saleh, “Software Engineering”, 2009 Edition, J Ross Publishing, ISBN: 1932159940.
3. Ian Sommerville, “Software Engineering”, Pearson, 2017, ISBN: 9332582696.
4. Pankaj Jalote, “An Integrated Approach to Software Engineering”, 2005, ISBN: 8173197024.
5. S. Thangasamy, “Essentials of Software Engineering”, Wiley, 2012, ISBN: 9788126520060.

22CA2004	Mobile Application Development	L	T	P	C
		3	0	0	3

Course Objectives:

1. To outline the platforms, tools for developing mobile applications.
2. To create user interface with flutter.
3. To develop fully featured apps.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the basics on dart.
2. explore the object-oriented concepts in dart.
3. design a user interface using flutter.
4. build themes and animation in flutter.
5. create firebase plugins.
6. create apps with sqLite database.

Unit I: Introduction to Dart

(10 hours)

Getting started with Dart: The evolution of Dart-How Dart works- Hands-on Dart-Understanding why flutter uses Dart-Introducing the structure of the Dart Language- Dart Operators-Dart data types and variables-Control flows and loops- functions-Data structures, collections and generics.

Unit II: OOps concept in Dart

(10 Hours)

Dart OOps Features: Object and classes-Encapsulation-Inheritance and composition-Abstraction-Polymorphism- Intermediate Dart Programming: Dart classes and constructors- The enum type- The cascade notation-constructors-Named constructors- Factory constructors-Field accessors-static fields and methods-class inheritance-abstract classes interfaces-dart libraries and packages.

Unit III: Creating User Interface with flutter

(10 Hours)

Comparisons with other mobile app development frameworks- differences between existing frameworks-flutter compilation and rendering- widgets-Hello Flutter-Building layouts in flutter-Built- In Widgets-Understanding built-in layout widgets-Creating a UI with widgets-Creating custom widget.

Unit IV: Handling user Input and Navigations

(7 Hours)

Handling User Input and Gestures: Pointers, Gestures-Input Widgets-Validating input forms-Custom input and form field-Theme widgets- Navigating between screens: Navigator-Overlay-Route-Named routes-screen transitions-Hero animations.

Unit V: Developing Fully Featured Apps

(8 Hours)

Firebase Plugins: Firebase overview-firebase authentication-NoSQL database with cloud Firestore-Cloud storage with firebase storage-Ads with Firebase Admob-ML with Firebase ML Kit, SQLite Database.

Text Book:

Alessandro Biessek, “Flutter for Beginners”, Packt Publishers, 2019, ISBN: 978178899608.

Reference Books:

1. Marco L. Napoli, “Beginning Flutter A Hands-on Guide to App Development”, Wrox, 2020, ISBN: 9781119550822.
2. Jakob Iversen, Michael Eierman, “Learning Mobile App Development A Hands-on Guide to Building Apps with IOS and Android”, Addison Wesley, 2014, 9780321947864.
3. Rap Payne, “Beginning App Development with Flutter: Create Cross – Platform Mobile Apps”, Apress, ISBN: 9781484251805.

- Thomas Bailey, “Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter 2.5 and Dart”, Packt Publishers, 2019, ISBN: 9781800565999.

22CA2005	Mobile Application Development Lab	L	T	P	C
		0	0	2	2

Course Objectives:

- To know the platforms, tools for developing mobile applications.
- To demonstrate the application lifecycle, configuration and the widgets.
- To create and manage android applications.

Course Outcomes:

By learning the course, the students will be able to

- list the required Graphical User Interface components for a real time applications.
- design the application using various layouts.
- identify the advanced widgets for creating themes.
- build themes and animation in flutter.
- create firebase plugins.
- create apps with SQLite database.

List of exercises

- Design a program to create a class and object using dart.
- Create a simple application to display a toast message.
- Create a container widget to display the container with different colors.
- Create application to get input from the user and display the text when a button is clicked.
- Develop an application to create a form and validate the widgets.
- Navigation and routing.
- Create a media player.
- Create a card that contain content and actions.
- Write a program to read and write in firebase.
- Animation.
- Create a nosql database.
- Using SQLite in flutter.

22CA2006	Deep Learning and Computer Vision	L	T	P	C
		3	0	0	3

Course Objectives:

- To summarize the fundamentals of deep learning.
- To model solutions using Deep Learning algorithms.
- To develop Computer Vision applications using Deep Learning Frameworks.

Course Outcomes:

By learning the course, the students will be able to

- distinguish between machine learning and deep learning.
- prepare datasets for analysis.
- apply Convolutional Neural Networks for problem-solving.
- experiment faster R-CNN with Computer Vision Problems.
- illustrate object detection using Convolutional Neural Networks.
- analyze case studies of applying deep learning for solving computer vision problems.

Unit I: Introduction to Deep Learning
(5 Hours)

Introduction to Machine Learning: Diving into the ML Ecosystem – Training ML Algorithms from Data – Introducing Deep Learning – Importance of Deep Learning – Introduction to Deep Learning Frameworks: Introduction to Colaboratory – Introduction and Setup of Tensor Flow – Introduction and Setup of Keras – Introduction to PyTorch – Introduction to Dopamine – Other Deep Learning Libraries – Training Networks using Multiple GPUs.

Unit II Dataset Preparation
(10 Hours)

Dataset Preparation: The ImageNet Dataset – Obtaining ImageNet – Preparing the Dataset: Understanding the File Structure – Building the Dataset.

Unit III: Working with CNN Architectures
(10 Hours)

Implementing AlexNet on ImageNet: Training AlexNet – Evaluating AlexNet – AlexNet Experiments – Training VGGNet on ImageNet: Implement VGGNet – Training VGGNet – Evaluating VGGNet – VGGNet Experiments – Training GoogleNet on ImageNet: Understanding GoogleNet – Evaluating GoogleNet – GoogleNet Experiments – Training ResNet on ImageNet: – Understanding ResNet – Implementing ResNet – Training ResNet – Evaluating ResNet – ResNet Experiments.

Unit IV: Faster R-CNN Architectures

(10 Hours)

Faster R-CNNs: Object Detection and Deep Learning – The faster R-CNN Architecture – Training a Faster R-CNN: – Introducing the Dataset – Installing TensorFlow Object Detection API – Training Faster R-CNN – Single Shot Detectors: Architecture – Multibox, Priors, and Fixed Priors – Training Methods – Training SSD on the Vehicle Dataset.

Unit V: Case Studies

(7 Hours)

Emotion Recognition: Facial Expression Recognition – Implementing a VGG-like Network – Training the Facial Expression Recognizer – Evaluating the Facial Expression Recognizer – Emotion Detection in Real Time – Vehicle Identification: Dataset Description – Fine-tuning VGG on the Dataset – Evaluating the Vehicle Classifier – Visualizing Results.

Text Books:

1. Dr. Pablo Rivas, “Deep Learning for Beginners”, Packt, 2020, ISBN: 9781838640859.
2. Dr. Adrian Rosebrock, “Deep Learning for Computer Vision with Python”, PyImageSearch, 1st Edition, 2017, ISBN: 9781722487836.

Reference Books:

1. Magnus Ekman, “Learning Deep Learning: Theory and Practice of Neural Networks, Computer Vision, Natural Language Processing, and Transformers Using TensorFlow”, Addison Wesley Professional, First Edition, 2021, ISBN: 978-0137470358.
2. Srinivasan, Computer Vision and Image Processing in the Deep Learning Era, IGI Global, 2022, ISBN: 9781799888925.
3. Mahmoud Hasaballah, Ali Ismail Awad, “Deep Learning in Computer Vision – Principles and Applications”, CRC Press, ISBN: 9781032242859.
4. Nikhil Singh, “Fundamentals of Deep Learning and Computer Vision: A Complete Guide to become an Expert in Deep Learning and Computer Vision”, BPB Publications, 2020, ISBN: 978-9388511858.
5. Rajalingappaa Shanmugamani, “Deep Learning for Computer Vision”, Packt, 2018, ISBN: 9781788295628.
6. Vaibhav Verdhnan, “Computer Vision using Deep Learning”, Apress, 2021, ISBN: 978-1484266151.

22CA2007	Healthcare Analytics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the basics of analytics.
2. To demonstrate analytical skills in identifying problems and improving the performance of healthcare organizations.
3. To build useful applications using analytics in healthcare.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate the basics of healthcare and the supporting technologies.
2. summarize about big data, predictive modeling and decision models.
3. apply use of analytics in healthcare organizations.
4. develop solutions for improving the performance metrics in health analytics.
5. select algorithms that best suits the medical decision making.
6. develop applications with the vision of future in healthcare.

Unit I: Introduction to disruptive technologies

(7 Hours)

Disruptive Technologies, Hadoop, the Cloud, and Modern Data Platforms, creating a Data-Driven Healthcare Organization, Applying “Big Data” to Change Healthcare, Making Data Consumable, Data Privacy and Confidentiality.

Unit II: Predictive Modeling

(8 Hours)

Big Data, Predictive Modeling, and Collaboration, Big Data, Decision Models, Predictive Modeling, Information Sharing beyond Organizational Walls, Interorganizational Collaboration, Health Information Exchange

Unit III: Analytics in Healthcare organizations

(10 Hours)

Analytics in Healthcare organizations, Analytical Challenges, The Value of Analytics in Healthcare, Types of Data in Healthcare Organizations, Understanding and Managing Data, Analytical Tools, Analyzing Data, Statistical Analysis in Health Analytics, Applying Analytics in Performance Improvement, Case Study.

Unit IV: Future of Healthcare

(10 Hours)

Future of Healthcare- Shifting from Volume to Value, Evidence-Based Medicine, Personalized Medicine, Vision of the Future, Connected Medicine, Medication Adherence, Accessible Diagnostic Tests, Smart Implantables, Digital Health and Therapeutics, Education, Incentivized Wellness AI, Virtual and Augmented Reality, Blockchain, Robots, Smart Places.

Unit V: Case Studies

(10 Hours)

Case Studies-AI for Imaging of Diabetic Foot Concerns and Prioritization of Referral for Improvements in Morbidity and Mortality, Outcomes of a Digitally Delivered, Low-Carbohydrate, Type 2 Diabetes Self-Management Program: 1-Year Results of a Single-Arm Longitudinal Study, Biomedical Analytics and Morphoproteomics: An Integrative Approach for Medical Decision Making for Recurrent or Refractory Cancers, Improving Learning Outcomes For Junior Doctors Through the Novel Use of Augmented and Virtual Reality, Big Data, Big Impact, Big Ethics: Diagnosing Disease Risk from Patient Data.

Text Book:

Arjun Panesar, “Machine Learning and AI for Healthcare: Big Data for Improved Health Outcomes”, Apress, 2019, ISBN: 9781484237991.

Reference Books:

1. Laura B. Madsen, “Data-Driven Healthcare: How Analytics and BI are Transforming the Industry”, Wiley, 2014, ISBN: 9781118772218.
2. Eve K Lee, “Healthcare Analytics: From Data to Knowledge to Healthcare Improvement”. Wiley, 2016, ISBN: 9781119374664.
3. James R. Langabeer, “Performance Improvement in Hospitals and Health Systems: Managing Analytics and Quality in Healthcare, 2nd Edition. United Kingdom: Taylor & Francis, 2018, ISBN: 9781138296404, 1138296406.

22CA2008	Web Development	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize web application development procedures.
2. To impart servlet technology for writing business logic.
3. To create text-based format using JSON.

Course Outcomes:

At the end of the course, the student should be able to:

1. summarize about client-server communication and protocols used during communication.
2. design simple web pages using markup languages like HTML and XHTML.
3. develop web pages using XML/XSLT.
4. design web pages using Cascading Style Sheets.
5. make use of java script, JSON.
6. develop the server-side programming using servlets.

Unit I: Web Site Basics and HTML

(9 Hours)

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols –The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: An Introduction to HTML History and Versions – Some Fundamental HTML elements - Lists-tables-Frames-Forms-Relative URLs – XHTML - Basic XHTML Syntax and Semantics.

Unit II: Cascading Style Sheets, XML And XSL

(10 Hours)

Introduction to Cascading Style Sheets-Features-CSS Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties - CSS box model - positioning using CSS – Lists – Tables-XML documents, XML versions and XML declaration, XML namespaces, Javascript and XML: Ajax - DOM

based XML processing - Transforming XML documents - Introduction to XSL-XLS component overview-transforming with XSLT.

Unit III: Client-Side Programming (8 hours)

The JavaScript Language-History and Versions- Introduction to JavaScript - JavaScript in Perspective-Syntax-Variables and Data Types-Statements- Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers.

Unit IV: Server-Side Programming (9 hours)

Java Servlets: - Servlet Architecture Overview-A Servlet Generating Dynamic Content-Servlet Life Cycle-Parameter Data- Sessions-Cookies-URL Rewriting-Other Servlet Capabilities-Data Storage - Servlets and Concurrency.

Unit V: JSON (9 hours)

Introducing JSON-JSON Grammar-JSON Values-JSON Tokens-Creating JSON-The JSON Object -Parsing JSON-Data Interchange-Serving JSON-Posting JSON.

Text Books:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2011.
2. Ben Smith," Beginning JSON", Apress, 2015, ISBN: 9781484202029.

Reference Books:

1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006, ISBN: 9780137618279.
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007, ISBN: 8131764583.
3. Marty Hall and Larry Brown, "Core Web Programming", Second Edition, Volume I and II, Pearson Education, 2001, ISBN:0130897930.
4. Bates, "Developing Web Applications", Wiley, 2006, ISBN: 9780470065082.

22CA2009	Web Development Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize web application development procedures.
2. To design interactive web pages.
3. To make use of JSON in javascript.

Course Outcomes:

At the end of the course, the student should be able to:

1. summarize client-server communication and protocols used during communication.
2. design simple web pages using markup languages like HTML and XHTML.
3. develop web pages using XML/XSLT.
4. design and understand the concept of Cascading Style Sheets.
5. outline the concept of java script.
6. make use of JSON in java script.

List of Exercises:

1. Write a HTML program for the demonstration of Lists
 - a. Unordered List
 - b. Ordered List
 - c. Definition List
 - d. Nested List
2. Write a HTML program for demonstrating Hyperlinks
 - a. Navigation from one page to another.
 - b. Navigation within the page
3. Write HTML for demonstration of cascading stylesheets
 - a. Embedded stylesheets.
 - b. External stylesheets.
 - c. Inline styles.
4. Write an XML for person information and access the data using XSL.
5. Write an XML for student information and access second students data using DOM.

6. Write a javascript program for validating Registration Form.
7. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
8. Write a simple servlet that displays a message.
9. Write a servlet that reads parameters from employee login page.
10. Write a servlet for creating a cookie and retrieving it.
11. Write a servlet that connects to the database and retrieves the data and displays it.
12. Working with JSON in javascript.

22CA2010	Emerging Technologies in Computing	L	T	P	C
		3	0	0	3

Course Objectives:

1. To find the tremendous historical impact of emerging technologies, the business and government settings and the associated frameworks.
2. To identify new and promising information technologies like internet of things, cryptocurrencies, robotics, quantum computing and e-commerce.
3. To compare and analyze how technologies are developed, marketed, and implemented in the real world.

Course Outcomes:

By learning the course, the students will be able to

1. identify the key components of IoT and the possible future IoT trends.
2. summarize cryptography, cryptocurrencies and their framework.
3. recognize the concepts of robotics and the component characteristics.
4. apply the knowledge on quantum computing concepts and algorithms.
5. summarize the fundamentals of e-commerce, EDI, digital payment methods, mobile commerce and safe e-commerce transactions.
6. examine and evaluate the role of state-of-the-art digital technology on changing society

Unit I: Internet of Things

(8 Hours)

Internet of Things: Introduction – Physical design of IoT – Logical design of IoT – IoT Enabling Technologies – IoT levels and Deployment Templates. Domain Specific IoTs – Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health and Lifestyle – Case studies.

Unit II: Cryptography and Cryptocurrencies

(10 Hours)

Cryptography and Cryptocurrencies: Introduction – Cryptographic hash functions – Hash pointers and data structures – Block Chain – Merkle Trees – Digital Signatures – Public keys as Identities – Decentralized Identity Management – Goofycoin – ScroogeCoin – Centralization vs Decentralization – Distributed Consensus – Consensus without identity using a block chain – Bitcoin Transactions – Bitcoin Blocks – The Bitcoin Network.

Unit III : Robotics

(8 Hours)

Robotics: Introduction – Robot Subsystems - Classification of Robots – Robot Anatomy - Robot Power Sources/ Actuators: Characteristics - Robot End-Effectors - Robot Control Methods - Robot Sensors: Characteristics.

Unit IV : Quantum Computing

(9 Hours)

Quantum Computing: Introduction – Major Players – Qubits and multi-qubits states - Block Sphere representation - Quantum Superposition overview - Quantum Entanglement basics– Overview on Quantum Algorithms.

Unit V : Mobile commerce

(10 Hours)

E-commerce: Introduction – Benefits of E-commerce – Classification of E-commerce – E-commerce business models – Electronic data interchange: benefits and applications – securing e-commerce – securing e-commerce network transaction – Electronic Payment Systems – Mobile commerce: framework and benefits – Need for agents in e-commerce.

Text Books:

1. Arshdeep Bahga and Vijay Madisetti, “Internet of Things: A Hands-on Approach”, 2014. ISBN:9780996025515, 0996025510
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, 2016, ISBN: 9780691171692.

3. Saha, S.K., “Introduction to Robotics”, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
4. Chuck Easttom, “Quantum Computing Fundamentals”, Addison-Wesley Professional, June 2021. ISBN: 9780136793830
5. Bharat Bhasker, “Electronic Commerce Framework, Technologies and Applications”, Fourth Edition, McGraw Hill Education (India) Private Limited, 2013.

Reference Books:

1. Pramod Kumar, Anuradha Tomar, R. Sharmila, “Emerging Technologies in Computing Theory, Practice, and Advances”, 1st Edition, Published December 21, 2021 by Chapman and Hall/CRC. ISBN 9780367633646.
2. Follett, J. (ed.). (2014) “Designing for emerging technologies: UX for genomics, robotics, and the Internet of things”, O'Reilly Media. ISBN-978-1-4493- 7051-0.
3. Kelly, K. (2016) “The inevitable: understanding the 12 technological forces that will share our future”, New York, NY: Viking. ISBN-978-0-525428084.
4. Pethuru Raj, Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, Auerbach Publications, 1st edition (2 March 2017). ISBN-10 : 1498761283

22CA2011	System Administration	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize SLES 15 and perform basic Linux configuration.
2. To make use of system commands.
3. To make use of boot process, processes, jobs, users, permissions, software and storage.

Course Outcomes:

By learning the course, the students will be able to

1. identify the application of Linux commands and Linux flavours.
2. make use of remote administration and secure system boot up process.
3. organize process management, identity and security.
4. examine the software and network policies.
5. create and manage storage devices.
6. create policies to monitor and perform installation.

Unit I: Overview of Linux Enterprise, Linux File System and Using Command Line (7 Hours)

Different Flavors of SUSE Linux - SLE Maintenance Model - YaST - GNOME Desktop – Linux Filesystem - Filesystem Hierarchy Standard - Linux File Types - data redirection -Help at the Command Line - SLE Shell Environment - CLI Commands - VIM editor - Application: Working with GUI and CLI, piping and redirection.

Unit II : Remote Administration and System Initialization (8 Hours)

SSH v2 Connection Process - Connection via SSH - Manually Retrieve SSH Host Keys - Configure an SSH Server and Client - Create an SSH Key Pair - Upload Public Key to Server - Use the SSH Agent - Remote Management VNC Server - Configure a One Time VNC Session - Client Access – Boot Processes - GRUB2 Boot Loader - systemd initramfs - Advantages of UEFI - Secure Boot – Differences between GRUB Legacy and GRUB2 - Configuration File Structure - Edit Menu Entries During Boot - GRUB2 Commands - Set a Boot Password - systemd Basics - Unit File - systemctl - Manage Services - Target Units - Application: Remote Administration using VNC, Secure GRUB with a Password, Manage Services.

Unit III: Process Management and Identity and Security (10 Hours)

Processes Basics - View and Manage Processes - Processes Priority - Jobs and Processes - Pseudo TTYs and screen - Cron Jobs - at Daemon - User and Group Management - File Permissions and Ownership - File / Directory Modes - Modifying File / Directory Modes and Ownership - umask - Sticky Bit – Set Group ID and User ID - ACLs - ACL Check Algorithm - How Applications Handle ACLs – Privilege Delegation - Identity Switching Delegate Admin Privileges - Configure sudo.

Unit IV: Software Management and Network Management (10 Hours)

Compiling software from source - Disadvantages of Unpackaged Software - RPM Basics – RPM commands - Libzypp - Software Repositories - Manage Repositories with zypper - Manage Packages with zypper - Manage Patterns - Manage Patches - Manage Updates - Linux Network Terms - ping - Trace Network Packets - Network Related Configuration Files - SUSE sysconfig Network Commands - Address Configuration - Route Configuration - Link Configuration - Ethernet Configuration – Bridge Configuration

- Network Interface Types - Features of Wicked - Manage network and Interfaces using wicked - firewall
 - Application: Manage Software with RPM, zypper and yast, Configure and manage network, configure firewall.

Unit V: Storage Management

(10 Hours)

Linux I/O Stack - Local Disks - MBR and GPT Device - Files for Hard Disks with MBR – Expert Partitioner in YaST - parted vs. fdisk - Manage Partitions with parted - Virtual Filesystem Switch - Create File Systems from the CLI - Mount File Systems - File System Health Tools - LVM - Software RAID - Monitor RAID - Btrfs - Network File System Basics - NFS Server Configuration – Configure an NFS Client - Application: Manage Partitions using parted and fdisk, Create and manage btrfs, LVM and RAID partitions, Configure and use NFS.

Text Book:

SUSE Linux Enterprise Administration Lecture, SLE2001, Version 15.0.3, 2018.

Reference Books:

1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin, UNIX and Linux System Administration Handbook, Addison-Wesley Professional, 2017, ISBN 9780134278292.
2. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Unix and Linux System Administration handbook, Fourth Edition 2010, Pearson Education, ISBN 0132117363.
3. Tom Adelstein, Bill Lubanovic, Linux System Administration, O'Reilly Media Inc., First Edition, 2007, ISBN -13:978-0-596-00952-6.
4. Nicholas Wells, The Complete Guide to LINUX System Administration, Indian Edition, Cengage Learning, 2005, ISBN 978-81-315-0682-0.

22CA2012	System Administration Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize about SLES 15 and perform basic Linux configuration.
2. To summarize the command line interface and understand VIM editor.
3. To make use of different file permissions.

Course Outcomes:

By learning the course, the students will be able to

1. compare SSH utilities with public key authentication.
2. examine the services with the system command.
3. make use of process information using gnome-system-monitor and ps.
4. experiment with modify, add and remove local users and groups.
5. create software using rpm, zypper and zypper repositories
6. make use of different file permissions.

List of Exercises

1. Overview of SUSE Linux Enterprise
2. Explore Filesystem Hierarchy
3. Work with the Command Line
4. The VIM Editor
5. Remote Administration
6. System Initialization
7. Process Management
8. Identity and Security
9. Software Management
10. Network Management
11. Logical Volume Manager
12. Redundant Array of Independent Disks

22CA2013	Block Chain Technology	L	T	P	C
		3	0	0	3

Course Objectives:

1. To define blockchain as a disruptive technology and its internal workings such as cryptographic implementations, consensus mechanisms and distributed communication protocol.

2. To infer the components consensus, token economics, cryptography and its implication in the blockchain technology.
3. To apply the application of blockchain in various domain through real world use cases.

Course Outcomes:

By learning the course, the students will be able to

1. define significance of decentralized systems, blockchain as a technology and its real-world use cases.
2. demonstrate cryptographic cipher techniques - Caesar's cipher, Vigenere's squares.
3. apply cryptographic methods and standard algorithms such as RSA encryption, SHA-256 hashing, Elliptic Curve Cryptography.
4. Make use of various consensus algorithms such as PAXOS, RAFT, PBFT.
5. utilize various security features related to open-source systems, restricted VM features, smart contract development using functional languages, Analysis Tools & Security Audit.
6. summarize specific Enterprise related use cases such as Supply Chain, Traceability, Banking, and Healthcare.

Unit I: Introduction (7 Hours)

What is block chain – History of block Chain – The different types of block chain – Overview of blocks – Influence of Moore's law on block chain technology.

Unit II Cryptography (8 Hours)

Cryptography in depth - Cryptographic primitives - Symmetric Key, Asymmetric Key, Cryptographic hashing – Encode Schemes - Block ciphers, Stream Ciphers, Elliptic Curve Cryptography.

Unit III: Networking in blockchain (10 Hours)

Block synchronization – Building a simple blockchain in a P2P network – Blockchain networks – A Simple cryptocurrency application: Transactions, Wallet, Transaction Management, Application end points.

Unit IV: Diving into block chain (10 Hours)

Multichain blockchain platform – Setting up a blockchain environment – Getting started with Multichain – Proof of Existing architecture – Building the proof of Existing application – NEO blockchain – Ethereum blockchain.

Unit V: Design and Applications (10 Hours)

Blockchain for Enterprises – Essential Maturity imperatives for enterprise blockchain – Token Revolution – Understanding digital asset – Business networks- path to blockchain Enterprise Adoption – Business Modeling and Design.

Text Book:

Koshik Raj, "Foundations of Blockchain", Packt Publishers, 2019, ISBN: 9781789139396.

Reference Books:

1. Kevin Werbach, "The Block Chain and the new Architecture of Trust", The MIT Press Cambridge, Massachusetts, 2018, ISBN: 9780262038935.
2. Arun Jai Singh, Cuomo Jerry, Gaur Nitin, "Blockchain for Business", Addison-Wesley Professional, ISBN-10: 0135581354
3. Imran Bashir, "Mastering Blockchain", Packt Publishers, ISBN-13: 9781787125445.
4. Daniel Drescher, "Blockchain Basics", Apress, 2017, ISBN: 97814842 26032.

22CA2014	Artificial Intelligence for Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the concepts of cyber security and to detect the threats with AI.
2. To explore malware and network anomaly detection techniques.
3. To apply fraud detection with cloud AI solutions.

Course Outcomes:

By learning the course, the students will be able to

1. outline the fundamental concepts of artificial intelligence.
2. demonstrate the different approaches of automated learning in the field of cyber security.
3. describe the current level of interconnection between different devices.
4. outline the important role in terms of the protection of sensitive user related information.
5. identify and detect the malware and cyber security threats.
6. identify fraud prevention with cloud.

Unit I: Introduction to AI for Cyber Security
(9 Hours)

Evolution in AI from expert Systems to data mining – Types of Machine Learning – Algorithm training and optimization – Getting to Know Python's libraries for linear regression, Clustering, perceptron – AI in the concept of cyber security.

Unit II Detecting Cyber security Threats with AI
(9 Hours)

Detecting spam with perceptrons – Spam detection with SVMs – Phishing detection with logistic regression and decision trees – Spam detection with Naïve Bayes – NLP to the rescue.

Unit III: Malware Threat Detection
(9 Hours)

Malware analysis at a glance – Telling different malware families apart – Decision tree malware detectors – Detecting metamorphic malware with HMMs. – Advanced malware detection with deep learning.

Unit IV: Network Anomaly Detection with AI
(9 Hours)

Network anomaly detection techniques – How to classify network attacks – Detecting botnet topology – Different ML algorithms for botnet detection.

Unit V: Fraud Prevention with Cloud AI Solutions
(9 Hours)

Introducing fraud detection algorithms – Predictive analytics for credit card detection – Getting to know Watson cloud solutions – Importing sample data and running Notebook in the Cloud.

Text Book:

Alessandro Parisi, “Hands-On Artificial Intelligence for Cybersecurity: Implement smart AI systems for preventing cyber-attacks and detecting threats and network anomalies”, Packt Publishing; 1st edition, 2019, ISBN-13: 978-1789804027.

Reference Books:

1. Leslie F. Sikos, “AI in Cybersecurity (Intelligent Systems Reference Library)”, Springer; 1st edition, 2018, ISBN-13: 978-3319988412.
2. Russell, S. and Norvig, P., “Artificial Intelligence - A Modern Approach”, 3rd edition, Prentice Hall, 2015, ISBN-13: 978-9332543515.
3. Poole, D. and Mackworth, A., “Artificial Intelligence: Foundations of Computational Agents”, Cambridge University Press, 2017, Second Edition, ISBN-13: 978-1107195394.
4. Elaine Rich, Kevin Knight, Shivashankar B. Nair, Artificial Intelligence, Third Edition, McGrawHill, 2009, ISBN -13: 973-0-07-008770-5. ISBN-10:0-07-008770-9.
5. Kwangjo Kim, Muhamad Erza Aminanto, Harry Chandra Tanuwidjaja, “Network Intrusion Detection using Deep Learning: A Feature Learning Approach (SpringerBriefs on Cyber Security Systems and Networks)”, Springer; 1st edition, 2018 edition, ASIN: B07HNTPGGN.
6. Soma Halder, Sinan Ozdemir, “Hands-On Machine Learning for Cybersecurity: Safeguard your system by making your machines intelligent using the Python ecosystem”, Packt Publishing, 2018, ISBN-13: 978-1788992282.

22CA2015	Mobile Hacking	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the basics of mobile ecosystem and security models.
2. To demonstrate fuzzing and jailbreaking.
3. To prepare students for several mobile hacking techniques and mitigation.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate the basics of mobile ecosystem and security models.
2. summarize on the attack surfaces in mobile ecosystem.
3. apply several testing and exploitation methods on android and iOS.
4. associate several hacking techniques for mobile exploitation.
5. perform mobile hacking with the appropriate tools and methods.
6. develop secure mobile model and mobile applications.

Unit I: Mobile Ecosystem
(8 Hours)

The Mobile Ecosystem, The Mobile Risk Model-Physical Risks, Service Risks, App Risks, Basic Cellular Network Functionality- Interoperability, Voice Calls, The Control Channels, Voice Mailboxes, Short Message Service, Attacks and Countermeasures, New world of IP, iOS-Know Your iPhone, How Secure Is iOS?, Jailbreaking, Hacking Other iPhones.

Unit II: Android Security Model
(7 Hours)

Android-Security Model, Application Components, Data Storage, Near Field Communication (NFC), Android Development, Rooting, Decompiling and Disassembly, Intercepting Network Traffic, Intent-Based Attacks, NFC-Based Attacks, Information Leakage.

Unit III: Attacks and Malware

(10 Hours)

Android Malware, iOS Malware, Malware Security: Android vs. iOS, Mobile Services and Mobile Web, General Web Service Security Guidelines, Attacks Against XML-based Web Services, Common Authentication and Authorization Frameworks, Mobile Web Browser and WebView Security.

Unit IV: Fuzz Testing

(10 Hours)

Finding Vulnerabilities with Fuzz Testing, Fuzzing Background, Fuzzing on Android, Fuzzing Broadcast Receivers, Fuzzing Chrome for Android, Fuzzing the USB Attack Surface, Mobile Device Management Frameworks, Device Provisioning, Bypassing MDM, Decompiling and Debugging Apps.

Unit V: Security testing

(10 Hours)

Detecting Jailbreaks, Remote Wipe and Lock, Mobile Development Security, Mobile App Threat Modeling, Secure Mobile Development Guidance, Mobile Payments, Current Generation, Contactless Smartcard Payments, Google Wallet, Consumer Security Checklist, Mobile Application Penetration Testing Toolkit.

Text Books:

1. Neil Bergman, Mike Stanfield, Jaon Rouse, Joel Scambray, "Hacking Exposed™: Mobile Security Secrets & Solutions", McGraw Hill Education, 2013, ISBN: 9780071817028.
2. Joshua J. Drake, Stephen A. Ridley, Zach Lanier, Pau Oliva Fora, Georg Wicherski, Collin Mulliner, "Android hackers handbook", Wiley, 2014, ISBN: 978-1-118-60864-7, ISBN: 9781118608616.

Reference Books:

1. Dominic Chell, Tyrone Erasmus, Shaun Colley, Ollie Whitehouse, "The Mobile Application Hacker's Handbook", 2015, Wiley, ISBN: 9781118958506, 1118958500.
2. Fadia, Ankit, "An Ethical Guide to Hacking Mobile Phones", India: Macmillan Publishers India Limited, 2005, ISBN: 9781403928504, 1403928509.
3. Hidaia Mahmood Alassouli, "Wireless and Mobile Hacking and Sniffing Techniques", United States: Blurb, Incorporated, 2021, ISBN: 9781034734789, 1034734784.

22CA2016	Web Application Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To develop the web application designing skill in students.
2. To prepare the students for identifying and fixing vulnerabilities and threats in web applications.
3. To prepare the students for getting necessary knowledge about web server security.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate the structure of Web Application.
2. identify and handle Web Application Attacks.
3. define web browser from attacks.
4. state the importance of web authentication and authorization.
5. exhibit privacy for users.
6. exhibit the skills in securing Web server.

Unit I: Web Application

(9 hours)

History of software security-Introduction to Web Application Reconnaissance- The Structure of Modern Web Application- Finding Subdomains-API Analysis-Identifying third party dependencies- Identifying Weak Points in Application Architectures.

Unit II: Offense

(9 hours)

Introduction to Hacking Web Applications - Cross-Site Scripting (XSS) - Cross-Site Request Forgery (CSRF) - XML External Entity (XXE) – Injection - Denial of Service (DoS) - Exploiting Third-Party Dependencies.

Unit III: Defense

(9 hours)

Securing Modern Web Applications - Secure Application Architecture - Reviewing Code for Security - Vulnerability Discovery - Vulnerability Management - Defending Against XSS Attacks- Defending Against CSRF Attacks- Defending Against XXE - Defending Against Injection - Defending Against DoS.

Unit IV: Authentication & Authorization
(12 hours)

Passwords, Biometrics, Digital Signatures, Digital Certificates, Certification Authorities, Public Key Infrastructure, Session Management. **Privacy and Security for users:** Log Files, Understanding Cookies, Web Bugs, Picking Great Password, Avoiding Spam and Junk Email, Identity Theft, Blocking Ads and Crushing Cookies, Anonymous Browsing, Securing Email.

Unit V: Web Server Security
(8 hours)

Physical Security for Server-Host Security for servers- Securing Web Application-Deploying SSL Server Certificates, Securing Web Services.

Text Books

1. Andrew Hoffman, "Web Application Security", O'Reilly Media, Inc., 2020, ISBN: 9781492053101, 2020
2. Gene Spafford and Simson Garfinkel, Web Security, Privacy & Commerce, O'Reilly Media, Inc., 2001, ISBN-13: 978-0596000455, 2001

Reference Books:

1. Mike Shema, "Web Application Security for Dummies", John Wiley & Sons, Ltd, ISBN: 9781119 994879
2. Mike Shema, "Seven Deadliest Web Application Attacks", 2010 Elsevier Inc. ISBN: 9781597495431.
3. Wade Alcorn, Christian Frichot, The Browser Hacker's Handbook, John Wiley & Sons, Inc, ISBN: 9781118662090.
4. Dafydd Stuttard, Marcus Pinto, The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, 2ed, ISBN: 97881265334042011
5. Hanqing Wu, Liz Zhao, Web Security: A WhiteHat Perspective, Auerbach Publications 1st Edition, ISBN 9781466592612, 2015.
6. Steven Splaine, Testing Web Security: Assessing the Security of Web Sites and Applications 1st Edition, John Wiley & Sons, Inc, ISBN-13: 978-0471232810, 2002
7. Saumil Shah, Shreeraj Shah, Web Hacking: Attacks and Defense, Addison Wesley, ISBN-13: 978-0201761764, 2002

22CA2017	Web Application Security Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To develop the web application designing skill in students.
2. To prepare the students for identifying and fixing vulnerabilities and threats in web applications.
3. To prepare the students for getting necessary knowledge about web server security.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate the structure of Web Application.
2. identify and handle Web Application Attacks.
3. define web browser from attacks.
4. state the importance of web authentication and authorization.
5. exhibit privacy for users.
6. exhibit the skills in securing Web server.

List of Exercises

1. Design a web application
2. Installation of kali linux & Password cracking with Kali Linux
3. Download and install nmap. Use it with different options to scan open ports,perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, etc.
4. Use the Nessus tool to scan the network for vulnerabilities.
5. Install and execute Dalfox on kali linux
6. Cross Site Scripting(XSS) Vulnerabilities using Dalfox
7. Cross Site Scripting(XSS) Vulnerabilities using XSppear
8. Install and execute Sqlmap for SQL Injection
9. Attack Web Apps with Burp Suite & SQL Injection
10. Ensure the Security of any one web browser (Mozilla Firefox/Google Chrome)
11. Tracking the cookies information

12. Penetration testing

22CA2018	Entrepreneurship	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the business environment in order to identify business opportunities.
2. To identify the elements of success of entrepreneurial ventures, consider the legal and financial conditions for starting a business venture.
3. To evaluate the effectiveness of different entrepreneurial strategies, specify the basic performance indicators of entrepreneurial activity and to interpret their own business plan.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate basic concepts in the area of entrepreneurship,
2. outline the role and importance of entrepreneurship for economic development.
3. develop personal creativity and entrepreneurial initiative,
4. summarize the key steps in the elaboration of business idea,
5. identify the stages of the entrepreneurial process and the resources needed for the successful development of entrepreneurial ventures.
6. compare the effectiveness of different entrepreneurial strategies.

Unit I: Foundation and Entrepreneurship development

(9 Hours)

Introduction - Concept and need of entrepreneurship - Characteristics and Types of Entrepreneurship - Entrepreneurship as a career - Entrepreneurship as a style of Management - The changing role of the entrepreneur - Entrepreneurial traits, factors affecting entrepreneurs.

Unit II: Theories of Entrepreneurship

(9 Hours)

Influences on entrepreneurship development - External influences on entrepreneurship development - Socio-cultural, Political, economic, personal entrepreneurial success and failure reasons and remedies, Women entrepreneurs Challenges and achievements of women entrepreneurs.

Unit III: Business Planning Process

(9 Hours)

The business plan as an entrepreneurial tool - Elements of business planning – Objectives- Market analysis - development of Product/idea - Marketing, Finance, Organization and management – Ownership, Critical risk contingencies of The proposal, Scheduling and milestones.

Unit IV: Project Planning for Entrepreneurs

(9 Hours)

Technical, Financial, Marketing, Personnel, and management feasibility reports, Financial schemes offered by various financial institutions, Like Commercial Banks, IDBI, ICICI, SIDBI, SFCs, Foreign currency Financing, Estimation of Financial requirements.

Unit V: Entrepreneurship Development and Government

(9 Hours)

Role of Central Government and State Government in promoting entrepreneurship with various incentives, subsidies, grants, programs, schemes and challenges, Government initiatives and inclusive entrepreneurial Growth.

Text Book:

Khanna, S. S., “Entrepreneurial Development”, S Chand & Company New Delhi, 2011, ISBN: 9788121918015.

Reference books:

1. Hisrich D. Robert, Michael P. Peters, Dean A. Sheperd, “Entrepreneurship”, McGraw-Hill, 6th edition, ISBN: 87921819180.
2. Zimmerer W. Thomas, Norman M. Scarborough, “Essentials of Entrepreneurship and Small Business Management”, PHI, 4^{ed.}, ISBN: 9780137272983.
3. Holt H. David, “Entrepreneurship: New Venture Creation”, Prentice- Hall of India, New Delhi, Latest edition, ISBN: 9789332568730.
4. Kuratko, F. Donald, Richard M. Hodgetts, Entrepreneurship: Theory, Process, Practice, Thomson, 7^{ed.}, ISBN: 9780324258264.
5. Desai, Vasant, Dynamics of Entrepreneurship: New Venture Creation, Prentice-Hall of India, New Delhi, Latest edition, ISBN: 9789350244548.

22CA2019	Web Development and Analytics	L 3	T 0	P 0	C 3

Course Objectives:

1. To develop interactive 2D and 3D Charts.
2. To build a Real Time Web App.
3. To deploy the WebApp in Cloud.

Course Outcomes:

By learning the course, the students will be able to

1. build interactive 2D and 3D Charts.
2. develop python framework using flask.
3. build real time web application.
4. integrate machine learning algorithm into a webapp.
5. implement Dash Bootstrap components.
6. Develop a Web App on the Cloud.

Unit I: Tabulating Data and Interactive Charts

(7 Hours)

Tabulating the Data- 2D Charting- 3D Charting-Interactive Tabulations and Charting: Plotty- Tabulating the Data with Plotly -Interactive Charting- 2D Charting-Choropleth Map-3D Charting- Indicators- Updating Graph Layout-Subplots- Styling Charts.

Unit II: Essentials of HTML and Python Web Framework

(10 Hours)

Communication between a Web Browser and a Web Server- URL structure- Domain Hosting- Hyper Text Markup Language- Viewing Web Page Source- Python Web Frameworks and Apps: Web Frameworks-Web Apps-Flask- Dash- Jupyter Dash.

Unit III: Dash Bootstrap Components and Theming

(8 Hours)

Number Input- Text Area- Select- Radio Items- Checklist- Switches- Tabs- Button -Table – Styling – Cascade Styling Sheet- Bootstrap- Dash Bootstrapping – Responsive Grid System.

Unit IV: Building a Real- Time Web App

(10 Hours)

Dash App Structure- Importing Key Dependencies- Loading the Bootstrap Icons Library- Navigation Bars- Specifying the Web App CSS Code- Side Navigation Bar Menus and Submenus- Search Functionality- Specifying the App Layout- Specifying a Callback Function-Run the Dash App- Authentication with Dash Auth- Authentication with Flask.

Unit V: Integrating Machine Learning and Deploying WebApp

(10 Hours)

Linear Regression- Integrating an algorithm to a Web App-Navigation Bars- Specifying a callback for descriptive statistics- Integrated Development Environment – Virtual Environment – File Structure – Integrating Innumerable Python Files- Hosting Web Apps.

Text Book:

Tshepo Chris Nokeri, “Web App Development and Real – Time Web Analytics with Python”, Apress, 2022, ISBN: 9781484277836.

Reference Books:

1. Miguel Grinberg, “Flask Web Development”, O’Reilly, 2018, ISBN:9781491991732.
2. Jack Stouffer, “Mastering Flask”, Packt, 2015, 9781784393656.
3. Daniel Gaspar, Jack Stouffer, “Mastering Flask Web Development”, Packt, 2015, ISBN: 9781788995405.
4. Wietse Venema,” Building Serverless Applications with Google Cloud Run”, O’reilly, 2021, 9781492057093.

22CA2020	Sustainable Water Management using Artificial Intelligence	L 3	T 0	P 0	C 3

Course Objectives:

1. To identify the need for smart water.
2. To apply smart technologies for water management.
3. To analyze the impact of artificial intelligence techniques in sustainable water management.

Course Outcomes:

By learning the course, the students will be able to

1. identify the necessity for smart water.
2. summarize the techniques and technologies of Smart hardware and software.
3. illustrate the application of smart techniques and technologies in domestic water management.

4. utilize smart technologies for water management.
5. apply artificial intelligence-based water management in agriculture.
6. analyze the public concern and impact of smart technology implementation in water management.

Unit I: Necessity for Smart Water

(10 Hours)

Smart Water: Defining ‘Smart’ – Smart Power and Smart Grids – Cleantech and Smart Cleantech – Smart Water – Disruption and a Conservative Sector – Estimates and Forecasts of Market Size – Funding Agencies – Perspectives on Venture Capital and New Technologies - Sales of Smart Systems - Smart Water for Consumers - Smart Water for Utilities and Industrial Customers - Irrigation and Surface Water Monitoring - Water and the ‘Internet of Things’ - Some Initial Caveats – **Need for Smart Water:** The Water Supply Crunch – The impact of Climate Change – Leakage and Water Losses - Water Efficiency and Demand Management - Lowering Energy Usage - Appreciating Asset Condition and its Effective Performance.

Unit II: Smart Water Techniques and Technologies.

(8 Hours)

The Technologies and Techniques Driving Smart Water: Necessity of Integration from Innovation to Application – Digital Manufacturing – Smart Objects and the Internet of Things – Smart Hardware and Software – Case Studies – **Domestic Water and Demand Management:** Metering and Smart Water Metering – Types of Water Meter – Smart Metering at Practice – Domestic Water – Developing Water Efficiency Standards – Case Studies.

Unit III: Technologies for Water Management

(10 Hours)

Optimizing how we Manage Water and Wastewater: Traditional Techniques and Expectations - Living in a Real-time World - Network Monitoring and Efficiency - Drinking Water – Quality - Water Utilities and the Wider Environment - Wastewater and Sewerage - Avoiding Surplus Assets – Case Studies - **Appropriate Technology and Development:** Sustainable Development and Water in Developing Economies - Overcoming Traditional Obstacles - The Impact of Mobile Telephony - Smart Water Initiatives Seen in Developing Economies – Case Studies.

Unit IV: Water Management in Agriculture

(7 Hours)

Agriculture, Horticulture, and Recreation: Resource Competition and Municipal, Agricultural and Industrial Demand - The Economics of Irrigation - Smart Irrigation and Sustainability - Smart Irrigation Agriculture - Lawns, Parks and Sports Fields – Case Studies.

Unit V: Public Concern and Impact

(10 Hours)

Obstacles to Adoption: Public Concerns about Health and Privacy - Trust, Technology and Politics - Ownership of Data - Stranded Assets - The Role of Utilities - Integrity and the Internet - A Question of Standards Revisited - Demand Management and Flushing Sewage Through the Network - Data Handling Capacity for the Internet of Things - Leakage Management and Measurement – Logical Limits of Smart Water – **Smart Water Management:** Conservation and Innovation – Desired Outcomes – Impact of Smart Water.

Text Book:

David A. Lloyd Owen, “Smart Water Technologies and Techniques”, Wiley Publications, 2018, ISBN: 9781119078647.

Reference Books:

1. Ambrogio Bacciga, Renato Naliato, “Recent Advances in Artificial Intelligence Research”, nova science publishers, 2013, ISBN:9781628088076.
2. A G S Reddy, “A Text Book on Water Chemistry Sampling, Data Analysis and Interpretation, Nova Science Publishers, 2020, ISBN: 97815367030.
3. Arthur W. Hounslow, “Water Quality Data”, CRC press, 1995, ISBN: 9780873716765.

22CA2021	Project Preparation and Documentation	L	T	P	C
		2	1	0	3

Course Objectives:

1. To familiarize and train with software documentation procedures.
2. To conduct case studies and generate reports.
3. To map the software engineering concepts with the project management procedures.

Course Outcomes:

By learning the course, the students will be able to

1. explore the ways of proposing a software project.
2. write a software requirements specification document and draw use case diagrams.
3. construct and normalize a database design.

4. draw diagrams (like Class, Activity, Sequence etc) to demonstrate the project processes.
5. derive test cases and generate a test report.
6. review, correct and expand the ideas in the system software documentation.

Unit I: Documentation and Software Proposal

(7 Hours)

Importance of Documents – Standards – The Documentation Plan - Project Planning – Writing a Software Proposal Document: Introduction - Product Description – Objectives – Scope – Proposal Evaluation. Scheduling: Staffing and Scheduling – Budget Plan - Gantt Chart.

Unit II: Software Requirements Specification

(8 Hours)

Value of a Good SRS – Writing a Software Requirements Specification Document: Functional Requirements - Developing Use Cases - Hardware Requirements - Software Requirements - Non-functional Requirements.

Unit III: Database Design

(10 Hours)

E-R Diagram – Database creation – Table creation – Identifying domain constraints, Keys and Relationships – Normalization of Tables - Creation of other Database Objects – Data Flow Diagrams – Levels 0, 1 and 2.

Unit IV: Object Oriented Software Process Design

(10 Hours)

Component Diagram - Identifying Classes, Objects, Inheritance and Relationships - Class Diagram - Activity Diagram - Sequence Diagram - Collaboration Diagram - State Chart Diagram - Prototype (Interface Design).

Unit V: Testing, Deployment and Documentation

(10 Hours)

Conversion of functional requirements into Test cases - Preparing a Test case Document – Observing Test Results - Generating test report - Deployment Diagram – Consolidating a Project Document – Reviewing the document - Preparing a User Guidance Document.

Text Book:

1. Pankaj Jalote, "An integrated approach to software engineering", Springer Science & Business Media, 2012.
2. John Rakos et al, "The Practical Guide to Project Management Documentation", 2004.

Reference Books:

1. John F Dooley and Dooley, "Software Development, Design and Coding", Apress, 2017.
2. Paul Clements et al, "Documenting Software Architectures: Views and Beyond", SEI Series in Software Engineering, 2010.
3. Karl E. Wiegers, "Software Requirements", Second Edition, 2009.
4. Sharanam Shah, "Software Documentation for Professionals", 2012.
5. Baha Ghanim, "Software Requirements Specification Document", 2015.
6. Betty Cheng, "Software Requirements Specification (SRS) Book E-Commerce System, 2011.
7. Gerardus Blokdyk, "Software Design Document A Complete Guide", 2020, Kindle Edition. ISBN : 1867315335
8. Dorothy Graham and Mark Fewster, "Experiences of test automation: case studies of software test automation", Addison-Wesley Professional, 2012.

22CA2022	Security Investigation and Report Writing	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize on threats, vulnerabilities and the need for testing.
2. To demonstrate on vulnerability identification and exploitation.
3. To build the skill of testing and report writing.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate the basics of threats, exploits and vulnerabilities.
2. summarize on the different types of testing process.
3. demonstrate vulnerability identification using several testing methods.
4. develop solutions to exploit the vulnerabilities.
5. select methods that best suits the security analysis process.
6. develop skills of testing and report writing.

Unit I: Introduction to security testing

(8 Hours)

Security test, Inevitable weakness of security test, Types of Security Tests, Social Engineering, Uncovering Vulnerabilities, The Vulnerability Wheel and the Heartbleed Bug, Zero Day Exploits, How Vulnerabilities Are Scored and Rated, Software Development Life Cycle and Security Testing, Security Metrics, What Is Important Data?, Client-Side vs. Server-Side Testing.

Unit II: Security testing process

(10 Hours)

Security testing process- The Process of a Security Test, The Initialization Phase, Setting the Scope, Collecting Network Traffic, Inform The CSIRT, Keep Track of Things, Know Which System You're Testing, The Security Tester's Software Setup, Virtual Machines for Security Testing, When to Use Hacker Distributions, Metasploit, Security Test Execution, The Technical Security Test Process, When to Use What Approach, Pre Security Test System, Production Systems versus Pre-Production Systems, Legal Considerations, Report.

Unit III: Identifying vulnerabilities

(10 Hours)

Identifying vulnerabilities-Footprinting, Scanning, port scan, Unknown Networks Ports, DNS Zone Transfers, DNS Brute Forcing, Server Debug Information, Nslookup, Getting Geographical IP Info Using Pollock, Harvesting E-Mail Addresses with the Harvester, Enumeration, Enumerating Web Presence Using Netcraft, American Registry for Internet Numbers (ARIN), Searching for IP Addresses, Data from Hacked Sites, Have I Been PWNED, Shodan, Checking Password Reset Functionality.

Unit IV: Exploiting Vulnerabilities

(7 Hours)

Exploiting Vulnerabilities-System Compromise, Password Attacks, OWASP Top Ten, OWASP Top Ten Training Ground, SQL Injection, Security Risk Mitigation, Selecting Safeguards.

Unit V: Reporting

(10 Hours)

Reporting Vulnerabilities, Importance of final report, the executive summary, secure deliverence of final report, the cost of security, presentation, risk choices, patching, password cracking, Example reports.

Text Book:

Robert Svensson, "From Hacking to Report Writing: An Introduction to Security and Penetration Testing", United States, Apress, 2016, ISBN: 9781484222836, 1484222830.

Reference Books:

1. Michael Karson, Lavita Nadkarni, "Principles of Forensic Report Writing", American Psychological Association, 2013, ISBN: 9781433813061, 1433813068.
2. Bruce W. Pixley, "Report Writing Handbook for the Computer Forensic Examiner: Law Enforcement Edition. United States: Createspace Independent Pub, 2014, iSBN: 9781492208433, 1492208434.
3. Izzat Alsmadi, Chuck Easttom, Lo'ai Tawalbeh, "The NICE Cyber Security Framework Cyber Security Management" Springer International Publishing, 2020, ISBN: 978-3-030-02359-1, 978-3-030-02360-7.

22CA2023	Preserving and Recovering Digital Evidences	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the computer crime investigation.
2. To apply the idea of cyber crime law.
3. To describe about preserving a digital crime scene.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate the basics of digital forensics.
2. summarize about cyber-crime law.
3. apply digital investigations.
4. demonstrate digital crime scene.
5. describe about the apprehending offenders.
6. inspect about duty of experts.

Unit I: Digital Forensics and Language of Computer Crime Investigation

(7 Hours)

Foundations of Digital Forensics - Digital Evidence - Increasing Awareness of Digital Evidence - Digital Forensics: Past, Present, and Future - Principles of Digital Forensics - Challenging Aspects of Digital Evidence - Following the Cybertrail - Digital Forensics Research - Language of Computer Crime Investigation- The Role of Computers in Crime.

Unit II: Duty of Experts and cyber-crime law

(8 Hours)

Admissibility - Levels of Certainty in Digital Forensics - Direct versus circumstantial evidence -Search by keyword, title, subject area - Scientific Evidence - Presenting Digital Evidence - Cybercrime Law -Federal Cybercrime Law - State cybercrime law- Constitutional law - Fourth Amendment - Fifth Amendment and encryption.

Unit III: Cybercrime Law and Digital Investigations (10 Hours)

The European and National Legal Frameworks - Progression of Cybercrime Legislation in Europe - Specific Cybercrime Offenses - Computer-Integrity Crimes - Computer-Assisted Crimes - Content-Related Cybercrimes- Other Offenses – Jurisdiction- Digital Investigations - Conducting Digital Investigations - Digital Investigation Process Models - Scaffolding for Digital Investigations - Applying the Scientific Method in Digital Investigations - Investigative Scenario: Security Breach.

Unit IV: Handling and Preserving a Digital Crime Scene (10 Hours)

Published Guidelines for Handling Digital Crime Scenes- Fundamental Principles - Authorization - Preparing to Handle Digital Crime Scenes - Surveying the Digital Crime Scene -Search by keyword, title, subject area - Preserving the Digital Crime Scene - Investigative Reconstruction with Digital Evidence - Equivocal Forensic Analysis - Victimology - Crime Scene Characteristics - Threshold Assessments.

Unit V: Motive, and Technology, Apprehending Offenders (10 Hours)

Axes to Pathological Criminals and Other Unintended Consequences - Modus Operandi - Technology and Modus Operandi-Motive and Technology - Current Technologies Apprehending Offenders - Violent Crime and Digital Evidence - The Role of Computers in Violent Crime - Processing The Digital Crime Scene - Investigative Reconstruction.

Text Book:

Eoghan Casey, “Digital Evidence and Computer Crime Forensic science, Computers and Internet”, Elsevier Academic Press –Second Edition, 2011, ISBN: 9780123742681.

Reference Books:

1. Shira A scheindlin, “A Electronic Discovery and Digital Evidence in a Nut Shell West”, Academic Press; 2nd Revised edition, 2016, ISBN-13: 978-1634597487.
2. Marcella, “Cyber Forensics: A Field Manual For Collecting, Examining & Preserving Evidence Of Computer Crimes”, Auerbach Publications, 2 edition, 2007, ISBN-13: 978-0849383281.
3. John Sammons, “The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics Paperback”, Syngress; 2 edition, 2014, ISBN-13: 978-1597496612
4. Casey, Eoghan. “Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet Hardcover”, Academic Press; 3 edition, 2011, ISBN-13: 978-0123742681
5. Albert Marcella, Jr., Doug Menendez “Cyber Forensics: A field manual for collecting, Examining, preserving evidence of computer crimes”, Second Edition, CRC Press.

22CA2024	Trust Management in E- Commerce	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand network and e-commerce.
2. To acquire knowledge on E-commerce Security Environment.
3. To understand Trust models and the E-commerce domain.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the network and e-commerce
2. infer the e-commerce security environment and payment systems.
3. identify ethical, social and political issues in E-commerce.
4. analyze different e-commerce platform through case studies.
5. state the trust mechanisms through privacy and information rights.
6. state the intellectual property rights and evaluate measures taken in an e-commerce platform.

Unit I : Introduction to E-commerce (7 Hours)

Introduction to E-commerce – Technological building blocks underlying e-commerce - Major trends in e-commerce – unique features – types of e-commerce – understanding e-commerce: technology, business and society – technical and behavioural approaches - Major Business-to-consumer (B2C) models - Major Business-to-Business (B2B) models.

Unit II : E- Commerce Security
(8 Hours)

E-commerce Security Environment: The Underground Economy Marketplace – Dimensions of E-commerce security – Security vs Ease of use – Public Safety and the Criminal Uses of the Internet – Technology Solutions – Management Policies and Business Procedures – E-commerce payment systems.

Unit III: Issues in E- Commerce
(10 Hours)

Ethical, Social and Political Issues in E-commerce: Issues – A model for organizing the issues – Basic Ethical Concepts – Analyzing Ethical Dilemmas – Candidate Ethical Principles – E-commerce in action: Case Studies on Online Retail Sector, Online Financial Services, and Online Career Services.

Unit IV : Privacy and Information Rights
(10 Hours)

Privacy and Information Rights: Privacy in public and private sector – Information – Information Collected by E-commerce Companies - Key Issues in Online Privacy of Consumers - Marketing: Profiling, Behavioral Targeting, and Retargeting - Social Networks: Privacy and Self Revelation - Mobile Devices: Privacy Issues - Consumer Privacy Regulation and Enforcement: GDPR - Privacy and Terms of Use Policies -Industry Self-Regulation- Technological Solutions.

Unit V : Intellectual Property Rights
(10 Hours)

Intellectual Property Rights: Types of Intellectual Property Protection - Copyright: The Problem of Perfect Copies and Encryption - Fair Use Doctrine -The Digital Millennium Copyright Act of 1998 - Copyright Protection in the European Union - E-commerce Patents - Trademarks: Online Infringement and Dilution - Cybersquatting and Brandjacking – Cyberpiracy – Metatagging - Trade Secrets. Governance: Taxation, Net Neutrality, Antitrust, Monopoly, and Market Competition in the Internet Era - Public Safety and Welfare - protecting Children.

Text Books:

1. Kenneth C. Laudon and Carol Guercio Traver, “E-Commerce 2021: Business, Technology, and Society”, 16th edition, Pearson, 2021.
2. Muneesh Kumar and Mamta Sareen, “Trust and Technology in B2B E-Commerce: Practices and Strategies for Assurance”, 2011. ISBN: 1613503539

Reference Books:

1. David Whiteley, “E-Commerce Strategy Technologies & Applications”, McGraw Hill Education, 2014.
2. Bharat Bhasker, “Electronic Commerce Framework, Technologies and Applications”, Fourth Edition, McGraw Hill Education (India) Private Limited, 2013.
3. Joseph, P. T., S.J., “E-Commerce: An Indian Perspective”, Sixth Edition, PHI Learning Pvt. Ltd., 2019.

22CA3001	Cyber Security Investigation Trends	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the basics of cyber investigation.
2. To explore the idea of incidence response.
3. To build applications using WiFi Transmissions.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate the basics of computer crime.
2. summarize about cyber investigative roles.
3. apply incident responses.
4. develop WiFi Transmission to solve computational problems.
5. describe about conducting cyber investigations.
6. Summarize cyber-crime prevention.

Unit I: Computer Crime
(7 Hours)

The Problem at Hand - The Gaps in Cyber Crime Law -Unveiling the Myths Behind Cyber Crime - Prioritizing Evidence -Setting the Bar Too High - “Computer Crime” Discussed- Examining “Computer Crime” Definitions -Dissecting “Computer Crime” - Using Clear Language to Bridge the Gaps.

Unit II Preparing for Prosecution and Testifying and Cyber Investigative Roles (8 Hours)

Preparing for Prosecution and Testifying- Common Misconceptions- Chain of Custody-Keys to Effective Testimony -Differences between Civil and Criminal Cases - The Role of Law Enforcement Officers- The Role of the Prosecuting Attorney.

Unit III: Incident Response and Legal Issues of Intercepting WiFi Transmissions (10 Hours)

Incident Response - Postmortem versus Live Forensics - Today's Live Methods - Case Study: Live versus Postmortem - Computer Analysis for the Hacker Defender Program - Network Analysis- Legal Issues of Intercepting WiFi Transmissions - WiFi Technology -Understanding WiFi RF- Scanning RF Eavesdropping on WiFi - Fourth Amendment Expectation of Privacy in WLANs.

Unit IV: Seizure of Digital Information and Conducting Cyber Investigations (10 Hours)

Seizure of Digital Information - Defining Digital Evidence -Digital Evidence Seizure Methodology Factors Limiting the Wholesale Seizure of Hardware -Other Options for Seizing Digital Evidence Common Threads within Digital Evidence Seizure - Determining the Most Appropriate Seizure Method- Conducting Cyber Investigations -Demystifying Computer/Cyber Crime - Understanding IP Addresses - The Explosion of Networking - The Explosion of Wireless Networks - Interpersonal Communication.

Unit V: Digital Forensics and Analyzing Data and Cyber Crime Prevention (10 Hours)

The Evolution of Computer Forensics - Phases of Digital Forensics - Ways to Prevent Cyber Crime Targeted at You - Ways to Prevent Cyber Crime Targeted at the Family -Ways to Prevent Cyber Crime Targeted at Personal Property -Ways to Prevent Cyber Crime Targeted at a Business - Ways to Prevent Cyber Crime Targeted at an Organization - Ways to Prevent Cyber Crime Targeted at a Government Agency.

Text Book:

Anthony Reyes, Kevin O'Shea, Jim Steele, Jon R. Hansen, Benjamin R. Jean, Thomas Ralph, "Cyber Crime Investigations: Bridging the Gaps Between Security Professionals, Law Enforcement, and Prosecutors", Elsevier Science, 2011, ISBN: 9780080553634.

Reference Books:

1. Joshua Brunty, Katherine Helenek, "Social Media Investigation for Law Enforcement", 1st Edition, 2012, Anderson Publisher, ISBN: 9781455731626.
2. Catherine D. Marcum, George E. Higgins, "Social Networking as a Criminal Enterprise", Routledge, 1st edition, 2016, ISBN-13: 978-1138141902.
3. Thaddeus A. Hoffmeister, "Social Media in the Courtroom: A New Era for Criminal Justice", Praeger, 2014, ASIN: B00NVJUWJG.
4. Daniel Trotter, "Christian Fuchs Social Media, Politics and the State: Protests, Revolutions, Riots, Crime and Policing in the Age of Facebook, Twitter and YouTube (Routledge Research in Information Technology and Society)", Routledge; 1st edition, 2015, ISBN-13: 978-1138798243
5. Mohammad A. Tayebi, Uwe Glässer, David B. Skillicorn, "Open Source Intelligence and Cyber Crime: Social Media Analytics (Lecture Notes in Social Networks)", Springer, 1st edition, 2020, ISBN-13: 978-3030412500

22CA3002	Research Methodology and Documentation	L	T	P	C
		3	0	0	3

Course Objectives:

1. To develop the basic scientific research skills.
2. To develop the skills for getting the data from different sources for research.
3. To prepare the students for getting necessary knowledge about documentation.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the basic principles of research methodology.
2. develop the knowledge and skill of scientific research.
3. identify and critically evaluate research methods.
4. acquire knowledge with research designs and research problems.
5. exhibit the skills for the data collection.
6. develop the knowledge for preparation of report.

UNIT I: Formulating a Research Problem (9 Hours)

Research Problem - Research problem Identification - Review the Literature – Formulating Research problem – identifying variables-Constructing hypotheses.

UNIT II: Conceptualising a research design (9 Hours)

The research design-Selecting the design study: study design in Quantitative research-cross over comparative experimental design-replicated cross-sectional design- study in Qualitative research-Holistic research.

UNIT III: Constructing an instrument for Data Collection
(9 Hours)

Selecting method for Data Collection-Collecting data using attitudinal scales-Establishing the validity and reliability of research instrument.

UNIT IV: Selecting a sample
(9 Hours)

Selecting sample: Sampling in quantitative research-sampling terminology-principles of sampling-Aim in selecting sampling-types of sampling- sampling in qualitative research.

UNIT V: Writing a research report
(9 hours)

Writing a research report-Research methodology and practice evaluation-intervention-development-evaluation process-types of evaluation from a focus perspective-types of evaluation from a philosophical perspective.

Text Book:

Ranjit kumar," Research methodology a step-by-step guide for beginners", Sage Publications, 3rd edition, 2015.

Reference Books:

1. S. N. Hesse – Biber, Handbook of Feminist Research, Sage Publications, London, 2011.
2. Crotty, M, The Foundation of Social Research: Meaning and Perspective in the Research Process, Sage Publications, London, 1998.
3. Blaikie, N, Deginning Social Research, Polity Press, Cambridge, 2000.
4. V. Desai & R. B. Potter, Doing Development Research, Sage Publications, New Delhi, 2006.

22CA3003	Docker Deep Dive	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the principles of Docker.
2. To make use of Docker Commands.
3. To model how to prepare the organization to thrive in a container world.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate the fundamentals of Devops.
2. summarize Installation and configure Docker and Kubernetes.
3. create Docker Networks.
4. develop tools for creating, sharing and running individual containers.
5. create a system for operating containerized applications at scale.
6. build fast, reliable and continuous deployments.

Unit I: Getting Started with Docker, Image Creation and Sharing
(10 Hours)

Introduction - Installing Docker on Linux OS - Setting Up a Local Docker Host by Using Vagrant 4 - Running Boot2Docker on Windows 8.1 Desktop-Starting a Docker Host in the Cloud by Using Docker Machine Using Docker Experimental Binaries - Running Hello World in Docker - Running a Docker Container in Detached Mode - Creating, Starting, Stopping, and Removing Containers - Building a Docker Image with a Dockerfile - Using Supervisor to Run WordPress in a Single Container - Running a WordPress Blog Using Two Linked Containers - Backing Up a Database Running in a Container - Sharing Data in Your Docker Host with Containers - Sharing Data Between Containers - Copying Data to and from Containers. Keeping Changes Made to a Container by Committing to an Image - Saving Images and Containers as Tar Files for Sharing - Writing Your First Dockerfile - Packaging a Flask Application Inside a Container - Optimizing Your Dockerfile by Following Best Practices - Versioning an Image with Tags - Migrating from Vagrant to Docker with the Docker Provider - Using Packer to Create a Docker Image - Publishing Your Image to Docker Hub - Using ONBUILD Images

Unit II : Docker Networking , Configuration and Development
(10 Hours)

Introduction - Finding the IP Address of a Container - Exposing a Container Port on the Host - Linking Containers in Docker - Understanding Docker Container Networking - Choosing a Container Networking Namespace - Configuring the Docker Daemon IP Tables and IP Forwarding Settings - Using pipework to Understand Container Networking - Setting Up a Custom Bridge for Docker - Using OVS with Docker - Building a GRE Tunnel Between Docker Hosts - Running Containers on a Weave Network - Running a Weave Network on AWS - Deploying flannel Overlay Between Docker Hosts - Networking Containers on Multiple Hosts with Docker Network - Diving Deeper into the Docker Network Namespaces Configuration - Managing and Configuring the Docker Daemon - Compiling Your Own Docker Binary from Source -

Running the Docker Test Suite for Docker Development - Replacing Your Current Docker Binary with a New One - Using nsenter - Introducing runc - Accessing the Docker Daemon Remotely - Exploring the Docker Remote API to Automate Docker Tasks - Securing the Docker Daemon for Remote Access - Using docker-py to Access the Docker Daemon Remotely - Using docker-py Securely - Changing the Storage Driver

Unit III: Kubernetes

(10 Hours)

Introduction - Understanding Kubernetes Architecture - Networking Pods for Container Connectivity - Creating a Multinode Kubernetes Cluster with Vagrant - Starting Containers on a Kubernetes Cluster with Pods - Taking Advantage of Labels for Querying Kubernetes Objects - Using a Replication Controller to Manage the Number of Replicas of a Pod - Running Multiple Containers in a Pod - Using Cluster IP Services for Dynamic Linking of Containers - Creating a Single-Node Kubernetes Cluster Using Docker Compose - Compiling Kubernetes to Create Your Own Release - Starting Kubernetes Components with the hyperkube Binary - Exploring the Kubernetes API - Running the Kubernetes Dashboard Upgrading from an Old API Version - Configuring Authentication to a Kubernetes Cluster - Configuring the Kubernetes Client to Access Remote Clusters.

Unit IV : Optimized Operating System Distributions for Docker

(8 Hours)

Introduction - Discovering the CoreOS Linux Distribution with Vagrant - Starting a Container on CoreOS via cloud-init - Starting a CoreOS Cluster via Vagrant to Run Containers on Multiple Hosts - Using fleet to Start Containers on a CoreOS Cluster - Deploying a flannel Overlay Between CoreOS Instances - Using Project Atomic to Run Docker Containers - Starting an Atomic Instance on AWS to Use Docker - Running Docker on Ubuntu Core Snappy in a Snap - Starting an Ubuntu Core Snappy Instance on AWS EC2 Running Docker Containers on RancherOS.

Unit V : Monitoring Containers, Application Use Cases

(7 Hours)

Introduction - Getting Detailed Information About a Container with docker inspect - Obtaining Usage Statistics of a Running Container - Listening to Docker Events on Your Docker Hosts - Getting the Logs of a Container with docker logs - Using a Different Logging Driver than the Docker Daemon - Using Logspout to Collect Container Logs - Managing Logspout Routes to Store Container Logs - Using Elasticsearch and Kibana to Store and Visualize Container Logs - Using Collectd to Visualize Container Metrics - Using cAdvisor to Monitor Resource Usage in Containers - Monitoring Container Metrics with InfluxDB, Grafana, and cAdvisor - Gaining Visibility into Your Containers.

Text Book:

Sebastien Goasguen, “Docker Cookbook”, O’Reilly Media, Inc., Nov 2015, “, ISBN: 9781491919712.

Reference Books:

1. Ferdinando Santacroce, “Git Essentials”, ISBN: 978-1-78528-790-9, April 2015, Packt Publishing Ltd.
2. Nikhil Pathania, “Learning Continuous Integration with Jenkins”, ISBN: 9781788479356, 2017, Packt Publishing Ltd.
3. James Turnbull, “The Docker Book: Containerization Is the New Virtualization”, ISBN: 9781788479356, 2018.
4. Lorin Hochstein, Rene Moser, “Ansible: Up and Running: Automating Configuration Management and Deployment the Easy Way”, 2017, O’Reilly Media Inc., ISBN: 9781491979808.
5. Viktor Farcic, “The DevOps 2.0 Toolkit”, ISBN: 9781785289194, August 2016 Packt Publishing Ltd.

22CA3004	Deep Learning in Cyber Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To outline the foundations of Neural Networks.
2. To build applications using different types of Deep Neural Networks.
3. To explore the different cyber security attacks.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the fundamental concept of Neural Networks.
2. illustrate the concept of Convolutional of Neural Networks.
3. apply Recurrent Neural Networks for solving applications.
4. explore the concept of Artificial Intelligence techniques.

5. apply Artificial Intelligence for analysis of big data for real time applications.
6. explore the different types of cyber attack in real time.

Unit I: Neural Network Foundations (10 Hours)

Neural Network Foundations with TensorFlow2.0: TensorFlow-Keras-Introduction to Neural Networks- Perceptron- Multilayer Perceptron- Regularization-Sentiment Analysis-Hyperparameter Tuning and AutoML-Predicting Output-Practical Overview of Back Propagation-Towards a Deep Learning Algorithm. TensorFlow: TensorFlow1.x-TensorFlow 2.x-Keras-Regression: What is Regression? – Prediction using Linear Regression – TensorFlow Estimators- Classification Tasks and Decision Boundaries – Logistic Regression.

Unit II: Convolutional Neural Networks (10 Hours)

Convolutional Neural Networks: Deep Convolutional Neural Networks- Very Deep Convolutional Neural Networks for Large Scale Image Recognition- Advanced CNN: Deep Inception-V3 Net used for Transfer Learning-Transfer Learning for Classification of Horses and Humans- Application Zoos with tf.Keras and TensorFlow Hub- Other CNN Architectures.

Unit III: Recurrent Neural Networks (7 Hours)

Recurrent Neural Networks: The basic Recurrent Neural Networks cell- Recurrent Neural Network cell variants-Recurrent Neural Network Variants-Recurrent Neural Network Topologies- Encoder-Decoder Architecture-Attention Mechanism-Transformer Architecture. Auto Encoder: Introduction-Vanilla Autoencoders-Sparse Encoder-Denoising Autoencoder-Stacked Encoder.

Unit IV: Big Data and Artificial Intelligence (8 Hours)

Ontology for Big Data: Human Brain and Ontology- Ontology of Information Science-Learning from Big Data: Supervised and Unsupervised Machine Learning-Regression Analysis-Data Clustering-k-means Algorithm-Data Dimensionality Reduction-Single Value Decomposition- Principal Component Analysis Method-Content based Recommendation Systems.

Unit V: Cyber Security (10 Hours)

GANs Attacks and Defenses- GANs in nutshell- A glimpse into deep learning-Adversarial attack methodologies- Adversarial attack transfer ability- Defending against adversarial attacks-Network attack via model substitution- substitute model training-fooling malware detectors with MalGAN.

Text Book:

1. Antonio Gulli,Sujit Pal, “Deep Learning with TensorFlow2 and Keras”, Packt, 2019, ASIN: B082MBMFVF.
2. Anand Deshpande and Manish Kumar, “Artificial Intelligence for Big Data”, Packt, 2018, ISBN: 9781788472173.
3. Alessandro Parisi,” Hands-on Artificial Intelligence for Cyber Security”. Packt, 2019, ISBN: 9781789804027.

Reference Books:

1. Padmavathi Ganapathi, D. Shanmugapriya, “Handbook of Research on Machine Learning and Deep Learning Applications for Cyber Security”, IGI Global, 2020, ISBN:9781522596117.
2. Mamoun Alazab, MingJian Tang, “Deep Learning Applications for Cyber Security”, Springer, 2019, ISBN: 9783030130565.

22CA3005	Intellectual Property Rights	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the importance of Intellectual Property Rights
2. To illustrate the categories of Intellectual property Rights.
3. To analyze case studies on Intellectual Property Rights.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the basics of Intellectual property rights.
2. illustrate the importance and application of patents.
3. demonstrate the laws concerning trademarks.
4. analyze the significance of copyrights.
5. apply copyright laws to digital age
6. discuss case studies in IPR.

Unit I: Introduction to Intellectual Property Rights

(8 Hours)

Introduction to IPR: Historical Perspective – Invention and Creativity – Importance and Need for Protection of Intellectual Property (IP) – Emerging Trends in IPR. Basic Forms of IPR: Introduction– Copyright and Neighboring Laws – Trade Mark, Trade Name, Service Marks and Trade Secrets –Industrial Design – Layout Designs of Integrated Circuits – Geographical Indication – Emerging Forms– Traditional Knowledge and Domain Name.

Unit II: Patents

(10 Hours)

Patents: Introduction – Types of Patent Applications – Patent Specifications – Patent Filing and Examinations – Patent Search and Databases – Commercializing Patent Technology –Patentability –Design Patents – Plant Patents – Double Patenting – Patent Application Process – Prosecuting the Application – Post Issuance Actions – Patent Ownership and Transfer: Ownership Rights – Sole and Joint Investors – Disputes over Inventorship – Assignment of Patent Rights – Licensing of Patent Rights - Case Illustration: False Marking.

Unit III: Trademarks

(8 Hours)

Trademark Law: Introduction – Purpose and Function of Trademarks – Types of Marks – Categories of Marks – Selecting and evaluating a Mark – The Trademark Search – New Developments in the Trademark Law: Protecting a Domain Name – Hyperlinking and the First Amendment – Cyberspace Trademark Issues – Case Illustration: Keyword Advertising as Infringement.

Unit IV: Copyrights

(10 Hours)

Copyright: Introduction – Originality of the Material – Fixation of the Material – Works of Authorship – Exclusions from Copyright Protection – Compilations, Collections, and Derivative Works – Case Illustration: Merger Doctrine. Ownership and Transfers: Copyright Ownership Issues - Joint Works - Ownership in Derivative or Collective Works - Works Made for Hire - Transfers of Copyright - Termination of Transfers of Copyright Rights - Duration of Copyright. Registration and Searching: Application – Deposit Materials – Preregistration – Registration – Searching Copyright Office Records – Obtaining Copyright Office Records and Deposit Materials. New Developments: Copyright Protection for Computer Programs - Copyright Protection for Automated Databases - Copyright in the Electronic Age - The Digital Millennium Copyright Act - Entertainment Notes - Recent Developments 1. in Copyright Law - Terms of the Trade - Vessel Hull Protection - Semiconductor Chip Protection.

Unit V: Case Studies

(6 Hours)

Case Studies: Turmeric Patent Case – Basmati Rice Case – Ginger Case – Bajaj Auto Limited vs TVS Motor Company Limited Case – The Coco-Cola Company vs. Bisleri International Pvt. Ltd. Case – Apple vs Samsung Case.

Text Books:

1. Ramakrishna. B. and Anil Kumar. H.S., “Fundamentals of Intellectual Property Rights”, Notion Press, 2017, ISBN: 978-1-946556-31-8.
2. Deborah E. Bouchoux, “Intellectual Property, The Law of Trademarks”, Copyrights, Patents and Trade Secrets, Cengage Learning, Fourth Edition, 2012, ISBN: 978-1-111-64857-2.

Reference Books:

1. Dr. Anusuya Yadav, A Complete Manual on Intellectual Property Rights & Cyber Laws in India, Notion Press, 2022, ISBN: 979-8886848229.
2. Twinkle Mahashwary, Intellectual Property Rights in the Creative Industry, Thomson Reuters, 2022, ISBN: 9789392630842.
3. Pandey Neeraj, Dharni Khushdeep, Intellectual Property Rights, PHI Learning Pvt. Ltd., 2014, ISBN: 978-8120349896.
4. V. K. Ahuja, Intellectual Property Rights in India, Lexis and Nexis, 2015, ISBN: 978- 9351433880.
5. Elizabeth Verkey, Jithin Saji Isaac, Intellectual Property, Eastern Book Company, 2nd Edition, 2021, 9789339656336.
6. Sumeet Malik, Intellectual Property Rights Manual, Eastern Book Company, 2015, ISBN: 9789351452300.

**DEPARTMENT OF
DIGITAL SCIENCES**

LIST OF COURSES

Sl. No.	Course Code	Course Title	Credits [L:T:P:C]
1	20CA3026	Machine Learning and Data Analytics	4:0:0:4
2	20CA3027	Internet of Things and Blockchain Technology	4:0:0:4
3	21CA2001	Programming Logic and Design	3:0:0:3
4	21CA2002	Fundamentals of Web Designing	3:0:0:3
5	21CA2003	Web Designing Lab	0:0:2:2
6	21CA2004	Computer Hardware and Network Administration Lab	0:0:2:2
7	21CA2005	Computing Fundamentals Lab	0:0:2:2
8	21CA2006	Computer Organization and Architecture	3:0:0:3
9	21CA2007	Java Programming	3:0:0:3
10	21CA2008	Java Programming Lab	0:0:2:2
11	21CA2009	Computer Networks	3:0:0:3
12	21CA2010	Software Engineering	3:0:0:3
13	21CA2011	Operating System Concepts	3:0:0:3
14	21CA2012	Introduction to Artificial Intelligence	3:0:0:3
15	21CA2013	Web Technology	3:0:0:3
16	21CA2014	Web Technology Lab	0:0:2:2
17	21CA2015	Full Stack Development	3:0:0:2
18	21CA2016	Full Stack Development Lab	0:0:2:2
19	21CA2017	Computer Skills and Programming	2:0:0:2
20	21CA2018	Computer Skills for Basic Sciences Lab	0:0:1:1
21	21CA2019	Fundamentals of Programming	2:0:0:2
22	21CA2020	Fundamentals of Programming Lab	0:0:1:1
23	21CA2021	Computer Programming for Basic Sciences	4:0:0:4
24	21CA2022	Computer Programming for Basic Sciences Lab	0:0:2:2
25	21CA2023	Fundamentals of Logics in Programming	2:0:0:2
26	21CA3001	Knowledge Representation	4:0:0:4
27	21CA3002	Python for Data Science	3:0:0:3
28	21CA3003	Data Science with Python Lab	0:0:2:2
29	21CA3004	Big Data Architecture	3:0:0:3
30	21CA3005	Big Data Architecture Lab	0:0:2:2
31	21CA3006	Cloud Computing	4:0:0:4
32	21CA3007	Data Visualization Lab	0:0:2:2
33	21CA3008	Artificial Intelligence Techniques	3:0:0:3
34	21CA3009	Artificial Intelligence Lab	0:0:2:2
35	21CA3010	Multivariate Techniques for Data Analytics	4:0:0:4
36	21CA3011	Human Computer Interaction	3:0:0:3
37	21CA3012	Data Analytics using R	3:0:0:3
38	21CA3013	Data Analytics Lab	0:0:2:2
39	21CA3014	Image Processing and Computer Vision	3:0:0:3
40	21CA3015	Image Processing and Computer Vision Lab	0:0:2:2
41	21CA3016	Deep Learning	3:0:0:3
42	21CA3017	Deep Learning Lab	0:0:2:2
43	21CA3018	Natural Language Processing	4:0:0:4
44	21CA3019	Advanced Computing	3:0:0:3
45	21CA3020	Advanced Computing Lab	0:0:2:2
46	21CA3021	Internet of Things and its Applications	4:0:0:4
47	21CA3022	Vulnerability Assessment and Penetration Testing	3:0:0:3
48	21CA3023	Vulnerability Assessment and Penetration Testing Lab	0:0:2:2

49	21CA3024	Malware Analysis	3:0:0:3
50	21CA3025	Malware Analysis Lab	0:0:2:2
51	21CA3026	Linux System Administration	3:0:0:3
52	21CA3027	Linux System Administration Lab	0:0:2:2
53	21CA3028	Mobile Forensics	3:0:0:3
54	21CA3029	Forensics Investigation	3:0:0:3
55	21CA3030	Forensics Investigation Lab	0:0:2:2

20CA3026	Machine Learning and Data Analytics	L	T	P	C
		4	0	0	4

Course Objectives:

1. To explain basics about machine learning concepts.
2. To learn about supervised and unsupervised algorithms.
3. To explore data analytics.

Course Outcome:

After completion of this course, the students will be able to

1. summarize the concepts of machine learning.
2. apply dimensionality reduction.
3. summarize the concepts of neural networks.
4. elaborate supervised and unsupervised algorithms.
5. apply machine learning for predictive analytics.
6. analyze the processed data.

Module 1: Introduction to Machine Learning

Introduction to machine learning- types of machine learning- supervised learning-the machine learning process-terminology- testing machine learning algorithms-turning data into probabilities- basic statistics- bias variance tradeoff.

Module 2: Neural Networks

Brain and the neuron – neural networks- perception-linear separability- linear regression- multi layer perceptron: Going forwards- going backwards: back propagation of error- multilayer perceptron in practice- examples of using the MLP- Deriving back propagation.

Module 3: Dimensionality Reduction and Probabilistic Learning

Radial basis function network-interpolation and basis functions-linear discriminant analysis- principal component analysis- factor analysis- independent components analysis- locally linear embedding- isomap-gaussian mixture models- nearest neighbour methods.

Module 4: Supervised and Unsupervised Algorithms

Optimal separation- kernels- support vector machine algorithm-extension to svm- genetic algorithm generic operations- using genetic algorithms- reinforcement learning-Learning with trees: using decision trees- constructing decision trees- classification and regression trees- boosting-bagging- random forest- different ways to combine classifiers- Kmeans algorithm- markov chain carlo method.

Module 5: Machine Learning for Predictive Data Analytics

Introduction to predictive data analytics and machine learning – how does machine learning works? – predictive data analytics project lifecycle: crisp-dm – predictive data analytics tools. data to insights to decisions: converting business problems into analytics solutions – assessing feasibility - designing the analytics base table – designing and implementing features - data exploration: data quality report – getting to know data – identifying data quality issues – handling data quality issues – advanced data exploration – data preparation.

Module 6: Predictive Data Analytics and Data Visualization

Machine learning for predictive data analytics: different perspectives on prediction models – choosing a machine learning approach – descriptive statistics and data visualization: descriptive statistics for continuous features – descriptive statistics for categorical features – populations and samples – data visualization.

Text Books:

1. Stephen Marsland, “Machine Learning An algorithmic perspective”, CRC press, 2015, ISBN: 9781466583337.

- John D. Kelleher, Brian Mac Namee, Aoife D' Arcy, "Fundamentals of Machine Learning for Predictive Data Analytics", MIT Press, 2015, ISBN: 9780262029445.

Reference Books:

- Giuseppe Bonaccorso, "Machine Learning Algorithms", Packt Publishing, 2017, ISBN: 97817858889622.
- Shai Shalev-Shwartz, Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press, 2015, ISBN: 9781107512825.
- Daniel T. Larose, Chantal D. Larose, "Data Mining and Predictive Analytics", Wiley, 2015, ISBN: 9781118116197.
- Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Mathematics for Machine Learning, Cambridge University Press, 2020, ISBN: 9781108455145.
- Joao Moreira, Andre Carvalho, Tomas Horvath, "A General Introduction to Data Analytics", Wiley, 2018, ISBN: 9781119296263.
- Thomas W. Miller, "Modeling Techniques in Predictive Analytics with python and R", Pearson, 2018, ISBN: 9789353065737.
- Field Cady, "The Data Science Handbook", Wiley, 2017, ISBN: 9781119092940.

20CA3027	Internet of Things and Blockchain Technology	L	T	P	C
		4	0	0	4

Course Objectives:

- To explain the principles and foundations of Internet of Things.
- To apply Machine Learning and Deep Learning for IoT Applications.
- To implement security for IoT Applications using Blockchain Technology.

Course Outcomes:

After completion of this course, the students will be able to

- Summarize the principles and foundations of Internet of Things.
- apply machine learning and deep learning for IoT applications.
- apply Optimization in IoT Environments.
- elaborate the applications of IoT in various domains.
- summarize the concepts of blockchain technology.
- apply block chain technology for problem solving.

Module 1: Principles and Foundations of IoT and AI

Introduction to IoT 101 – Big Data and IoT – Infusion of Data Science in IoT – Tools used for AI - Data Access and Distributed Processing for IoT: Using Text Files – Working with CSV Files – Working with XLSX Format – Working with JSON Format – Working with HDF5 Format – SQL Data – NoSQL Data – HDFS.

Module 2: Machine Learning and Deep Learning for IoT

Machine Learning and IoT – Learning Paradigms – Prediction using Linear Regression – Logistic Regression for Classification – Classification using Support Vector Machines – Naïve Bayes – Decision Trees – Ensemble Learning – Improving the Model. Deep Learning for IoT: Deep Learning 101 – Multilayered Perceptrons for Regression and Classification – Convolutional Neural Networks – Recurrent Neural Networks – Autoencoders.

Module 3: Genetic Algorithms for IoT

Optimization – Introduction to Genetic Algorithms – Coding Genetic Algorithms using Distributed Evolutionary Algorithms in Python – Reinforcement Learning for IoT: Introduction to Reinforcement Learning – Simulated Environments – Q-Learning – Q-Network. Generative Models for IoT: Generating Images using VAEs – GANs.

Module 4: IoT Applications

Personal IoT – IoT and Smart Homes – AI for the Industrial IoT: Introduction to AI-powered industrial IoT - Predictive maintenance using AI - Electrical load forecasting in industry – AI for Smart Cities : Introduction to Smart Cities – Components of a Smart City – Adapting IoT for Smart Cities – Processing Different Types of Data.

Module 5: Blockchain Technology

Blockchain and Hyperledger – Application to a Use Case – Creating Blockchain Network with Hyperledger Composer – Installing Hyperledger Network using Hyperledger Fabric and Composer – Addressing Food Safety: Regulations, Challenges and Concerns in the modern Food Chain – Application of Blockchain and IoT in Food Chain.

Module 6: Blockchain Solution

Business of Food – Technological Approach – Software Components – Creating a Blockchain Solution: Technical Requirements – Overview of Solution – Creating a Blockchain Network – Creating the IoT Part of the Solution – End-to-end Testing – IoT, Blockchain and Industry 4.0: Industry 4.0 – Cloud Computing as Innovation Platform – The IoT

– Blockchain, simplifying Business Chains. Developing Cloud Applications – Blockchain using Hyperledger Composer.

Text Books:

1. Amita Kapoor, Hands-on Artificial Intelligence for IoT, Packt Publishing, 2019, ISBN: 9781788836067.
2. Maximiliano Santos, Enio Moura, Hands-on IoT Solutions with Blockchain, Packt Publishing, 2019, ISBN: 178913224X.

Reference Books:

1. Mohammad Abdur Razzaque, Md. Rezaul Karim, Hands-on Deep Learning for IoT, Packt Publishing, 2019, ASIN: B07TP7ZRC7.
2. Imran Bashir, Mastering Blockchain, Packt Publishing, Second Edition, 2018, ISBN 9781788839044.
3. Sachin Shetty, Charles A. Kamhoua, Laurent L. Nijila, Blockchain for Distributed Systems Security, IEEE Press, 2019, ISBN: 9781119519607.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2017, ISBN: 9780262035613.
5. John Krohn, Grant Beyleveld, Aglae Bassens, Deep Learning Illustrated: A Visual Interactive Guide to Artificial Intelligence, Pearson Publications, 2020, ISBN: 978-9353945466.
6. Ela Kumar, Artificial Intelligence, Wiley Publications, 2020, ISBN: 978-9389795134.

21CA2001	Programming Logic and Design	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the basics of computers and programming.
2. To solve problems using modular programming.
3. To apply modern programming concepts.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the basics of computers and programming.
2. solve problems using programming control structures.
3. analyze problems and represent solutions using modular programming.
4. organize and process data using different data structures.
5. apply programming skills to solve problems.
6. illustrate the importance of modern programming concepts.

Module 1: Introduction to Computers and Programming

Introduction to Computers and Programming: Hardware - How Computers store Data - How a program works - Types of Software - Input Processing and Output: Designing a Program - Output, Input and Variables - Variable Assignment and Calculations - Examples - Variable Declaration and Data Types - Named Constants - Hand Tracing a Program - Documenting a Program - Designing a Program.

Module 2: Control Structures

Decision Structures and Boolean Logic: Decision Structures - If-then statement - Dual Alternative Decision Structures - If-then-else Statements - Comparing Structures - Nested Decision Structures - Multiple Nested Decision Structures - The Case Structure - Using a Case Structure - Logical Operators - Boolean Variables - Repetition Structures: Introduction - Condition Controlled Loops - Designing loops - Count Controlled loops - Examples - Sentinels - Nested Loops - Input Validation: Garbage in, Garbage out - Input Validation Loop - Defensive Programming.

Module 3: Modular Programming and Functions

Modules: Introduction - Defining and Calling a Module - Example - Local Variables - Passing Arguments to Modules - Passing by value and by reference - Global variables and Global constants - Functions: Generating Random Numbers - User defined Functions - Library Functions - Recursion: Introduction - Problem Solving with Recursion - Recursive Algorithms.

Module 4: Arrays and Files

Arrays: Array Basics - Processing the Contents of an Array - Parallel Arrays - Two Dimensional Arrays - Files: File Input and Output - Processing Files using Loops - Processing Records - Control Break Logic.

Module 5: Advanced Programming Concepts

Object Oriented Programming: Procedural vs Object Oriented Programming - Classes - Inheritance - Polymorphism - GUI Applications and Event-driven Programming: Graphical User Interfaces - Designing User Interfaces - Event Handlers.

Module 6: System Modeling with the UML

System Modelling with the UML: System Modelling-UML-UML Use Case Diagrams-other UML Diagrams-Usage of UML diagrams.

Text Books:

1. Tony Gaddis, “Starting out with Programming Logic and Design”, Pearson Publications, 2018, ISBN: 978-0-13-398507-8.
2. Joyce Farrell, “Programming Logic and Design”, Eighth Edition, Cengage Learning, 2014, ISBN: 978-1-285-77671-2.

Reference Books:

1. Joakim Wassberg, “Computer Programming for Absolute Beginners”, Packt Publishing, 2020, ISBN-13: 978-1839216862.
2. Nathan Clark, “Computer Programming for Beginners: Fundamentals of Programming Terms and Concepts”, CreateSpace Independent Publishing Platform, 2018, ISBN-13: 978-1719439558.
3. Peter J. Denning, Matti Tedre, “Computational Thinking”, MIT Press, 2019 ISBN-13: 978-0262536561.
4. Matthias Felleisen, Robert Bruce Findler, Matthew Flatt, “How to Design Programs: An Introduction to Programming and Computing”, The MIT Press, 2001, ISBN-13: 978-0262062183.
5. H. Scott Fogler, Steven E LeBlanc, Benjamin Rizzo, “Strategies for Creative Problem Solving”, 2008, ISBN-13: 978-0133091663.

21CA2002	Fundamentals of Web Designing	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the fundamentals of internet, web development and deployment.
2. To explain the fundamentals of CSS and Java Script.
3. To summarize the concepts of bootstrap framework.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize web architecture and web services.
2. develop static and dynamic web applications.
3. develop web applications.
4. apply the knowledge of HTML and JavaScript Programming to design interactive web pages.
5. build CSS to visually format web pages and applications.
6. acquire knowledge about how to create a bootstrap framework.

Module 1: Introduction to Web Development

Web Server and its working- Web Browser and its working: DOM- Page Rendering-Browser Compatibility - Protocols affecting Web Applications: HTTP Header - HTTP Status Codes- HTTP Redirection- Introduction to HTTP Caching- Web Standards- Type of Web Applications (Static, Dynamic) Search Engine Definition - Working of Search Engine - difference between Search Engines- Introduction to SEO and its advantages.

Module 2: Basic HTML Tags

Introduction to hyper media and linear media - Anatomy of webpage - Structure of the webpage- Basic Tags - Meta Tags and their impacts on Search Engines - HTML Lists- HTML Hyperlink- HTML Tables - HTML Image Handling- Image Mapping- HTML Frames- HTML iframe- HTML Forms and controls with Attributes and functions.

Module 3: Advanced HTML tags and CSS

HTML4 Vs HTML5, Basic tags of HTML5, HTML5 Forms and Attributes, HTML5 Multimedia Support (Audio – Video and Controls)- Introduction - inline styles- embedded styles - conflicting styles - linking external style sheets- box model and text flow - grouping/nesting - pseudo-class- pseudo-element- navigation bar - image manipulation - media types - attribute selectors – borders- gradients- text effects – transformation – transitions- animations- multiple columns.

Module 4: JavaScript

Introduction, pseudo code, displaying a line of text in web page, user inputs with prompt dialogs, comments, variable, data types, operators, control statements, functions, arrays, JavaScript objects, cookies, using JSON to represent objects, JavaScript events, registering event handlers, form processing with different events, the event object and this, event bubbling, introduction of document object model (DOM), modeling a document, traversing and modifying a DOM tree, DOM collections.

Module 5: JQuery

Introduction of jquery, install, syntax, selectors, events, jquery effects, jquery html, jquery traversing.

Module 6: Bootstrap Framework

Introduction of bootstrap framework, bootstrap grids, bootstrap theme, bootstrap CSS ref, bootstrap JS ref.

Text Book:

1. Kogent Learning Solutions Inc., “HTML 5 Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP & jQuery Black Book”, dreamtech , 2013, ISBN: 978-93-5004-095-9.

Reference Books:

1. Thomas Powell, “Web Design: The Complete Reference Second Edition”, Tata McGraw Hill Education Private Limited, Fifteenth reprint 2013, ISBN: 978-0-07-058252-1.
2. Joel Sklar, “Principles of Web Design: The Web Warrior Series”, Cengage Learning, Sixth Edition, 2014, ISBN: 81-315-0961-3.
3. Jon Duckett, “Beginning Web Programming with HTML, XHTML and CSS”, 2nd Edition, Wiley India Pvt. Ltd, 2011, ISBN: 978-81-265-1697-1.
4. Kris Jamas, Konrad King, Andy Anderson, “HTML and Web Design: Tips and Techniques”, Tata McGraw-Hill, 12th Reprint 2010, ISBN: 978-0-07-049921-8.
5. Elisabeth Robson and Eric Freeman, “Head First HTML and CSS”, O’Reilly Media Inc., 2012, ISBN: 9780596159900.
6. Jennifer Kyrnin, “Bootstrap in 24 Hours”, Pearson Education Inc, 2nd Edition, 2015, ISBN: 9780672337048.
7. John Pollock, “A Beginner’s Guide JavaScript”, 5th Edition, McGraw Hill Publication 2020, ISBN: 97812604576981.

21CA2003	Web Designing Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize the fundamentals of internet, web development and deployment.
2. To explain the fundamentals of CSS and Java Script.
3. To summarize the concepts of bootstrap framework.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize web architecture and web services.
2. develop static and dynamic web applications.
3. develop web applications.
4. apply the knowledge of HTML and JavaScript Programming to design interactive web pages.
5. build CSS to visually format web pages and applications.
6. acquire knowledge about how to create a bootstrap framework.

List of Experiments:

1. Design a Bio-Data using HTML Tags
2. Various Text Effects using HTML tags
3. Create a table to show your class time-table using HTML tags.
4. Create a webpage with four frames.
5. Insert an image and create a link such that clicking on image takes user to other page.
6. Create a webpage to show the block level elements and text level elements and Character elements.
7. Create a webpage to show various confectionary items using ordered list and unordered list.
8. Embed Audio and Video into your HTML web page.
9. Create a simple form to get registration details (naukri.com). Add few form elements such as radio buttons, check boxes and password field. Add a submit button at last
10. Create a Web Page in HTML to show Admission form.
11. Apply in-line CSS to change colors of certain text portion, bold, underline and italics certain words in your HTML web page. Also change background color of each paragraph using in-line CSS.
12. Write all the above styling in CSS in different file (.css) and link it to your webpage such that changes made in CSS file are immediately reflected on the page. (External CSS)

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

21CA2004	Computer Hardware and Network Administration Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize the proper techniques of maintenance of hardware and networking devices.
2. To explore the science of hardware and networking.
3. To Diagnose and repair all major problems regarding hardware, PC peripheral devices.

Course Outcomes:

After completion of this course, student will be able to

1. perform system assembling.
2. install desired operating system.
3. configure networking of system.
4. implement Network Security.
5. configure RAID and Volume manager in Linux environment.
6. implement file, user and group permission management in operating system environment.

List of Experiments:

1. Assembly and disassembly of a system box and identifying various parts inside the system box.
2. Install and configure of Windows and Linux OS (Dual boot Installation).
3. Cable Crimping using Different Color Codes (Straight and Cross Cable).
4. Set up and configuring Networking System using various network devices.
5. Share and controlling resource and Internet connection through network.
6. Implement Network Security to protect from various attacks on networking.
7. Linux OS - Basic Operations.
8. User Management.
9. Directory management.
10. Process management commands.
11. Software package management.
12. RAID and volume manager.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

21CA2005	Computing fundamentals Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize the features of MS-Word.
2. To construct Power Point presentations with effects and Animation.
3. To provide hands-on experience in MS-Excel and MS-Access.

Course Outcomes:

After completion of this course, the students will be able to

1. perform documentation by analyzing and applying appropriate techniques.
2. develop presentations using MS-PowerPoint.
3. perform basic text editing functions by keying text into a document.
4. evaluate the appropriate means for inserting text, values and formulas into a worksheet.
5. construct tables and charts.
6. perform accounting operations.

List of Experiments:

1. Usage of MS Word - Bio Data Preparation
2. Usage of MS Word – Application of Mail Merge
3. Usage of MS Word - Smart Art Creation
4. Usage of MS Word – Designing a Birthday Card
5. Usage of MS Word - Mathematical table using formulas
6. Usage of MS PowerPoint - Create your Own presentation
7. Usage of MS Excel - Editing and Printing in Excel
8. Usage of MS Excel – Usage of formula functions
9. Usage of MS Excel - Charts in Excel

10. Usage of MS Access – Creation of database
11. Usage of MS Access – Forms
11. Usage of MS Access – Reports

21CA2006	Computer Organization and Architecture	L	T	P	C
		3	0	0	3

Course Objectives:

1. To outline the architecture of a computer and the components of a system.
2. To elaborate the Hardware and Software Interfaces and processor architecture.
3. To summarize the applications of computer architecture.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the architecture of a computer and the digital logic circuits.
2. identify the processor elements and the components of a computer system.
3. make use of various hardware and software interfaces.
4. elaborate the processor and memory architectures.
5. illustrate the application of computer architecture.
6. outline the future direction of computer architecture.

Module 1: Introduction to Computer Architecture

Introducing Computer Architecture: The evolution of Automated Computing Devices - Moore's Law - Computer Architecture. Digital Logic: Electrical Circuits - Transistor - Logic Gates - Latches - Flip Flops - Registers - Adders - Clocking - Sequential Logic - Hardware Description Languages.

Module 2: Processor Elements

A Simple Processor - The Instruction Set Addressing Modes - Instruction Categories - Interrupt Processing - Input/Output Operations. Computer System Components: Technical Requirements - Memory Subsystem - Introducing the MOSFET - Constructing DRAM circuits with MOSFETs - I/O Subsystem - Graphic Displays - Network Interface - Keyboard and Mouse - Modern Computer System Specifications.

Module 3: Hardware Software Interface

Hardware-Software Interface: Device Drivers - BIOS - The boot Process - Operating Systems Processes and Threads - Multiprocessing - Specialized Computing Domains: Real-time Computing - Digital Signal Processing - GPU Processing - Examples of Specialized Architectures.

Module 4: Processor and Memory Architectures

Processor and Memory Architectures: The von Neumann, Harvard and Modified Harvard Architectures - Physical and Virtual Memory - Paged Virtual Memory - Memory Management Unit. Performance Enhancing Techniques: Cache Memory - Instruction Pipelining - Simultaneous Multithreading - SIMD Processing. Specialized Processor Extensions: Technical Requirements - Privileged Processor Modes - Floating Point Mathematics - Power Management - System Security Management.

Module 5: Applications of Computer Architecture

Processor Virtualization: Introducing Virtualization - Virtualization Challenges - Virtualizing Modern Processors - Virtualization Tools - Virtualization and Cloud Computing. Domain-specific Computer Architectures: Architecting Computer Systems to meet Unique Requirements - Smartphone Architecture - Personal Computer Architecture - Warehouse-scale Computing Architecture - Neural Networks and Machine Learning Architectures.

Module 6: Future Directions in Computer Architecture

Future Directions in Computer Architectures: The ongoing evolution of Computer Architectures - Potentially Disruptive Technologies.

Text Book:

Jim Ledin, "Modern Computer Architecture and Organization", Packt Publishing, Illustrated Edition, 2020, ISBN: 978-1-83898-439-7.

Reference Books:

1. John Hayes, Computer Architecture and Organization, McGraw Hill Education; 3rd edition, 2017, ISBN-13 : 978-1259028564.
2. M. Morris Mano, Computer System Architecture, Pearson Education; Third edition, 2017, ISBN-13 : 978-9332585607.
3. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, ISBN: 978-1133628477.
4. Alka Vishwa, Computer Organization and Architecture, DreamTech Press, ISBN: 978- 9389307627.

- John L. Hennessey, David A. Paterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann; 6th edition, ISBN : 978-0128119051.
- Rafiquzzman, Modern Computer Architecture, Galgotia Publications, ISBN: 9788186340080, 9788186340080.

21CA2007	Java Programming	L	T	P	C
		3	0	0	3

Course Objectives:

- To explain basic programming structures in java.
- To acquire knowledge about graphics programming in java.
- To solve problems using object-oriented paradigm.

Course Outcomes:

After completion of this course, the students will be able to

- create java programs that solve simple business problems.
- Summarize the basic principles of object-oriented programming including constructors, inheritance, polymorphism.
- construct programs in exception handling.
- summarize multithreading concepts.
- apply i/o methods in applications.
- develop simple graphical user interfaces.

Module 1: Fundamentals

Evolution of Java: Java and internet-Bytecode,-Java Buzzwords-Evolution of Java. Overview of Java: Object Oriented Programming- A sample program- Data Types-Primitive types- Literals- Variables-Type Conversion and Casting.

Module 2: Control Statement and classes

Operators- Control statements- Class Fundamentals-Declaring Objects-Adding Methods-constructors-Overloading methods. Inheritance: Basics- Using Super-Method Overriding.

Module 3: Inheritance and Packages

Inheritance: Basics- Using Super-Method Overriding - Defining Packages-Access Protection- Importing Packages.

Module 4: Interfaces and Exception

Interfaces: Defining interfaces –Implementing interfaces - Exception Handling Basics Exception types-try and catch- throw –throws-finally- Built in exceptions-creating exception subclasses.

Module 5: Multithreading and AWT

Multithreading: Creating Thread- Interthread communication- Suspending, Resuming and stopping threads- String handling- Java.util.part 1: The collections Framework.

Module 6: Graphics

Graphics: Event Handling-Event handling mechanisms-Delegation event model-Event Classes: ActionEvent, MouseEvent, Window Fundamentals-Working with frame windows- Handling events in frame window- AWT Controls, Layout Managers and menus.

Text Book:

Herbert Schildt, “Java: The Complete Reference”, McGraw – Hill Edition, Eleventh edition, 2019, ISBN: 978-9339212094.

Reference Books:

- Cay S. Horstmann and Garry Cornell, “Core Java 2 Volume I Fundamentals”, Prentice Hall, Ninth Edition, 2012, ISBN:978-0137081899.
- James Gosling, Bill Joy, Guy L. Steele Jr., Gilad Bracha and Alex Buckley, “The Java Language Specification, Java SE 8 Edition”, Addison-Wesley Professional, 2014, ISBN:0133900797.
- Deitel H. M and Deitel P. J, “Java How to Program”, Prentice Hall India, Tenth Edition, 2014, ISBN: 0131483986.
- K. Rajkumar, “Java Programming”, Pearson, First Impression 2013, ISBN:978-81-317-99093.
- Pravin M Jain, “The class of Java”, Pearson, Third Impression 2011, ISBN:978-81-317-55440.
- E. Balagurusamy, “Programming with Java –a Primer”, Fourth edition 2010, ISBN:978-0-07-0141698.

21CA2008	Java Programming Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To apply the object-oriented paradigm features of Java.
2. To implement java concepts like interface, packages, multithreading etc.
3. To develop graphic applications in applet and using AWT.

Course Outcomes:

After completion of this course, the students will be able to

1. develop java programs with simple class and methods.
2. construct java programs with multiple classes and methods.
3. construct java packages and importing packages.
4. explore exceptions in java.
5. develop threads in java.
6. develop simple GUI programs.

List of Experiments:

1. Usage of Input and Output
2. Usage of Decision Making
3. Usage of Iteration
4. Usage of Classes
5. Usage of Inheritance
6. Usage of Packages
7. Usage of Interfaces
8. Usage of Method Overriding
9. Usage of Threading
10. Usage of Graphics
11. Event Handling
12. Usage of AWT

21CA2009	Computer Networks	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the uses of computer networks
2. To enable the students to know about the different layers of networking
3. To learn about the congestion control and quality of service in networking

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the necessity for computer networks.
2. analyze the requirement of the physical layer.
3. summarize the essentials of the data link layer.
4. explore the issues in the network layer.
5. elaborate the need for the transport layer.
6. illustrate the importance of the application layer.

Module 1: Introduction to Computer Networks and Physical Layer

Introduction: - Uses of Computer Networks - Network Hardware – Network Software – Reference Models – Example Networks: The Internet – Third Generation Mobile Phone Networks

Module 2: The Physical Layer

The Physical Layer: Guided Transmission Media – Wireless Transmission – Communication Satellites – Digital Modulation and Multiplexing – The Public Switched Telephone Network – The Mobile Telephone System – Cable Television

Module 3: The Data Link Layer and The Medium Access Control Sublayer

The Data Link Layer: Data Link Layer Design Issues – Error Detection and Correction – Elementary Data Link Protocols – Sliding Window Protocols – Example Data Link Protocols - The Medium Access Control Sublayer: The Channel Allocation Problem – Multiple Access Protocols – Ethernet – Wireless LAN's – Broadband Wireless – Data Link Layer Switching

Module 4: The Network Layer

The Network Layer: Network Layer Design Issues – Routing Algorithms: The Optimality Principle – Shortest Path Algorithm – Flooding – Distance Vector Routing – Congestion Control Algorithms – Quality of Service – Internetworking – The Network Layer in the Internet

Module 5: The Transport Layer

The Transport Layer: The Transport Service – Elements of Transport Protocols – Congestion Control – The Internet Transport Protocols – UDP – TCP

Module 6: The Application Layer

The Application Layer: Domain Name System – Electronic Mail – The World Wide Web – Streaming Audio and Video – Content Delivery

Text Book:

Andrew S. Tanenbaum and David J. Wetherall, “Computer Networks”, Prentice Hall, 5th Edition, 2013, ISBN: 78-0-13-212695-3

Reference Books:

1. Kurise James F and Ross Keith W, “Computer Networking”, Pearson, 6th Edition, 2017, ISBN: 9789332585492
2. Brijendra Singh, “Data Communications and Computer Networks”, Prentice Hall, 4th Edition, 2014, ISBN: 8120349075
3. William Stallings, “Data and Computer Communications”, Pearson, 10th Edition, 2017, ISBN: 9789332586932
4. Behrouz A Forouzan, “Data Communications and Networking”, McGraw Hill Education, 5th Edition, 2017, ISBN: 1259064751
5. Dhanashree K Toradmalle, “Computer Networks and Network Design”, Wiley India, 1st Edition, 2020, ISBN: 9390395097

21CA2010	Software Engineering	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the software life cycle models.
2. To explore the importance of modelling and modeling languages.
3. To design and develop correct and robust software products.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the principles of various software process models widely used in software construction.
2. create effective project management plans, manage time and physical resources.
3. Make use of the knowledge about how to analyze, design and develop any application.
4. design test cases and effective testing procedures.
5. design human-computer interfaces.
6. develop an appreciation of the cost, quality and management issues involved in software application.

Module 1: Process Models

Prescriptive Process Models- Specialized Process Models - The Unified Process- Personal and Team Process Models.

Module 2: Agile Development

Agile Development: What Is Agility? -Extreme Programming-Other Agile Process Models- Understanding Requirements: Establishing the Groundwork - Eliciting Requirements.

Module 3: Design Concepts

The Design Process- The Design Concepts- The Design Model- The Design Model. Architectural Design: Software Architecture - Architectural Styles - Architectural Design. Component Level Design: What is a Component? - Designing Class-Based Components.

Module 4: User Interface Design

The Golden Rules- User Interface Analysis and Design- Interface Design Steps. Software Quality- Achieving Software Quality - Review Techniques: Informal Reviews- Formal Technical Reviews.

Module 5: Software Testing Strategies

A Strategic Approach to Software Testing- Test Strategies for Conventional Software - Validation Testing- System Testing. Estimation for Software Projects: The Project Planning Process- Resources- Decomposition Techniques.

Module 6: Project Scheduling

Project Scheduling - Defining a Task Set for the Software Project – Scheduling. Software Risks- Risk Projection- Risk Refinement- Risk Mitigation, Monitoring, and Management.

Text Book:

Roger S. Pressman, Bruce R Maxim, “Software Engineering: A Practitioner's Approach”, Tata McGraw Hill, Eighth Edition, 2015 , ISBN:0078022126.

Reference Books:

1. Ian Sommerville, “Software Engineering”, Pearson Education, Ninth Edition, 2015, ISBN: 978-93-325- 4243-3.
2. James F Peters and Witold Pedrycz, “Software Engineering - An Engineering Approach”, John Wiley, Second Edition, 2007, ISBN: 9788126511884.
3. P. Fleeger, “Software Engineering”, Pearson Prentice Hall, Third Edition, 2009, ISBN:978-81-317-2098.
4. Suraiya Hussain, “Software Engineering”, I. K. International Publishing House, First Edition, 2012, ISBN: 978-93-81141-74-8.
5. Rajib Mall, “Fundamentals of Software Engineering”, Prentice Hall, Fourth Edition, 2014, ISBN: 8120348982.
6. Frank Tsui, Orlando Karam, Barbara Bernal, “Essentials of Software Engineering”, Jones & Bartlett Publishers, 2013, ISBN: 9781449691998.

21CA2011	Operating System Concepts	L	T	P	C
		3	0	0	3

Course Objectives:

1. To build an understanding Operating System Services.
2. To familiarize with Process Management Techniques.
3. To familiarize with Memory Management Techniques.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the concepts of the operating systems.
2. outline the fundamental concepts and algorithms used in existing commercial operating systems.
3. demonstrate on various process scheduling algorithms and IPC.
4. summarize Operating System Components.
5. identify the different types of Operating System Services.
6. observe the Methods of trouble shooting.

Module 1: Introduction

Types of operating systems- Operating System Services: User Operating System Interface – System Calls – Types of System Calls – System Programs

Module 2: Operating System Implementation

Operating System Design and Implementation – Operating System Structure – Virtual Machines – Operating System Generation – System Boot.

Module 3: Processes

Processes: Process Concept – Process Scheduling – Operation on Processes – Interprocess Communication.

Module 4: CPU Scheduling

Basic concepts – Scheduling Criteria – Scheduling Algorithms – Thread Scheduling – Multiple Processor Scheduling – Algorithm Evaluation. Deadlocks: System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlock

Module 5: Memory Management

Memory management: Main Memory: Swapping – Contiguous memory Allocation – Paging – Structure of the Page Table – Segmentation. Virtual Memory: Demand Paging – Copy-on-Write - Page Replacement – Allocation of Frames – Thrashing – Memory-mapped Files – Allocating Kernel Memory.

Module 6: File System Implementation

File System Structure – File System Implementation – Directory Implementation –Allocation Methods – Free Space Management – Efficiency and Performance – Recovery – NFS. Mass Storage Structure: Overview of Mass Storage Structure – Disk Structure – Disk Attachment - Disk Scheduling – Disk Management – Swap-Space Management – RAID Structure – Stable-Storage Implementation.

Text Book:

Abraham Silberschatz, Galvin and Gagne, “Operating System Concepts”, Tenth Edition, 2018, Wiley.
 ISBN:9781119320913.

Reference Books:

1. A.M. Lister and R.D. Eager, “Fundamentals of Operating Systems”, Fifth Edition, Springer, 2013, ISBN: 1475722524 (Print) 978-1-4757-2252-9 (Online).
2. William Stallings, “Operating Systems Internals and Design Principles”, Sixth Edition, 2009, Pearson Prentice Hall, ISBN:0-13-600632-9.
3. Andrew S Tanenbaum and Albert S Woodhull, “Operating Systems Design and Implementation”, 3rd Edition, 2009, Prentice Hall Software Series, ISBN: ISBN-13:978-0131429383.
4. Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, “Operating Systems”, 3rd Edition, 2004, Pearson/Prentice Hall, ISBN-13:978-0131828278.

21CA2012	Introduction to Artificial Intelligence	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the foundations of artificial intelligence and machine learning algorithms.
2. To organize artificial intelligence based implementations for real life applications.
3. To summarize the concepts of neural networks.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the foundations of artificial intelligence.
2. analyze machine learning and deep learning algorithms.
3. apply artificial intelligence to solve real world problems.
4. implement artificial intelligence for solving problems.
5. outline the concepts of neural networks.
6. Illustrate the training of neural networks.

Module 1: AI Foundations

AI Foundations: Alan Turing and the Turing Test - The Brain is a Machine - Cybernetics - The origin Story - Golden Age of AI - AI Winter - The Rise and Fall of Expert Systems - Neural Networks and Deep Learning - Technological Drivers of Modern AI - Structure of AI - Data: Data Basics - Types of Data - Big Data - Databases and other Tools - Data Process - Ethics and Governance - Amount of Data needed for AI - Data Terms and Concepts.

Module 2: Machine Learning and Deep Learning

Machine Learning Basics - Standard Deviation - The Normal Distribution - Bayes Theorem - Correlation - Feature Extraction - Solution using Machine Learning - The Machine Learning Process - Applying Algorithms - Common Types of Machine Learning algorithms - Naive Bayes Classifier - k-Nearest Neighbor - Linear Regression - Decision Tree - Ensemble Modeling - K-means Clustering. Deep Learning: Difference between Machine Learning and Deep Learning - Deep Learning - The Brain and Deep Learning - Artificial Neural Networks - Backpropagation - The Various Neural Networks - Deep Learning Applications - Deep Learning Hardware - When to use Deep Learning - Drawbacks with Deep Learning.

Module 3: Robotic Process Automation and Natural Language Processing

Robotic Process Automation: Overview of RPA - Pros and Cons of RPA - What can you expect from RPA - How to implement RPA - RPA and AI - RPA in the Real World. Natural Language Processing: The Challenges of NLP - How AI Translates Language - Voice Recognition - NLP in the Real World - Voice Commerce - Virtual Assistants - Chatbots - Future of NLP. Physical Robots: Overview of Robots - Industrial and Commercial Robots - Robots in the Real World - Humanoid and Customer Robots - The Three Laws of Robotics - Cybersecurity and Robotics - Programming Robots for AI - The future of Robots.

Module 4: Implementation of AI

Implementation of AI: Approaches to implementing AI - The Steps for AI Implementation - Identifying a Problem to Solve - Forming the Team - The Right Tools and Platforms - Deploying and Monitoring the AI System. The Future of AI: Autonomous Cars - Technological Unemployment - The Weaponization of AI - Drug Discovery - AGI - Social Good.

Module 5: Basics of Neural Networks

Using Neural Networks to recognize handwritten digits: Perceptrons - Sigmoid Neurons - The architecture of neural networks - A simple network to classify handwritten digits - Learning with Gradient Descent - Toward Deep Learning

- Working of the Back Propagation Algorithm: A fast matrix-based approach to computing the output from a neural network - Assumptions about the Cost Function - The Hadamard Product - The four fundamental equations behind backpropagation.

Module 6: Training Neural Networks.

Improving the way Neural Networks learn: The Cross-Entropy Cost Function - Overfitting and Regularization - Weight Initialization - How to choose a Neural Networks Hyperparameters - Why Neural Networks are Hard to Train? : The vanishing Gradient Problem - Unstable gradients in deep neural nets - Other obstacles to deep learning.

Text Books:

1. Tom Taulli, “Artificial Intelligence Basics, Apress, 2019, ISBN-13: 978-1-4842-5028-0.
2. Michael Nielson, “Neural Networks and Deep Learning”, (Free online book)

Reference Books:

1. Ela Kumar, Artificial Intelligence, DreamTech Press, ISBN-13 : 978-9389795134.
2. Parag Kulkarni, Prachi Joshi, Artificial Intelligence, Building Intelligent Systems, PHI, ISBN-13 : 978-8120350465.
3. Dr. Nilakshi Jain, Artificial Intelligence: Making a System Intelligent, Wiley, ISBN-13 978 - 8126579945.
4. Anuradha Srinivasaraghavan, Vincy Joseph, Machine Learning, Wiley, ISBN-13 : 978 - 8126578511.
5. Madan Gopal, Applied Machine Learning, McGraw Hill Education, ISBN-13 : 978 - 9353160258.
6. Pablo Rivas, Laura Montoya, Deep Learning for Beginners, Packt Publishing Ltd, ISBN-13 : 978-1838640859.

21CA2013	Web Technology	L	T	P	C
		3	0	0	3

Course Objectives:

1. To create dynamic web pages using PHP.
2. To develop applications with the object oriented concepts.
3. To design and develop web application using MySQL.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the basics about PHP.
2. apply control flow statements in developing applications.
3. make use of object-oriented concepts.
4. plan how to secure user interfaces.
5. develop web application using database.
6. illustrate about the authentication.

Module 1: Introduction to PHP

Introduction to PHP 8 - three tier architecture- basic PHP 8 syntax- comments- variables- data types.

Module 2: Control flow statements

if statement-if-else -else if – switch statement- functions- include- require- arrays- multidimensional arrays- for loop- for each loop.

Module 3: Object Oriented Concepts

PHP Libraries, Extensions, classes and objects- creating classes and objects- creating PHP class- method- return method- set methods- get methods- constructor methods.

Module 4: Secured User Interface and Exception

Secured User interaction- form validation- filtering- additional html input security- select list box and radio button- validating input with an XML file- handling exceptions-logging exceptions

Module 5: Data Objects

Data class- MySQL and NoSQL data with MySQL 8+- backup and recovery-connecting the data tier.

Module 6: Authentication and Multifunctional Interfaces

Verification and sessions-Data handling using javascript.

Text Book:

1. Steve Prettyman, “Learn PHP 8 Using MySQL, JavaScript, CSS3 and HTML 5”, Apress publication, Second Edition, 2020, ISBN:9781484262405.

Reference Books

1. Jim Epp, “ Learn PHP 8: Using MySQL, JavaScript, CSS3 and HTML 5: Build a web application that interacts with a database”, Kailbec Publications,

2. Kogent Learning Solutions Inc., “HTML 5 Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and jQuery Black Book”, Dreamtech Press, Reprint 2013, ISBN: 978-93-5004-095-9.

21CA2014	Web Technology Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To create dynamic web pages using PHP.
2. To develop applications with the object oriented concepts.
3. To design and develop web application using MySQL.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the basics about PHP.
2. apply control flow statements in developing applications.
3. implement object-oriented concepts.
4. Understand how to secure user interfaces.
5. Develop web application using database.
6. Illustrate about the authentication.

List of Experiments

1. User Interface input validation
2. Control flow statements
3. Usage of Arrays
4. Class and Object
5. Array of Objects
6. Constructors
7. Inheritance
8. File manipulation
9. Session
10. Cookies
11. Database connectivity
12. Data handling

21CA2015	Full Stack Development	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the basics of Angular JS.
2. To develop Forms, inputs and Services.
3. To develop Directives and Databases.

Course Outcome:

After completion of this course, the students will be able to

1. create and bind controllers with Javascript.
2. apply filter in AngularJS application.
3. summarize Client Side MVC and SPA.
4. explore AngularJS Component and develop an AngularJS Single Page Application from scratch.
5. create Forms, validate and use filters, CRUD functions using AngularJS form.
6. construct Angular application with other Javascript libraries such as Node.js

Module 1: Introduction to JavaScript

JavaScript - Introduction, Variable, Value, Data type, Operators and Expressions, Arrays, Decision making and Loops, Functions, Variable Scope and Objects, The Browser Environment – BOM & DOM, Events and Event Handling.

Module 2: Full Stack Development Core Concepts

What is AngularJS?, Advantages of Angular, AngularJS MVC ,Introduction to SPA, Setting up the environment, First App using MVC architecture, Understanding ng attributes, Expression and Data Binding, Working with directives, Angular Modules , Controller, Scope and View ,Create Controller and Module, scope hierarchy.

Module 3: Filter, Forms and Ajax

Filters - Built-in filters - upper case and lower case filters, date ,currency and number formatting ,orderBy, filter ,custom filter, Angular JS Forms – Working with AngularJS forms, model binding, form controller ,Using CSS classes, form events ,custom model update triggers ,custom validation ,\$.http service ,Ajax implementation using \$.http

Module 4: Dependency Injection, Services ,Routing and Navigation

What is dependency injection?, Using dependency injection, Angular JS service – Understanding services , Using built-in service, Creating custom service, Injecting dependency in service, Routing – What is Routing?, Routing using ngRoute and UIRouter, ngView Directive, Configuring \$routeProvider ,\$stateProvider, Animating Angular App

Module 5: Introduction to Node.js

What is Node.js?, Features of Node.js, Setup Development Environment- Installing Node.js, Working with REPL, Node.js Console, Node.js Module, Node Package Manager,Node.js Basics, File System ,HTTP and HTTPS, Creating Web Server- Handling http request, Node.js Callbacks, Node.js Events, introduction to react.

Module 6: Database Connectivity

Promises, Express.js, Database Connectivity – Connecting to RDBMS and NoSQL database, Performing CRUD operations.

Text Book:

1. Brad Dayley, “Node.js, MongoDB, and AngularJS Web Development”, Addison – Wesley, 2017.

Reference Books:

1. Mastering HTML, CSS & Javascript Web Publishing Paperback – 15 Jul 2016, Laura Lemay, Rafe Colburn , Jennifer Kyrnin
2. Web Design with HTML, CSS, JavaScript and jQuery Set Paperback, Jon Duckett, 2014.
3. Angular J S, Programming by Example, Agus Kurniawan
4. Adam Freeman - ProAngular JS, Apress, First Edition, 2014.
5. AgusKurniawan, “AngularJS Programming by Example”, First Edition, PE Press, 2014.

21CA2016	Full Stack Development Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize the basics of Angular JS.
2. To develop Forms, inputs and Services.
3. To develop Directives and Databases.

Course Outcome:

After completion of this course, the students will be able to

1. create and bind controllers with Javascript.
2. apply filter in AngularJS application.
3. summarize Client Side MVC and SPA.
4. explore AngularJS Component and develop an AngularJS Single Page Application from scratch.
5. create Forms, validate and use filters, CRUD functions using AngularJS form.
6. integrate Angular application with other Javascript libraries such as Node.js

List of Experiments

1. Develop static pages (using only HTML) of an online Book store. The pages should resemble: www.amazon.com. The website should consist the following pages. Home page, Registration and user Login, User profile page, Bookscatalog, Shopping cart, Payment by credit card, order confirmation.
2. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
3. Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.
4. Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXTSHRINKING” in BLUE color. Then the font size decreases to 5pt.
5. Creating Node.js Application
6. Using Events, Listeners, Timers, and Callbacks in Node.js
7. Creating the RESTful Layer for Application
8. Setting Up AngularJS: Creating Single-Page Application

9. Securing RESTful API Using Spring Security
10. Consuming Secured RESTful Services Using AngularJS
11. Perform CRUD operations
12. Database connectivity

21CA2017	Computer Skills and Programming	L	T	P	C
		2	0	0	2

Course Objectives:

1. To summarize the basics of computing.
2. To make use of the idea of developing programming logic.
3. To apply C/C++ programming concepts.

Course Outcomes:

After completion of this course, the students will be able to

1. illustrate the basics of computers and programming.
2. summarize the basics of C programming.
3. summarize about character sets and data types.
4. apply control structures in programming.
5. explore object-oriented features.
6. summarize the basics of C++ concepts.

Module 1: Introduction to Programming

Computers- classification of computers- numbers- system software- software life cycle- algorithms-flowcharts-pseudocode-structured programming-compilers-operating systems- standard Input and Output Devices.

Module 2: Variables and Expressions

Character set-identifiers and keywords-variables-displaying variables-characters and character strings-qualifiers-typedef statements-constants-operators and expressions.

Module 3: Control Structures

Introduction – if statement- if else statement-multiway decisions- switch-Loops- for loop-while loop- do.. while - break, continue, goto Statements.

Module 4: Functions

Introduction- Function main- Function accepting more than one parameter- user defined and library function- function parameter- return value – recursion.

Module 5: Object Oriented Concepts

Introduction to Object Oriented Programming- Features- Objects and Classes.

Module 6: Advanced Object-Oriented Concepts

Inheritance- Polymorphism – Operator Overloading virtual functions.

Text Books:

1. K. R. Venugopal,” Mastering C”, McGraw Hill Education, second edition, 2016, ISBN: 9789332901278.
2. Robert Lafore,” Object Oriented Programming with C++”, Pearson Education, Fourth Edition, 2020, ISBN:9788131722824.

Reference Books:

1. Herbert Schildt, “The Complete Reference C”, McGraw Hill Education, 4th Edition, 2017, ISBN: 9780070411838.
2. Stephen G. Kochan, “Programming in C”, Pearson Education, 4th Edition, 2015, ISBN: 9789332554665.
3. Brain W. Kernighan, Dennis Ritchie,” The C Programming Language”, Pearson Publications, 2015, ISBN: 9332549443.
4. K. R. VenuGopal, Rajkumar Buyya, “Mastering C++”, McGraw Hill Education,2013, ISBN:9781259029943.
5. Stanley B. Lippman, Josee Lajoie, Barbara Moo, “C++ Primer”, Addison Wesley Professional, Fifth Edition, 2012, , ISBN:9780321714114.
6. Stanley B. Lippman, Josee Lajoie, Barbara Moo, “C++ Primer”, Addison Wesley Professional, Fifth Edition, 2012, ISBN: 978-0321714114.

21CA2018	Computer Skills for Basic Sciences Lab	L	T	P	C
		0	0	1	1

Course Objectives:

1. To summarize the basics of programming.
2. To make use of idea of developing program.
3. To apply C/C++ programming concepts.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the basics of C programming.
2. summarize about character sets and data types.
3. apply control structures in programming.
4. explore modular programming.
5. explore object-oriented features.
6. apply inheritance concepts.

List of Experiments:

1. Input Output Statements
2. Decision Control Structures
3. Looping structure
4. Functions
5. Class and Objects
6. Inheritance

21CA2019	Fundamentals of Programming	L	T	P	C
		2	0	0	2

Course Objectives:

1. To explore the essence of computational problem solving.
2. To summarize python programming concepts.
3. To examine the collections in python.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize about computational problem solving.
2. summarize the basics about python programming.
3. demonstrate the use of control flow statements in python.
4. develop modules for reusability of code.
5. summarize the concepts of file.
6. infer the concept of collections in python.

Module 1: Introduction to Computational problem solving

What is computer science? - The essence of computational problem solving- Computer Algorithms- Computer Hardware- Computer Software – syntax, semantics, and program translation-program debugging-The process of computational problem solving.

Module 2: Basics about Python Programming

The python programming language- Data and expressions: fundamental concepts-variables and identifiers- Operators- expressions and data types.

Module 3: Control Structures

Control structures: fundamentals concepts- Boolean Expressions- selection control- Iterative control structure.

Module 4: Functions

Modules- Python modules- modules and namespaces-importing modules-module loading and execution-local, global and built-in namespaces in python.

Module 5: File

Text file – using text files- opening text files- reading text files- writing text files- string methods.

Module 6:

Collections- list – set – dictionary.

Text Book:

Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem -Solving Focus”, Wiley, 2013, ISBN: 9780470555156.

Reference Books:

1. John V. Guttag, "Introduction to Computation and Programming using python", MIT press Cambridge, 2013, ISBN: 978-0-262-525008.
2. R. Nageswari Rao, "Core Python Programming", Dreamtech, 2018, ISBN: 9789386052308.
3. Jeeva Jose, "Taming Python Programming", Khanna Publishing, 2019, ISBN: 9789386173348.
4. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and problem solving with python", McGrawHill, 2018, ISBN:9789387067578.
5. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford Higher Education, 2017, ISBN: 9780199480173.

21CA2020	Fundamentals of Programming Lab	L	T	P	C
		0	0	1	1

Course Objectives:

1. To explore the essence of computational problem solving.
2. To summarize python programming concepts.
3. To examine the collections in python.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize about computational problem solving.
2. summarize the basics about python programming.
3. demonstrate the use of control flow statements in python.
4. develop modules for reusability of code.
5. summarize the concepts of file.
6. infer the concept of collections in python.

List of Experiments

1. Decision making statements
2. Iterative statements
3. Functions
4. File handling
5. Collections
6. GUI application

21CA2021	Computer Programming for Basic Sciences	L	T	P	C
		4	0	0	4

Course Objectives:

1. To explain about python programming concepts.
2. To acquire knowledge on data analysis library.
3. To summarize about chempy library

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the basics about computers.
2. Illustrate the fundamentals of programming.
3. demonstrate the use of control flow statements in python.
4. explore data preprocessing techniques.
5. interpret the data by visualization.
6. explore chempy library

Module 1: Computer Fundamentals

Introduction and characteristics – evolution of computers-generation of computers-classification of computers- basic computer organization- hardware and software-operating system-Computer software: Types of computer software-application software packages-office software packages-software development steps-Evolution of Internet- uses of Internet- Application of the Internet- algorithm-flowchart-pseudo code-compiler, interpreter-loader-linker.

Module 2: Fundamentals of Programming

Basic Features of Python-Basics of python programming: Basic Syntax- Declaring variables and assigning values-basic operators in python-python comments-formatting strings- conversion types-replacement field-Date and Time module-python calendar module.

Module 3: Programming Techniques

Selection statements- iteration statements- use of break, continue and pass statements, string processing-tabular data and data formats-pandas data science library-lambdas and numpy library-data cleaning and manipulation techniques-series-data frames

Module 4: Data Analysis

Series-data frames- Data Gathering and Cleaning: cleaning data- reading and cleaning csv data- merging and integrating data-Data Exploring and Analysis: Series Data Structures- Data frame data structures.

Module 5: Visualization

Data analysis – Data Visualization: Direct Plotting-Seaborn plotting system-matplotlib plot.

Module 6: Working with Chempy library

Chempy library- List of elements and mass- reaction -Parsing formula- working with units-

Reference Books:

1. Dr. Ossama Embark, “Data Analysis and Visualization using python”, Apress publications, 2018, ISBN:9781484241080
2. Pradip dey, Manas Ghosh, “ Fundamentals of Computing and Programming in C”,Oxford University Press, 2014, ISBN:9780198061175.
3. Phuong Vo. T. H, Martin Czygan, Ashish Kumar, Kirthi Raman, “Python: Data Analytics and Visualization, Packt Publishing Ltd, 2017, ISBN: 9781788290098
4. Matt Harrison, “Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization, O'Reilly, 2016, ASIN: B01GIE03GW.
5. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, O'Reilly Media, 2012, ISBN: 9789352136414.
6. Online Resources <https://pypi.org/project/chempy/>

21CA2022	Computer Programming for Basic Sciences Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To explain about python programming concepts.
2. To acquire knowledge on data analysis library.
3. To summarize about chempy library

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the basics about computers.
2. illustrate the fundamentals of programming.
3. demonstrate the use of control flow statements in python.
4. explore data preprocessing techniques.
5. interpret the data by visualization.
6. explore chempy library

21CA2023	Fundamentals of Logics in Programming	L	T	P	C
		2	0	0	2

Course Objectives:

1. To summarize the basics of computers and programming.
2. To solve problems using modular programming.
3. To apply modern programming concepts.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the basics of computers and programming.
2. solve problems using programming control structures.
3. analyze problems and represent solutions using modular programming.
4. organize and process data using different data structures.
5. apply programming skills to solve problems.
6. illustrate the importance of modern programming concepts.

Module 1: Introduction to Computers and Programming

An Overview of Computers and Programming: Computer Systems - Simple Program Logic - Program Development Cycle - Pseudocode Statements and Flowchart Symbols - Sentinel Value - Programming and User Environments - Evolution of Programming Models. Elements of High Quality Programs: Variables and Constants - Arithmetic Operations - Modularizing a Program - Advantages - Features of Good Programming Design.

Module 2: Conditional Control Structures

Understanding Structure: Disadvantages of Unstructured Spaghetti Code - The Three Basic Structures - Using a Priming Input to Structure a Program - Understanding the Reasons for Structure - Recognizing Structure - Structuring and Modularizing Unstructured Logic. Making Decisions: Boolean Expressions and the Selection Structure - Using Relational Comparison Operators - Understanding AND Logic - Understanding OR Logic - Understanding NOT Logic - Making Selections within Ranges - Understanding Precedence When Combining AND and OR Operators.

Module 3: Iteration Structures

Looping: Advantages of Looping - Using a Loop Control Variable - Nested Loops - for loop - Common Loop Applications.

Module 4: Modular Programming and Functions

Modularization: Parts of a Method - Methods with no Parameters - Methods that require Parameters - Methods that return a Value - Passing Arrays to methods - Overloading methods - Predefined Methods - Method Design Issues - Recursion.

Module 5: Arrays

Arrays: Storing Data in Arrays - How an Array Can Replace Nested Decisions - Using Constants with Arrays - Searching an Array for an Exact Match - Parallel Arrays - Array Bounds - Processing and Array.

Text Book:

1. Joyce Farrell, Programming Logic and Design, Eighth Edition, Cengage Learning, ISBN: 978-1-285-77671-2.

Reference Books:

1. Joakim Wassberg, "Computer Programming for Absolute Beginners", Packt Publishing, 2020, ISBN-13: 978-1839216862.
2. Nathan Clark, "Computer Programming for Beginners: Fundamentals of Programming Terms and Concepts", CreateSpace Independent Publishing Platform, 2018, ISBN-13: 978-1719439558.
3. Peter J. Denning, Matti Tedre, "Computational Thinking", MIT Press, 2019 ISBN-13: 978-0262536561.
4. Matthias Felleisen, Robert Bruce Findler, Matthew Flatt, "How to Design Programs: An Introduction to Programming and Computing", The MIT Press, 2001, ISBN-13: 978-0262062183.
5. H. Scott Fogler, Steven E LeBlanc, Benjamin Rizzo, "Strategies for Creative Problem Solving", 2008, ISBN-13: 978-0133091663.

21CA3001	Knowledge Representation	L	T	P	C
		4	0	0	4

Course Objectives:

1. To explain the basics about Knowledge Representation.
2. To design and apply knowledge based system.
3. To summarize the complexity of algorithms for representing knowledge.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize knowledge representation
2. inspect about the resolution
3. explore to generate rules in production.
4. summarize about object-oriented representation.
5. illustrate inheritance networks.
6. illustrate degree of belief and diagnosis.

Module 1: Introduction to Knowledge Representation

Key concepts Knowledge, Representation and Reasoning-Why Knowledge Representation and Reasoning? The Role of Logic- The language of first order logic: Introduction- The Syntax-The semantics- The pragmatics- Explicit and implicit belief- Knowledge Engineering- Vocabulary- Basic Facts- Complex Facts-Technological Facts- Entailments- Abstract Individuals- Other Sorts of Facts.

Module 2: Resolution and Reasoning

The propositional Case-Handling Variables and Quantifiers- Dealing with Computational Intractability-Horn Clauses- SLD resolution- computing SLD Derivations-Facts and Rules- Rule Formation and Search Strategy- Algorithm Design-Specifying Goal Order-committing to proof methods-controlling backtracking-Negation as future-Dynamic Databases.

Module 3: Rules in production

Production System: Basic Operations- Working memory- Production Rules- examples-Conflict Resolution- Making production system more effective- Application and Advantages-significant production rule system.

Module 4: Object Oriented Representation

Objects and Frames- Basic Frame Formalism- using Frame to plan a trip-Beyond the basics- Descriptions- Meaning and Entailment- Computing Entailments- Taxonomies and Classification-Beyond the basics.

Module 5: Inheritance Networks and Defaults

Inheritance Networks- Strategies for Defeasible Inheritance- A formal account of Inheritance Network- Defaults introduction- Closed World Reasoning- Circumscription- Default Logic- Autoepistemic logic

Module 6: Degree of Belief and Diagnosis

Noncategorical Reasoning- objective Probability- Subjective Probability- Vagueness-Diagnosis- Example- situation calculus- solution to frame problem- complex actions- STRIPS Representation-planning as a Reasoning Task.

Text Book:

1. Ronald J. Brachman, Hector J. Levesque, "Knowledge Representation and Reasoning", Elsevier, 2004, ISBN:558609326.

Reference Books:

1. Emilia Mendes, "Practitioner's Knowledge Representation -A Pathway to Improve Software Effort Estimation", Springer, 2014, ISBN: 9783642541568.
2. Michael Gelfond, Yulia Kahi, "Knowledge Representation, Reasoning, and the Design of Intelligent Agents", Cambridge University Press, 2014, ISBN: 9781107029569.
3. Lucja M. Iwariska and Stuart C. Shapiro, "Natural Language Processing and Knowledge Representation- Language for Knowledge and Knowledge for Language", AAAI Press/MIT Press,2000, ISBN: 9780262590211.

21CA3002	Python for Data Science	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the data structures in python.
2. To explore data preprocessing techniques.
3. To develop models using numpy and pandas library.

Course Outcome:

After completion of this course, the students will be able to

1. apply various data structures to effectively manage various type of data.
2. explore various steps of data science pipeline with role of python
3. design applications applying various operations for data cleaning and transformation.
4. demonstrate about data wrangling.
5. explore data to solve data science problems.
6. make use of various data visualization tools for effective interpretations and insights of data.

Module 1: Overview of python and data structure

Basics of python data types – variables-expressions - objects – functions- python data structures – strings- list – tuple -set -dictionary

Module 2: Introduction to Data Processing

Introduction- Python Libraries- Data Representation- Data Cleaning - Data Integration – Data Transformation – Data in Different Scales- Data Discretization-Train and Test Data –Supervised Learning, Unsupervised Learning- Reinforcement Learning- Performance Metrics

Module 3: Data Analysis and Libraries

Python libraries in Data Analysis- NumPy Arrays and Vectorized Computation: Numpy Arrays- Array functions - Data processing using Arrays

Module 4: Data Analysis with Pandas

An overview of the pandas package- The Pandas data structure- The essential basic functionality- Indexing and Selecting data- Working with missing data- Advanced uses of pandas and data analysis TimeSeries

Module 5: Data Wrangling

Subsetting a dataset- Generating random numbers and their usage-Generating random numbers following probability distributions- Grouping the data

Module 6: Data Visualization

Data Visualization: The Matplotlib API primer, Exploring plot types, Legends and annotations, Plotting functions with pandas, Case Studies: Modelling stock market data, Driving visual analyses with automobile data.

Text Books:

1. Rohan Chopra, Aaron England and Mohammed Noordeen Alaudeen, “Data Science with python”, Packt publishers, 2019, 9781838552862.
2. Phuong Vo. T. H, Martin Czygan, Ashish Kumar, Kirthi Raman, “Python: Data Analytics and Visualization, Packt Publishing Ltd, 2017, ISBN: 9781788290098.

Reference Books:

1. Dr. Ossama Embark, “Data Analysis and Visualization using python”, Apress publications, 2018, ISBN:9781484241080
2. Fabio Nelli, “Python Data Analytics”, Apress publication, 2015, ISBN:9781484209592.
3. Wes McKinney, “Python for Data Analysis Data Wrangling with pandas, Numpy, and ipython”, O’Reilly,2018, 9781491957660
4. Jesus Rogel-Salazar, “Data Science and Analytics with Python”, CRC Press, ISBN: 9781498742092,
5. Alberto Boschetti, Luca Massaron, “Python Data Science Essentials- Third Edition, Packt, 2018, ISBN: 9781789537864.
6. David Taieb, “Data Analysis with Python”, Packt, 2018, ISBN: 9781789950069

21CA3003	Data Science with Python Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To identify data preprocessing techniques.
2. To compare various data analysis processes.
3. To develop models using numpy and pandas library in python.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the basics of python programming.
2. make use of data preprocessing techniques.
3. analyze data using numpy.
4. demonstrate about data wrangling
5. explore data to solve data science problems.
6. interpret the data by visualization.

List of Experiments:

1. Employee details using List
2. Data Analysis using Sets
3. Data Preprocessing
4. Array Manipulations using numpy
5. Exploratory Data Analysis using Pandas
6. Cross Tabulations using Pandas
7. Time Series Analysis
8. House Price Prediction
9. Natural Language Processing
10. Weather Forecasting
11. Graphical Representation using matplotlib and seaborn
12. Analysis of Geospatial data

21CA3004	Big Data Architecture	L	T	P	C
		3	0	0	3

Course Objective:

1. To gain experience about Big Data and Understand the big data characteristics and challenges.
2. To summarize about Hadoop and Learn the basics of MapReduce paradigms.
3. To apply various features of Hive and Learn the core techniques of processing big data.

Course Outcome:

After completion of this course, students will be able to

1. summarize the fundamental of Big Data.
2. make use of existing big data techniques/tools
3. explain the concepts of Hadoop
4. illustrate the role of mapreduce programming in various scenarios
5. develop solutions to problems using Big Data
6. make use of the knowledge about MongoDB

Module 1: Introduction to Big Data

Types of Digital Data-Classification of Digital Data- Big Data and its importance – Sources of Big Data – Characteristics of Big Data – Challenges with big data - What is big data- Why big data - Big Data Analytics – Big Data Applications Apply Big Data to solve real world problems

Module 2: Introduction to Hadoop and Hadoop Architecture

Why Hadoop- Why not RDBMS- RDBMS versus Hadoop- Distributed Computing Challenges- History of Hadoop – Hadoop Overview – Use case of Hadoop- Hadoop Distributors – HDFS- Processing Data with Hadoop- Mapping Resources and Applications with Hadoop

Module 3: Hadoop Ecosystem and MapReduce Programming

Hadoop Ecosystem Concepts – Schedulers – New Features of Hadoop 2.0 – Name Node High Availability – HDFS Federation – YARN – Use Cases. Map Reduce Paradigm – Moving Data in and out of Hadoop – Understanding inputs and outputs of Map Reduce – Data Serialization - Mapper – Reducer – Combiner –Partitioner – Searching – Sorting – Compression

Module 4: No SQL databases: Mongo DB

Introduction – Features - Data types - Mongo DB Query language - CRUD operations – Arrays - Functions: Count – Sort – Limit – Skip – Aggregate - Map Reduce. Cursors – Indexes - Mongo Import – Mongo Export.

Module 5: Hive, HiveQL and HBase

Hive – Architecture - data type - File format – HQL – SerDe - User defined functions - Sorting and Merging – Joins and Subqueries – HBase Concepts – Schema Design – Advanced Indexing – Use cases.

Module 6: Apache Pig

Introduction, Parallel processing using Pig, Pig Architecture, Grunt, Pig Data Model-scalar and complex types. Pig Latin- Input and output, Relational operators, User defined functions. Working with scripts. Illustrate the role of mapreduce programming in various scenarios

Text Book:

1. Seema Acharya, Subhashini Chellappan, “Big data and Analytics”, First Edition, Wiley, 2016, ISBN: 978-8126554782.

Reference Books:

1. Anil Maheshwari, “Big Data Made Accessible”, McGrawHill Education Publication, 2017, ISBN: 978-9352604548.
2. AlanGates, “Programming Pig Data flowScripting with Hadoop”, O’Reilly Media, Inc, 2011 ISBN-13: 978-1449302641
3. Sandeep Karanth, “Mastering Hadoop”, First Edition, Packt Publishing, 2014, ISBN: 978-1783983643.
4. Prajapati, V., “*Big data analytics with R and Hadoop*”, Packt Publishing Ltd, 2013, ISBN: 9781782163282
5. Min Chen, Shiwen Mao, Yin Zhang, Victor C.M. Leung, “Big Data: Related Technologies, Challenges and Future Prospects”, Springer; 2014 edition.

21CA3005	Big Data Architecture Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize business decisions and create competitive advantage with Big data analytics.
2. To elaborate the architectural concepts of Hadoop and introducing map reduce paradigm.

3. Implement best practices for Hadoop development.

Course Outcomes:

After completion of this course, students will be able to

1. understand and apply the Perform setting up and Installing Hadoop
2. understand Map Reduce Paradigm
3. implement the file management tasks in Hadoop.
4. apply Map Reduce program that mines weather data
5. understand Pig Latin scripts sort, group, join, project, and filter your data
6. apply Hive to create, alter, and drop databases, tables, views, functions, and indexes.

List of Experiments:

1. Installation of Hadoop
2. File Management tasks in Hadoop
3. Word Count Map Reduce program to understand Map Reduce Paradigm
4. Write a Map Reduce program that mines weather data.
5. To study and implement basic functions and commands in R Programming.
6. Installation of HIVE.
7. Hive Databases, Tables, Views, Functions and Indexes
8. Installation of PIG.
9. Pig Latin Scripts to find Word Count
10. Write Pig Latin scripts to sort, group, join, project, and filter your data.
11. Installation of MongoDB.
12. To perform NoSQL database using mongodb to create, update and insert.

21CA3006	Cloud Computing	L	T	P	C
		4	0	0	4

Course Objectives:

1. To summarize the cloud computing platforms.
2. To explain cloud infrastructure, services and applications.
3. To illustrate various applications of cloud computing.

Course Outcomes:

After completion of this course, the students will be able to

1. illustrate the basic concepts of cloud computing.
2. outline the cloud computing platforms.
3. utilize cloud services and applications.
4. summarize the cloud infrastructure.
5. make use of cloud applications.
6. illustrate mobile cloud applications.

Module 1: Overview of cloud computing

Defining Cloud Computing: Definition of cloud computing - Cloud Types - Characteristics of Cloud computing - Role of Open Standards. Cloud Architecture: Exploring the Cloud Computing Stack - Connecting to the Cloud. Services and Applications: Infrastructure as a Service - Platform as a Service - Software as a Service - Identity as a Service - Compliance as a Service.

Module 2: Cloud Computing Platforms

Abstraction and Virtualization: Using Virtualization Technologies - Load Balancing and Virtualization - Understanding Hypervisors - Machine Imaging - Porting Applications. Capacity Planning: Baseline and Metrics - Network Capacity - Scaling.

Module 3: Services and Applications

Exploring Platform as a Service: Defining Services - PaaS Application Frameworks - Google Web Services: Exploring Google Applications - Surveying the Google Application Portfolio - Exploring the Google Toolkit - Google App Engine. Amazon Web Services: Understanding Amazon Web Services - AWS Components and Services - Elastic Compute Cloud - Amazon Storage Systems - Amazon Database Services. Microsoft Cloud Services: Exploring Microsoft Cloud Services - Windows Azure Platform - Windows Live.

Module 4: Cloud Infrastructure

Managing the Cloud: Administering the Clouds - Cloud Management Products - Emerging Cloud Management Standards - Cloud Security: Securing the Cloud - Securing Data - Establishing Identity and Presence. Service Oriented

Architecture: Introduction to Service Oriented Architecture - Defining SOA Communications - Managing and Monitoring SOA - Relating SOA and Cloud Computing.

Module 5: Cloud Applications

Moving Applications to the Cloud: Applications in the Clouds - Applications and Cloud APIs. Webmail Services: Cloud Mail Services - Syndication Services - Communicating with the Cloud: Instant Messaging - Collaboration Technologies - Social Networks. Media and Streaming: Streaming Process - Audio Streaming - VoIP Applications - Video Streaming.

Module 6: Mobile Cloud

Mobile Cloud: Working with Mobile Devices - Defining the Mobile Market - Using Smartphones with the Cloud. Mobile Web Services: Service Types - Service Discovery - Using SMS - WAP and other Protocols - Synchronization.

Text Book:

1. Barrie Sosinsky, Cloud Computing Bible, Wiley, ISBN: 978-0-470-90356-8.

Reference Books:

1. Anthony T Velte, Toby J Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", First Edition, 2017, McGraw Hill, ISBN: 978-0-07-162695-8.
2. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, McGraw Hill, ISBN-13 : 978-1259029950.
3. Sarishma Abhirup Khanna, Mobile Cloud Computing: Principles and Paradigms,

21CA3007	Data Visualization Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize the basics of data visualization.
2. To apply data analytics to massive datasets.
3. To extract insights from data with the help of visualization.

Course Outcomes:

After learning the course, students will be able to

1. build the data.
2. visualize the data using charts.
3. make use of the data for effective analysis.
4. explore insights from past data.
5. create dashboard.
6. apply insights and forecast for the future.

List of Experiments:

1. Handling Data Sources.
2. Handling Worksheets.
3. Calculations using Operators and Functions.
4. Sorting
5. Filter Operations
6. Data Visualization using Charts
7. Bubble Chart
8. Box Plot.
9. Gantt Charts
10. Motion Charts and Waterfall Charts.
11. Dashboard.
12. Forecasting and Trendlines

21CA3008	Artificial Intelligence Techniques	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the foundations of artificial intelligence
2. To organize artificial intelligence based implementations for real life applications.
3. To summarize the concepts of logic programming.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the foundations of artificial intelligence.
2. analyze machine learning algorithms.
3. make use of predictive analytics and ensemble learning.
4. make use of intelligence for solving problems.
5. outline the concepts of logic programming and heuristic searching.
6. illustrate the concepts of speech recognizer.

Module 1: Introduction to AI

What is Artificial Intelligence?- Why do we need to study AI?- Applications of AI- Branches of AI- Defining intelligence using Turing test- making machines think like humans-building rational agents-general problem solver-solving a problem with GPS- building an intelligent agent-types of modes-python packages- loading data.

Module 2: Supervised Learning

Supervised vs unsupervised learning- What is classification?- preprocessing data: Binarization, mean removal, scaling, normalization, label encoding- Logistic regression classifier-Naïve Bayes classifier- confusion matrix-support vector machines-what is regression-building a single variable regressor-building a multivariable regressor-

Module 3: Predictive analytics with ensemble learning

What is ensemble learning? -building learning models with ensemble learning-What are decision trees- building a decision tree classifier- what are random forests and extremely random forests-

Module 4: Unsupervised learning

Detecting patterns with unsupervised learning- what is unsupervised learning? Clustering data with K-means algorithm- Estimating the number of clusters with mean shift algorithm- estimating the quality of clustering with silhouette scores- what are gaussian mixture models-building a classifier based on gaussian mixture models-

Module 5: Logic Programming and Heuristic Search Techniques

Logic Programming- understanding the building blocks of logic programming-solving problems using logic programming-Heuristic search techniques- What is heuristic search? constraint satisfaction problems-local search techniques-constructing a string using greedy search.

Module 6: Probabilistic Reasoning and speech recognizer

Probabilistic reasoning for sequential data-understanding sequential data-handling time series data with pandas-slicing time series data- operating on time series- extracting statistics from time series- generating data using hidden markov models-building a speech recognizer-working with speech signals-visualizing audio signals-transforming audio signals to the frequency domain-generating audio signals.

Text Book:

Prateek Joshi, “Artificial Intelligence with python”, packt publisher, 2017, ISBN: 9781786464392.

Reference Books:

1. Ben Auffarth, “Artificial Intelligence with python Cookbook”, Packt publisher, 2020, ISBN: 9781789133967.
2. Alberto Artasanchez, Prateek Joshi,”Artificial Intelligence with python”, Packt publisher, 2020, ISBN:9781839219535.
3. Jim smith,” AI with Python for Beginners”, 2019, ISBN:9781086337686.
4. Dennis Rothman, Matthew Lamons, Rahul Kumar,” Python: Beginner’s guide to Artificial Intelligence”, Packt publisher, 2018, ISBN:9781789957327.
5. Chris Baker ,”Artificial Intelligence: Learning automation skills with python “, Mikan Ltd, ISBN: 9781914063206.

21CA3009	Artificial Intelligence Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To understand the foundations of artificial intelligence.
2. To organize artificial intelligence-based implementations for real life applications.
3. To summarize the concepts of speech recognizer.

Course Outcomes:

After completion of this course, the students will be able to

1. implement data preprocessing steps.
2. analyze machine learning algorithms.

3. implement predictive analytics and ensemble learning.
4. implement artificial intelligence for solving problems.
5. outline the concepts of logic programming and heuristic searching.
6. Illustrate the concepts of speech recognizer.

List of Experiments:

1. Data Preprocessing
2. Weather forecasting
3. Traffic Prediction
4. Logic Programming
5. Spam Detector
6. Ensemble learning
7. Text Classification
8. Heuristic Search
9. Speech Recognizer
10. Analyzing Timeseries Data
11. Natural Language Processing
12. Predictive Analysis

21CA3010	Multivariate Techniques for Data Analytics	L	T	P	C
		4	0	0	4

Course Objectives:

1. To learn about multivariate Data and Discriminant Analysis.
2. To familiarize on Classification and Principal Component Analysis.
3. To recite about Factorization and Graphical procedures

Course Outcomes:

After completing the course, the students will be able to

1. understand about multivariate analysis.
2. develop Multivariate Models.
3. acquire knowledge about discriminant analysis.
4. categorize about classification and principal component analysis.
5. outline about factor analysis.
6. illustrate about graphical procedures.

Module 1: Multivariate Data

Introduction - Why Multivariate Analysis?, - Basic Types of Data and Analysis, - **Characterizing and Displaying Multivariate Data** - Mean and Variance of a Univariate Random Variable- Covariance and Correlation of Bivariate Random Variables- Covariance – Correlation - Scatter Plots of Bivariate Samples - Graphical Displays for Multivariate Samples- Mean Vectors - Covariance Matrices - Correlation Matrices - Mean Vectors and Covariance Matrices for Subsets of Variables - Two Subsets - Three or More Subsets - Linear Combinations of Variables - Sample Properties - Population Properties - Measures of Overall Variability - Estimation of Missing Values - Distance between Vectors.

Module 2: Discriminant Analysis

Discriminant Analysis: Description of Group Separation - Introduction, The Discriminant Function for Two Groups, Relationship between Two-Group Discriminant Analysis and Multiple Regression - Discriminant Analysis for Several Groups - Discriminant Functions - A Measure of Association for Discriminant Functions - Standardized Discriminant Functions- Tests of Significance - Tests for the Two-Group Case - Tests for the Several-Group Case - Interpretation of Discriminant Functions - Standardized Coefficients - Partial *F*-Values - Correlations between Variables and Discriminant-Functions – Rotation - Scatter Plots- Stepwise Selection of Variables.

Module 3: Classification Analysis

Classification Analysis: Allocation of Observations to Groups - Introduction - Classification into Two Groups - Classification into Several Groups - Equal Population Covariance Matrices: Linear Classification Functions - Unequal Population Covariance Matrices: Quadratic Classification Functions - Estimating Misclassification Rates - Improved Estimates of Error Rates - Partitioning the Sample - Holdout Method - Subset Selection- Nonparametric Procedures - Multinomial Data - Classification Based on Density Estimators - Nearest Neighbor Classification Rule

Module 4: Principal Component Analysis

Principal Component Analysis - Introduction - Geometric and Algebraic Bases of Principal Components - Geometric Approach - Algebraic Approach - Principal Components and Perpendicular Regression- Plotting of Principal Components - Principal Components from the Correlation Matrix - Deciding How Many Components to Retain - Information in the Last Few Principal Components- Interpretation of Principal Components - Special Patterns in **S** or **R** - Rotation - correlations between Variables and Principal Components - Selection of Variables

Module 5: Factor Analysis

Factor Analysis- Introduction - Orthogonal Factor Model - Model Definition and Assumptions - Nonuniqueness of Factor Loadings - Estimation of Loadings and Communalities - Principal Component Method- Principal Factor Method - Iterated Principal Factor Method - Maximum Likelihood Method - Choosing the Number of Factors, m , - Rotation - Introduction - Orthogonal Rotation - Oblique Rotation - Interpretation - Factor Scores - Validity of the Factor Analysis Model - The Relationship of Factor Analysis to Principal Component Analysis.

Module 6: Graphical Procedures.

Graphical Procedures - Multidimensional Scaling - Introduction - Metric Multidimensional Scaling - Nonmetric Multidimensional Scaling - Correspondence Analysis – Introduction - Row and Column Profiles - Testing Independence - Coordinates for Plotting Row and Column Profiles, - Multiple Correspondence Analysis - Biplots - Introduction, Principal Component Plots, Singular Value Decomposition Plots, Coordinates, Other Methods.

Text Book:

1. Alvin C. Rencher, William F. Christensen, Methods of Multivariate Analysis, Wiley Interscience, ISBN: 978-0-470-17896, 2012

Reference Books:

1. Theodore W Anderson, 'An Introduction to Multivariate Statistical Analysis', Wiley, ISBN: 978-0-471-36091, 2003
2. Johnson, 'Applied Multivariate Statistical Analysis', PHI, ISBN: 9781292024943, 2013.
3. Alan J. Izenman, 'Modern Multivariate Statistical Techniques: Regression, Classification and Manifold Learning', Springer, ISBN: 978-0387781884, 2013.
4. Hardle, Wolfgang Karl, Hlávka, Zdeněk, 'Multivariate Statistics', Springer, ISBN: 978-3-642-36005-3, 2015.
5. Joseph F. Hair (Author), Rolph E. Anderson (Author), Ronald L. Tatham (Author), William C. Black, 'Multivariate Data Analysis: With Readings, Pearson College Div, ISBN: 978-0139133107, 2013.
6. James M. Lattin, 'Analyzing Multivariate Data', South Western, ISBN: 9788131503232, 2013.
7. Robert ho, Handbook of Univariate and Multivariate Data Analysis with IBM SPSS, Chapman and Hall/CRC, ISBN 9780367372576, 2013,
8. Joseph F Hair, William C Black, 'Multivariate Data Analysis', Pearson Education, ISBN: 0138132631, 2013.

21CA3011	Human Computer Interaction	L	T	P	C
		3	0	0	3

Course Objectives:

1. To outline the foundations of HCI.
2. To summarize the design process.
3. To illustrate communication interface.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the fundamental of HCI.
2. illustrate the concepts of interactions.
3. explore design process.
4. apply design principles.
5. demonstrate the design models.
6. illustrate communication interface.

Module 1: Foundations of HCI

The Human: Introduction - Input-Output Channels - Human Memory - Thinking: Reasoning and Problem Solving - Emotion - Individual Differences - Psychology and the design of Interactive Systems. The Computer: Introduction - Text entry devices - Positioning, Pointing and Drawing - Display Devices - Devices for Virtual Reality and 3D

Interaction - Physical Controls, Sensors and Special Devices - Paper: Printing and Scanning - Memory - Processing and Networks.

Module 2: Fundamentals of Interaction

The Interaction: Introduction - Models of Interaction - Ergonomics - Interaction Styles - Elements of the WIMP Interface - Interactivity. Paradigms: Paradigms for Interaction.

Module 3: Design Process

Interaction Design Basics: Introduction to Design - The Process of Design - User Focus - Navigation Design - Screen Design and Layout - Iteration and Prototyping. HCI in the software process : The Software Lifecycle - Usability Engineering - Iterative Design and Prototyping - Design Rationale.

Module 4: Design Principles

Implementation Support: Elements of Windowing Systems - Programming the Application - Using toolkits - User Interface Management Systems. Universal Design: Universal Design Principles - Multi-modal Interaction - Designing for Diversity.

Module 5: Design Models

Cognitive Models: Goal and Task Hierarchies - Linguistic Models - The Challenge of Display-based Systems - Physical and Device Models - Cognitive Architectures. Communication and Collaboration Models: Face-to-face Communication - Conversation - Text-based Communication - Group Working. Dialog Notations and Design: What is Dialog? - Dialog Design Notations - Diagrammatic Notations - Textual Dialog Notations.

Module 6: Advanced Interfaces

Groupware: Groupware Systems - Computer-mediated Communication - Meeting and Decision Support Systems - Shared Applications and artifacts - Frameworks for Groupware - Ubiquitous Computing and Augmented Realities: Ubiquitous Computing Applications Research - Virtual and Augmented Reality - Information and Data Visualization. Hypertext, Multimedia and the World Wide Web: Understanding Hypertext - Finding Things - Static Web Content - Dynamic Web Content.

Text Book:

1. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Human-Computer Interaction, Third Edition, ISBN-13: 978-0-13-046109-4.

Reference Books:

1. Helen Sharp, Jennifer Preece, Yvonne Rogers, "Interaction Design: Beyond Human – Computer Interaction". Wiley, 019, ISBN:9781119547259.
2. Dr. Samit Bhattacharya, "Human – Computer Interaction: User-centric Computing for Design", McGraw Hill, 2019, ISBN: 9789353168049.

21CA3012	Data Analytics using R	L	T	P	C
		3	0	0	3

Course Objectives:

1. Introduction to R programming and scripting
2. Visualization in R
3. Conceptualize and create loops to solve different types of problems

Course Outcomes:

After completion of this course, the students will be able to

1. summarize basic concepts such as data type and index and use them in their work
2. make use of the commands and solve problems
3. make use of the commands in R for data manipulation, statistical tests, and plotting graphs and diagrams
4. demonstrate use of basic functions
5. understand new data sets and functions
6. design and establish custom approaches for analyzing, visualizing and interpreting data

Module – 1: Introduction to Data Analysis and R

Overview of Data Analytics - Need of Data Analytics - Nature of Data -Classification of Data: Structured, Semi-Structured, Unstructured - Characteristics of Data, Applications of Data Analytics.

Introduction to R – History and Overview of R - Help Functions in R – Constants, operators, variables - Vectors – Vectorized Operations – Functions in R - Loops in R – Packages in R.

Module – 2: Matrices, Arrays and Lists

Matrix Operations – Adding and Deleting Rows and Columns – Higher Dimensional Arrays

– Lists – General List Operations – Accessing List Components and Values – Applying functions to Lists.

Module – 3: Data Frames

Creating Data Frames – Matrix-like Operations on a Data Frame – Merging Data Frames – Applying functions to Data Frames – Factors and Tables – Common Functions used with Factors – Working with Tables.

Module – 4: OOP

S3 Classes – S4 Classes – Managing the Objects – Input/Output – Accessing Keyboard and Monitor – Reading and Writing Files – accessing the Internet – String Manipulation.

Module – 5: Data Visualization

Introduction to GGPlot2 – Factors – Aesthetics – Plotting with Layers – Overriding Aesthetics – Mapping vs Setting – Histograms – Density Charts – Statistical Transformation – Facets – Coordinates – Themes.

Module 6: Working with R Charts and Graphs

Histograms, Boxplots, Bar Charts, Line Graphs, Scatterplots, Pie Charts

Text Books:

1. Norman Matloff , “The Art of R Programming: A Tour of Statistical Software Design”, No Starch Press, 2011.
2. Jared P. Lander, “R for Everyone: Advanced Analytics and Graphics”, Addison-Wesley Data & Analytics Series, 2013.

Reference Books:

1. Mark Gardener, “ Beginning R – The Statistical Programming Language”, Wiley, 2013
2. Robert Knell, “ Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R”, Amazon Digital South Asia Services Inc, 2013.
3. Thomas Mailund, “Beginning Data Science in R: Data Analysis, Visualization, and Modelling for the Data Scientist”, Apress; 1st ed. Edition, 2017 ISBN-13 : 978-1484226704

21CA3013	Data Analytics Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. Students should aware of packages and libraries of R and also familiar with functions used in R for visualization
2. To enable students to use R to conduct analytics on large real life datasets
3. To familiarize students with how various statistics like mean, median, mode and data can be collected for data exploration in R

Course Outcomes:

After completion of this course, the students will be able to

1. extend the functionality of R by using add-on packages
2. examine data from files and other sources and perform various data manipulation tasks on them
3. make use of statistical functions in R
4. classify tables and figures for descriptive statistics
5. make use of R Graphics and Tables to visualize results of various statistical operations on data
6. apply the knowledge of R gained to data Analytics for real life applications

List of Experiments:

1. Implement all basic R commands (Function and Operators)
2. Vectors
3. Factors: creating and plotting categorized data
4. Interact data through .csv files (Import from and export to .csv files).
5. Create a data frame
6. Working with graphics in R - visualize all Statistical measures (Mean, Mode, Median, Range, Inter Quartile Range etc., using Histograms, Boxplots and Scatter Plots).
7. Dealing with Missing Values - MICE
8. Data Visualization using ggplot2 - Uber Data Analysis
9. T – Test and Probability Distribution
10. Car Analysis
11. Implement k-means clustering using R - Customer Segmentation using Machine Learning in R
12. implement linear and multiple regression

21CA3014	Image Processing and Computer Vision	L	T	P	C
		3	0	0	3

Course Objectives:

1. To outline the fundamental concepts of image processing.
2. To build image processing applications using OpenCV.
3. To summarize the concepts of neural networks and augmented reality.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the fundamental concepts of image processing.
2. utilize OpenCV for processing images.
3. apply image processing techniques in real life situations.
4. apply image search techniques using OpenCV.
5. demonstrate object detection and tracking techniques.
6. explain the importance of neural networks and Augmented Reality in image processing.

Module 1: Image Processing Concepts

Image Processing Concepts: Fundamentals of Image processing - Image Transforms - Image Filtering - Color Image Processing - Image Segmentation - Image Descriptors and Features: Texture Descriptors - Color Features - Edge Detection - Object Boundary and Shape Representations.

Module 2: Introduction to OpenCV

Introduction to OpenCV - Handling Files, Cameras and GUIs: Basic I/O Scripts - Processing Images with OpenCV : Converting images between different color models - Exploring the Fourier Transform - Creating Modules - Edge Detection - Custom Kernels - Modifying the Application - Edge Detection with Canny - Contour Detection - Detecting Shapes.

Module 3: Image Segmentation

Depth Estimation and Segmentation: Creating Modules - Capturing Frames from a DepthCamera - Conversion of Images - Creating a Mask - Modifying the Application - Depth Estimation with a Normal Camera - Foreground Detection - Image Segmentation - Detecting and Recognizing of Faces: Conceptualizing Haar Cascades - Getting Haar Cascade Data - Face Detection using OpenCV - Swapping Faces in the Infrared.

Module 4: Image Searching

Retrieving Images and Searching Using Image Descriptors: Types of Feature Detection and Matching - Detecting Harris Corners - Detecting DoG Features and extracting SIFT Descriptors - Detecting Fast Hessian Features and extracting SURF Descriptors - Using ORB with FAST features and BRIEF descriptors - Filtering Matches using k-nearest neighbors and the radio test - Matching with FLANN - Homography with FLANN-based Matches - Case Study: Tattoo Forensics.

Module 5: Object Detection and Tracking

Building Custom Object Detectors: HOG Descriptors - NMS - SVMs - Detecting People with HOG Descriptors - Creating and Training an object Detector - Detecting Cars. Tracking Objects: Detecting Moving Objects with Background Subtraction - Tracking Colorful Objects using MeanShift and CamShift - Finding Trends in Motion using the Kalman Filter.

Module 6: Augmented Reality and Neural Networks

Camera Models and Augmented Reality: 3D Image Tracking and Augmented Reality - Implementing the Demo Application - Improving the 3D Tracking Algorithm - Neural Networks with OpenCV: Understanding ANNs - Training a basic ANN in OpenCV - Training an ANN Classifier - Case Study: Recognizing Handwritten Digits with ANN - Using DNNs from other Frameworks - Detecting and Classifying Objects with Third party DNNs - Detecting and Displaying Faces with Third Party DNNs.

Text Book:

1. Manas Kamal Bhuyan, Computer Vision and Image Processing, Fundamentals and Applications, CRC Press, ISBN: 978-0-367-26573-1.
2. Joseph Howse, Joe Minichino, Learning OpenCV 4 Computer Vision with Python 3, Third Edition, Packt Publishing, ISBN 978-1-78953-161-9.

Reference Books:

1. David A Forsyth, Jean Ponce, Computer Vision: A Modern Approach, Pearson Publications, ISBN-13 : 978-9332550117.
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar, Digital Image Processing, McGraw Hill, ISBN-13 : 978-9389811926.

- Aditya Sharma , Vishwesh Ravi Shrimali, Michael Beyeler, Machine Learning for OpenCV 4, Packt Publishing, ISBN-13 : 978-1789536300.
- Himanshu Singh, Practical Machine Learning and Image Processing: For Facial Recognition, Object Detection, and Pattern Recognition Using Python, Apress, ISBN-13 : 978-1484241486.
- Sandipan Dey, Hands-On Image Processing with Python, Packt Publishing, ISBN-13 : 978- 1789343731.
- Rafael C. Gonza Lez, Richard E. Woods, Digital Image Processing, Fourth Edition, Pearson, ISBN-13 : 978-9353062989.

21CA3015	Image Processing and Computer Vision Lab	L	T	P	C
		0	0	2	2

Course Objectives:

- To outline the fundamental concepts of image processing.
- To build image processing applications using OpenCV.
- To summarize the concepts of neural networks and augmented reality.

Course Outcomes:

After completion of this course, the students will be able to

- summarize the fundamental concepts of image processing.
- utilize OpenCV for processing images.
- apply image processing techniques in real life situations.
- apply image search techniques using OpenCV.
- demonstrate object detection and tracking techniques.
- explain the video streaming.

List of Experiments

- Histogram Equalization.
- Skin Color Detection.
- Warping and Estimation.
- Convolutions.
- Canny Edge Detection.
- Histogram of Oriented Gradients.
- Panorama Stitching using SIFT.
- Face Detection in an Image.
- Tracking an Object.
- EgoMotion: Simulating an Optical Mouse.
- Splitting a Video into Frames.
- Tracking an object in a Video Stream.

21CA3016	Deep Learning	L	T	P	C
		3	0	0	3

Course Objectives:

- To outline the foundations of neural networks.
- To build applications using different types of deep neural networks.
- To utilize deep learning applications in cloud and mobile.

Course Outcomes:

After completion of this course, the students will be able to

- summarize the fundamental concepts of neural networks.
- illustrate the concepts of convolutional neural networks.
- explore generative adversarial networks.
- apply recurrent neural networks for solving applications.
- demonstrate the applications of reinforcement learning.
- explore the application of deep learning in cloud and mobile applications.

Module 1: Neural Network Foundations

Neural network Foundations with TensorFlow 2.0: TensorFlow - Keras - Introduction to Neural Networks - Perceptron - Multilayer Perceptron - Regularization - Sentiment Analysis - Hyperparameter Tuning and AutoML - Predicting output - Practical Overview of Back Propagation - Towards a Deep Learning Approach. TensorFlow : TensorFlow

1.x - TensorFlow 2.x - Keras - Regression : What is Regression? - Prediction using Linear Regression - TensorFlow Estimators - Classification Tasks and Decision Boundaries - Logistic Regression.

Module 2: Convolutional Neural Networks

Convolutional Neural Networks: Deep Convolutional Neural Networks - Very Deep Convolutional Neural Networks for Large-scale Image Recognition - Advanced Convolutional Neural Networks: Computer Vision - Deep Inception-v3 Net used for Transfer Learning - Transfer Learning for Classification of Horses and Humans - Application Zoos with tf.keras and TensorFlow Hub - Other CNN Architectures - Classifying Videos with Pre-trained nets - Using a CNN for Sentiment Analysis - CNNs for Audio and Music - Convolution Operations - Capsule Networks.

Module 3: Generative Adversarial Networks

Generative Adversarial Networks: What is a GAN? - Deep Convolutional GAN - GAN Architectures - Word Embeddings: Origins and Fundamentals - Distributed Representations - Static Embeddings - Creating and Exploring Embedding Space - Using Word Embeddings for Spam Detection - Neural Embeddings - Character and Subword Embeddings - Dynamic Embeddings - Sentence and Paragraph Embeddings - Language Model Based Embeddings.

Module 4: Recurrent Neural Networks

Recurrent Neural Networks: The Basic RNN Cell - RNN Cell Variants - RNN Variants - RNN Topologies - Encoder-Decoder Architecture - Attention Mechanism - Transformer Architecture. AutoEncoders : Introduction - Vanilla Autoencoders - Sparse Autoencoder - Denoising Autoencoder - Stacked Autoencoder.

Module 5: Reinforcement Learning

Reinforcement Learning: Introduction - OpenAI Gym - Deep Q-Networks - Deep Deterministic Policy Gradient. TensorFlow and Cloud: Deep Learning on Cloud - Virtual Machines on Cloud - Jupyter Notebooks on Cloud.

Module 6: Mobile Applications

TensorFlow for Mobile and IoT: TensorFlow Mobile - TensorFlow Lite - Pretrained Models in TensorFlow Lite - TensorFlow.js. An Introduction to AutoML: What is AutoML? - Achieving AutoML - Automatic Data Preparation - Automatic Feature Engineering - Automatic Model Generation - AutoKeras - Google Cloud AutoML.

Text Book:

1. Antonio Gulli, Sujit Pal, Deep Learning with TensorFlow2 and Keras, Packt, ASIN : B082MBMFVF.

Reference Books:

1. Pramod Singh, Avinash Manure, Learn TensorFlow 2.0, Apress, ISBN-13: 978-1-4842-5560-5.
2. Dan Van Boxel, Hands-on Deep Learning with TensorFlow, Packt, ISBN-13 : 978- 787282773.
3. Samuel Burns, Python Deep Learning, ASIN : B07Q9LVJJS.
4. Sudharson Ravichandiran, Hands on Deep Learning Algorithms with Python, Packt, ASIN : B07LH43V8P.
5. Pablo Rivas, Laura Montoya, Deep Learning for Beginners, Packt, ISBN-13 : 978-1838640859.
6. S. Lovelyn Rose, L. Ashok Kumar, D. Karthika Renuka, Deep Learning using Python, Wiley, ISBN-13 : 978-8126579914.

21CA3017	Deep Learning Lab	L 0	T 0	P 2	C 2

Course Objectives:

1. To outline the foundations of neural networks.
2. To build applications using different types of deep neural networks.
3. To utilize deep learning applications in cloud and mobile.

Course Outcomes:

After completion of this course, the students will be able to

1. summarize the fundamental concepts of neural networks.
2. illustrate the concepts of convolutional neural networks.
3. summarize generative adversarial networks.
4. apply recurrent neural networks for solving applications.
5. demonstrate the applications of reinforcement learning.
6. explore the application of deep learning in cloud and mobile applications.

List of Experiments

1. Prediction of House Price using Linear Regression.
2. Classification of Handwritten Digits using Logistic Regression.
3. DCNN : LeNet
4. Recognizing CIFAR-10 Images with Deep Learning.

5. Classifying Fashion-MNIST with tf.keras - estimator Model.
6. Sentiment Analysis using CNN.
7. Recognizing Cats with very deep Convolutional Neural Networks.
8. Classification of Horses and Humans using Transfer Learning.
9. Classification of Handwritten Digits using Deep Convolutional GAN.
10. Generation of Text.
11. Reconstruction of Handwritten Digits using Autoencoder.
12. Object Detection.

21CA3018	Natural Language Processing	L	T	P	C
		4	0	0	4

Course Objectives:

1. To learn about Regular Expressions and N-gram Language Models
2. To familiarize on Vector Semantics , Sequence Labeling, Machine Translation and Constituency Grammars
3. To recite about parsing, logical representation and word senses

Course Outcomes:

After completing the course, the students will be able to

1. understand about regular expressions
2. develop N-gram Language Models
3. acquire knowledge about vector semantics
4. explore about sequence Labeling , Machine Translation and Constituency Grammars
5. summarize about parsing
6. illustrate about logical representation and word senses

Module 1: Regular Expressions and N-gram Language Models

Introduction - Regular Expressions, Text Normalization, Edit Distance - Regular Expressions - Words - Corpora - Text Normalization - Minimum Edit Distance - N-gram Language Models - N-Grams - Evaluating Language Models - Generalization and Zeros - Smoothing - Kneser-Ney Smoothing - Huge Language Models and Stupid Backoff - Advanced: Perplexity's Relation to Entropy.

Module 2: Vector Semantics and Sequence Labeling

Vector Semantics and Embeddings - Lexical Semantics - Vector Semantics - Words and Vectors - Cosine for measuring similarity - TF-IDF: Weighing terms in the vector - Pointwise Mutual Information (PMI) - Applications of the tf-idf or PPMI vector models - Word2vec - Visualizing Embeddings - Semantic properties of embeddings - Bias and Embeddings - Evaluating Vector Models -

Sequence Labeling for Parts of Speech and Named Entities - (Mostly) English Word Classes - Part-of-Speech Tagging - Named Entities and Named Entity Tagging - HMM Part-of-Speech Tagging -

Conditional Random Fields (CRFs) - Evaluation of Named Entity Recognition

Module 3: Machine Translation and Constituency Grammars

Machine Translation and Encoder-Decoder Models - Language Divergences and Typology - The Encoder-Decoder Model - Encoder-Decoder with RNNs - Attention - Beam Search - Encoder-Decoder with Transformers - Some practical details on building MT systems - MT Evaluation - Bias and Ethical Issues - Constituency Grammars - Constituency - Context-Free Grammars -Some Grammar Rules for English Treebanks - Grammar Equivalence and Normal Form - Lexicalized Grammars.

Module 4: Constituency Parsing and Dependency Parsing

Constituency Parsing - Ambiguity - CKY Parsing: A Dynamic Programming Approach - Span-Based Neural Constituency Parsing - Evaluating Parsers - Partial Parsing - CCG Parsing - Dependency Parsing - Dependency Relations - Dependency Formalisms - Dependency Treebanks - Transition-Based Dependency Parsing - Graph-Based Dependency Parsing - Evaluation.

Module 5: Logical Representations of Sentence and Information Extraction

Logical Representations of Sentence Meaning - Computational Desiderata for Representations -

Model-Theoretic Semantics - First-Order Logic - Event and State Representations -

Description Logics - Information Extraction - Relation Extraction - Relation Extraction Algorithms -

Extracting Times - Extracting Events and their Times - Template Filling.

Module 6: Word Senses and Semantic Roles

Word Senses and WordNet - Word Senses - Relations Between Senses - WordNet: A Database of Lexical Relations - Word Sense Disambiguation - Alternate WSD algorithms and Tasks - Using Thesauruses to Improve Embeddings

- Word Sense Induction - Semantic Role Labeling - Semantic Roles - Diathesis Alternations - Semantic Roles: Problems with Thematic Roles - The Proposition Bank . FrameNet - Semantic Role Labeling - Selectional Restrictions - Primitive Decomposition of Predicates.

Text Book:

1. Daniel, Jurafsky, James H. Martin, 'Speech and Language Processing , An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition', Pearson, ISBN: 978-0131873216, 2020.

Reference Books:

1. Ela kumar, 'Natural Language Processing', I-K International Publishing, ISBN-13: 978-9380578774, 2013
2. Honson Lane et al., 'Natural Language Processing in Action: Understanding, analyzing, and generating text with Python', Manning Publications, ISBN: 9781617294631, 2019.
3. Steven bird et al., 'Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit', O'Reilly, ISBN: 978-0596516499, 2013.
4. Nitin Indurkha , Fred J. Damerau , Handbook of Natural Language Processing (Chapman & Hall/CRC Machine Learning & Pattern Recognition), CRC , ISBN: 978-1420085921, 2013.
5. Sohom Ghosh, Dwight Gunning, Natural Language Processing Fundamentals: Build intelligent applications that can interpret the human language to deliver impactful results, Packt Publishing Limited, ISBN: 978-1789954043, 2013.
6. Delip Rao, Brian McMahan, Natural Language Processing with PyTorch: Build Intelligent Language Applications Using Deep Learning , O'Reilly Media, ISBN: 978-1491978238, 2013.
7. Thushan Ganegedara, Natural Language Processing with TensorFlow: Teach language to machines using Python's deep learning library, Packt Publishing, ISBN: 978-1788478311, 2013

21CA3019	Advanced Computing	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the need of different analytical architectures
2. To summarize Spark ecosystems and Scala programming language.
3. To explain the Processing of Big Data with Advanced architectures like Spark.

Course Outcomes:

After completing the course, the students will be able to

1. discuss the challenges and their solutions in Scala shell
2. explore and work with scala programming language.
3. analyse the Big Data using Spark framework.
4. explore spark programming with RDD.
5. summarize the graph algorithms and live streaming data in Spark
6. illustrate streaming of data in Spark.

Module:1 Introduction to Scala

Checking Scala Installation Status in Your System - Verifying Java Development Kit (JDK) Installation Status - Installing Scala in Windows - Verifying Scala Installation Status. Using Scala Shell – Introduction - Getting help in Scala shell - Hello World in Scala REPL

Understanding Hello World in Scala REPL Step by Step - Real Life Example: Usefulness of Scala REPL's Data Type Highlighting Feature - Paste Mode in Scala REPL - Retrieving History in Scala REPL - Auto-completion Feature of Scala REPL - Exiting from Scala REPL

Variables – Introduction - Immutability of Objects in Scala - Defining Variables (Mutable and Immutable) in Scala - Why Immutability Is So Emphasized in Scala? - Mutability and Type-safety Caveats - Specifying Types for Variables and Type Inference - Data Types – Introduction - Data Types - Boolean Type - String Type - Special Types in Scala - Type Casting in Scala -

Module:2 Conditional Statements and loops

Introduction - Caveats - Using {} after if/else - Nested If-Else Statements - If Else as Ternary Operator - Pattern Matching - Code Blocks – Introduction - Caveats - Code Blocks - Code Blocks and If/Else Statements Loops – Introduction - Types of Loops in Scala - Guards in For Loop - While Loop - Comparison of For and While Loop Functions – Introduction - Why use Functions at all? - Intuitive Understanding of Functions - Invoking a Function - Caveats - Function Definition - Functions With Multiple Parameters - Positional Parameters - Default Value of

Parameters in Functions - Function with No Arguments aka 0 Parity - Single Line functions - When To Actually Use Return Statements - Passing Function As Arguments - Anonymous Functions

Module 3: Scala collections

Introduction - Real Life and Intuitive Examples of Collections – Lists - Indexing List Elements - What Can You Store in Lists? - Widely Used Lists Operations - Iterating Over List - Using Map Function for Iterating Over Lists - Getting to Know Functional Programming Concepts - Using for each on Lists - Using filter on Lists - Reduce Operation on Lists - List Equality Check - Alternative Ways To Create Lists – Sets - Map Collections - Indexing a Map - Alternative Ways to Create Map Collections - Manipulating Maps - Iterating through Maps in Functional Style – Tuples - Indexing Tuples - Iterating Over Tuples - Alternative Ways to Create Tuples - Mutable Collections - Implications Related to Mutable Collections -Mutable Maps - Nested Collections

Module:4 Spark RDD Operations

Introduction to RDDs - RDD Creation - Types of RDDs - Aggregations - Partitioning and shuffling - Partitioners - HashPartitioner - RangePartitioner - Shuffling - Narrow Dependencies - Wide Dependencies - Broadcast variables - Accumulators

Module: 5 Spark SQL

Spark SQL - Spark SQL and DataFrames - DataFrame API and SQL API - Loading and saving datasets - Aggregations - Aggregate functions - groupBy - Rollup - Cube - Joins

Module:6 Spark Streaming

A Brief introduction to streaming - Spark Streaming - Input streams - textFileStream example twitterStream example - Discretized streams - Checkpointing - Interoperability with streaming platforms (Apache Kafka) - Structured streaming

Text Books:

1. Md. Rezaul Karim , Sridhar Alla, “Scala and Spark for Big Data Analytics: Explore the concepts of functional programming, data streaming, and machine learning”, July 2017, Packt Publishing, ISBN: 9781785280849
2. Irfan Elahi, Scala Programming for Big Data Analytics: Get Started With Big Data Analytics Using Apache Spark , July 2019, Apress, ISBN:9781484248096

Reference Books:

1. Mike Frampton, “Mastering Apache Spark”, Packt Publishing, 2015, ISBN: 9781783987146.
2. NickPentreath, “ Machine Learning with Spark, PacktPublishing,2015, ISBN 9781783288519.
3. Mohammed Guller, Big Data Analytics with Spark, Apress, 2016, ISBN-13 : 978-1484209653.
4. Mohammed Guller, “ Big Data Analytics with Spark: A Practitioner's Guide to Using Spark for Large Scale Data Analysis”, Apress; 1st ed. edition (14 February 2016), ISBN-13 : 978-1484209653.

21CA3020	Advanced Computing Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To understand the need of different analytical architectures
2. To summarize Spark ecosystems and Scala programming language.
3. To explain the processing of Big Data with Advanced architectures like Spark.

Course Outcomes:

After completion of this course, the students will be able to

1. discuss the challenges and their solutions in Scala shell
2. summarize and work with scala programming language.
3. analyse the Big Data using Spark framework.
4. demonstrate spark programming with RDD.
5. demonstrate the graph algorithms and live streaming data in Spark
6. summarize streaming of data in Spark.

List of Experiments

1. Spark Installation on Windows
2. Scala program to perform addition of two numbers using static input and using Dynamic input.
3. Scala program to perform various Scala Operations using operators (Arithmetic Operators, Relational Operators, Logical Operators, Bitwise Operators, Assignment Operators)
4. Scala program to perform various decision making statements.
5. Scala program to print numbers from 1 to 100 using for loop with until to determine loop range.

6. Scala Functions
7. Scala Strings
8. Scala Arrays
9. Scala Program to find largest number among two numbers.
10. Working with DataFrame in Apache Spark using Scala
11. Spark Transformations map(), filter(), flatmap(), groupBy(), groupByKey(), sample(), union(), join(), distinct(), keyBy(), partitionBy and zip().
12. Spark Actions getNumPartitions(), collect(), reduce(), aggregate(), max(), sum(), mean(), stdev(), countByKey().

21CA3021	Internet of Things and its Applications	L	T	P	C
		4	0	0	4

Course Objectives:

1. To explain the principles and foundations of Internet of Things.
2. To apply Machine Learning and Deep Learning for IoT Applications.
3. To transfer the expertise knowledge needed to design security policies for IoT.

Course Outcomes:

After completing the course, the students will be able to

1. formulate the principles and foundations of Internet of Things.
2. apply machine learning and deep learning for IoT applications.
3. adapt Optimization in IoT environments.
4. elaborate the applications of IoT in various domains.
5. design IoT devices.
6. develop identity and access management system.

Module 1: Principles and Foundations of IoT and AI

Introduction to IoT 101 – Big Data and IoT – Infusion of Data Science in IoT – Tools used for AI. Data Access and Distributed Processing for IoT: Using Text Files – Working with CSV Files – Working with XLSX Format – Working with JSON Format – Working with HDF5 Format – SQL Data – NoSQL Data – HDFS.

Module 2: Machine Learning and Deep Learning for IoT

Machine Learning and IoT – Learning Paradigms – Prediction using Linear Regression – Logistic Regression for Classification – Classification using Support Vector Machines – Naïve Bayes – Decision Trees – Ensemble Learning – Improving the Model. Deep Learning for IoT: Deep Learning 101 – Multilayered Perceptrons for Regression and Classification – Convolutional Neural Networks – Recurrent Neural Networks – Autoencoders.

Module 3: Genetic Algorithms for IoT

Optimization – Introduction to Genetic Algorithms – Coding Genetic Algorithms using Distributed Evolutionary Algorithms in Python – Reinforcement Learning for IoT: Introduction to Reinforcement Learning – Simulated Environments – Q-Learning – Q-Network. Generative Models for IoT: Generating Images using VAEs – GANs.

Module 4: IoT Applications

Personal IoT – IoT and Smart Homes – AI for the Industrial IoT: Introduction to AI-powered industrial IoT - Predictive maintenance using AI - Electrical load forecasting in industry – AI for Smart Cities : Introduction to Smart Cities – Components of a Smart City – Adapting IoT for Smart Cities – Processing Different Types of Data.

Module 5: Secure Design of IoT Devices

Challenges of secure IoT development – Secure design goals – Defining security policies – Configuring gateway and network security – Managing Keys and Certificates – Managing accounts – Monitoring – Managing compliance and incidents.

Module 6: Cryptography and IAM

Cryptography role in securing the IoT – Cryptographic key management – Cryptography controls for IoT protocols – Identity life cycle – Authentication credentials – IoT IAM infrastructure – Authorization and access control.

Text Books:

1. Amita Kapoor, “Hands-on Artificial Intelligence for IoT”, Packt Publishing, 2019, ISBN: 9781788836067.
2. Brian Russell, Drew Van Duren, “Practical Internet of Things Security: Design a security for Internet connected ecosystem”, 2nd edition, Packt Publishing, 2018, ISBN-13: 978-1788625821.

Reference Books:

1. Pethuru Raj Anupama C. Raman, “The Internet of Things Enabling Technologies, Platforms, and Use Cases”, Taylor & Francis Group, 2017, ISBN: -13: 978-1-4987-6128-4.

2. Mohammad Abdur Razzaque, Md. Rezaul Karim, Hands-on Deep Learning for IoT, Packt Publishing, 2019, ASIN: B07TP7ZRC7.
3. Jeeva Jose, "Internet of Things", Khanna Book Publishing, 2018, ISBN: 9789386173591.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, 2017, ISBN: 9780262035613.
5. John Krohn, Grant Beyleveld, Aglae Bassens, Deep Learning Illustrated: A Visual Interactive Guide to Artificial Intelligence, Pearson Publications, 2020, ISBN: 978-9353945466.
6. Ela Kumar, Artificial Intelligence, Wiley Publications, 2020, ISBN: 978-9389795134.

21CA3022	Vulnerability Assessment and Penetration Testing	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand Vulnerability Assessment and Penetration Testing.
2. To understand the foot printing, Scanning and Enumeration, Social Engineering.
3. To exploit Network Vulnerabilities.

Course Outcomes:

After completing the course, the students will be able to

1. plan and aim for Penetration Testing.
2. explore foot printing.
3. analyze Vulnerability Scans.
4. utilize Physical and Social Vulnerabilities.
5. utilize Application and Host Vulnerabilities.
6. build Penetration Scripting.

Module 1: Penetration Testing-Planning and Scoping

Introduction-What is Penetration Testing, Reasons for Penetration Testing, Penetration Testing performers, Penetration Testing process, The Cyber Kill Chain, Tools, Scope and Plan, Key Legal concepts, Compliance based assessments.

Module 2: Information gathering and scanning vulnerabilities

Information Gathering - Foot printing and Enumeration, Active Reconnaissance and Enumeration, Information Gathering and Defenses, Vulnerability Scanning - Identifying Vulnerability Management Requirements, Configuring and Executing Vulnerability Scans, Software Security Testing, developing a Remediation Workflow, Overcoming Barriers to Vulnerability Scanning.

Module 3: Analyze-exploit-pivot

Analyzing Vulnerability Scans - Reviewing and Interpreting Scan Reports, Common Vulnerabilities, Common Vulnerabilities, Exploit and Pivot - Exploits and Attacks, Exploitation Tool kits, Exploit Specifics, Leveraging Exploits, Persistence and Evasion, Pivoting.

Module 4: Network, Physical and Social Vulnerabilities

Exploiting Network Vulnerabilities-Conducting Network Exploits-Exploits Windows Services-Exploiting Common Services-Wireless Exploits-Exploiting Physical and Social Vulnerabilities-Physical Facility Penetration Testing-Social Engineering.

Module 5: Application and Host vulnerabilities

Exploiting Application Vulnerabilities: Exploiting Injection Vulnerabilities-Exploiting Authentication Vulnerabilities-Exploiting Authorization Vulnerabilities-Exploiting Web Application Vulnerabilities-Unsecure Coding Practices-Application Testing Tools-Exploiting Host Vulnerabilities: Attacking Hosts-Remote Hosts-Attacking Virtual Machines and Containers-Physical Device Security-Attacking Mobile Devices-Credential Attacks.

Module 6: Penetration testing - Scripting, Reporting and Communication

Scripting for Penetration Testing: Scripting and Penetration Testing-Variables, Arrays, Substitutions, Comparison Operations-String Operations-Flow Control- Input and Output(I/O)-Error Handling-Reporting and Communication: The Importance of Communication- Recommending Mitigation Strategies-Write a Penetration Testing Report-Wrapping up the Engagement.

Text Book:

1. Mike Chapple, David Seidl, "CompTIA Pen Test+ Study Guide: Exam PTO-001", Wiley, 2019, ISBN:978-1-119-50422-1.

Reference Books:

1. Jeremy Faircloth, "Penetration Tester's Open-Source Toolkit", Imprint: Syngress; 4th Edition, 2016, ISBN: 9780128021491

- Georgia Weidman, Peter van Eckhoutte , "Penetration Testing A Hands on Introduction to Hacking", No Starch Press , 2014, ISBN-10:1-59327-564-1.
- Dexter Jackson, "Hacking: Ultimate Beginner's Guide to Computer Hacking in 2016; Hacking for Beginners", Hacking University, Hacking Made Easy, Hacking Exposed, Hacking Basics", Create Space Independent Publishing Platform, 2016, ISBN: 978-1-5373-6976-1.
- Michael Gregg, "Certified Ethical Hacker(CEH)Version 9 Cert Guide (Certification Guide)", Pearson IT Certification; Second Edition, 2017,ISBN-10:9386873710.

21CA3023	Vulnerability Assessment and Penetration Testing Lab	L	T	P	C
		0	0	2	2

Course Objectives:

- To understand the ethical hacking terminology.
- To understand the foot printing, scanning and enumeration, social engineering
- To understand system hacking

Course Outcomes:

After completing the course, the students will be able to

- identify known weaknesses.
- explore basic penetration test.
- build the network or application.
- identify security flaws.
- experiment with security flaws.
- solve password cracking techniques.

List of Experiments

- WLAN analysis with Wireshark.
- Installing and running a vulnerability scanner.
- Vulnerability assessment using Nessus.
- Capturing windows password on the network.
- John the Ripper password cracking with the wordlist.
- John the Ripper password cracking with masking.
- Antimalware evasion using python.
- Foot printing using Monitis.
- Powershell as a TCP-connect port scanner.
- Detecting SQL injection flaws using sqlmap.
- Online security vulnerability scanning using Acunetix.
- Arachni-Web Application Security Scanner Framework.

21CA3024	Malware Analysis	L	T	P	C
		3	0	0	3

Course Objectives:

- To understand various Malware sources.
- To explain the code analysis tools.
- To understand various Malware functionalities and Persistence.

Course Outcomes:

After completing the course, the students will be able to

- illustrate the Assembly language and Disassembly primer.
- utilize IDA scripting and plug-ins.
- solve various malicious binaries.
- explore various malware functionalities and persistence.
- examine code injection techniques.
- formulate malware obfuscation techniques.

Module 1: Malware Introduction and computer Basics

Introduction-Types of Malware-Setting up the lab environment-Malware Sources-Assembly Language and Disassembly Primer : Computer Basics-CPU Registers-Data Transfer Instructions-Bitwise Operations-Branching and Conditionals-Loops-Functions-Arrays and Strings-X 64 Architecture

Module 2: Disassembly using IDA

Code Analysis Tools-Static Code Analysis (Disassembly) using IDA-Loading Binary in IDA-Exploring IDA Displays-Improving Disassembly using IDA-Disassembling Windows API-Understanding Windows API- Patching Binary using IDA- IDA scripting and plug-ins.

Module 3: Debugging Malicious Binaries

General Debugging Concepts- Launching and attaching to process-Controlling process execution-Interrupting a program with breakpoints-Tracing program execution- Debugging a Binary using X64dbg- Debugging Binary using IDA-Debugging a .NET Application.

Module 4: Malware Functionalities and Persistence

Malware Functionalities-Downloader-Dropper-Key logger-Malware replication through removable media-Malware command and control-Power shell based execution--Malware Persistence Methods-Run Register key-Scheduled tasks-Startup folder-Win logon registry entries-Image file Execution Options-Accessibility programs-Applnit_DLLs-DLL Search order hijacking-COM hijacking- Service.

Module 5: Code Injection and Hooking

Virtual Memory- Process Memory Components-Kernel memory contents-User mode and Kernel mode-Code Injection Techniques- Remote DLL Injection-APC Injection-DLL injection using SetWindowsHookEX()-DLL injection using the application compatibility Shim-Remote Executables/Shell code Injection-Hollow process Injection Techniques- Hooking Techniques- Additional Resources.

Module 6: Malware Obfuscation Techniques

Simple Encoding-Caesar cipher-Base64 Encoding-XOR Encoding-Malware Encryption-Identifying Crypto Signatures using Signsrch-Detecting Crypto constants using Findcrypt2-Detecting crypto signatures using YARA-Decrypting in Python-Custom Encoding/Encryption-Malware Unpacking-Manual Unpacking-Automatic Unpacking.

Text Book:

1. Monnappa K A, "Learning Malware Analysis", PACKT Publishing, 2018, ISBN: 9781788392501.

Reference Books:

1. Christopher C. Elisan, "Advanced Malware Analysis", Mc Graw Hill Education, 2015, ISBN:9780071819749.
2. Michael Hale Ligh, Steven Adair, Blake Hartstein, Matthew Richard, "Malware Analyst's Cookbook and DVD: Tools and Techniques for Fighting Malicious Code", Wiley Publishing, 2011, ISBN: 9780470613030.
3. Cameron H. Malin, Eoghan Casey, James M. Aquilina, Curtis W. Rose, "Malware Forensics Field Guide for Windows Systems", Elsevier, 2012, ISBN:9781597494724.
4. Michael Sikorski and Andrew Honig, " Practical Malware Analysis: The Hands-on Guide to Dissecting Malicious Software", No Starch Press, 2012, ISBN:10:1-59327-290-1.

21CA3025	Malware Analysis Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To explore and work on IDA database.
2. To understand the Malware command and control.
3. To understand hijacking techniques.

Course Outcomes:

After completing the course, the students will be able to

1. experiment with static and dynamic analysis techniques.
2. explore IDA displays.
3. make use of Malware command and control.
4. experiment with Hijacking techniques.
5. test for Remote DLL Injection.
6. experiment with hijacking

List of Experiments

1. Fingerprinting the Malware using MD5, SHA1 or SHA256.
2. String extraction using FLOSS
3. Scanning the Suspect binary with Virus Total.
4. Classifying Malware using Import Hash and Section Hash using PEStudio.
5. Logging system activities with Noriben.
6. Exploring IDA displays using IDA Quick Start

7. Working on IDA database Using IDA Quick Start
8. Debugging Malware using VC++.
9. Malware command and control
10. DLL Search order hijacking
11. COM hijacking
12. Remote DLL Injection.

21CA3026	Linux System Administration	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand concepts of Linux OS basics.
2. To summarize various Linux based administration tasks.
3. To implement Linux OS based server configuration, management and administration.

Course Outcomes:

After completing the course, the students will be able to

1. summarize Linux utilities to create and manage simple file processing operations and Linux boot processing.
2. apply Command line in Linux to manage user, user groups, system management, volume management, and troubleshooting application,
3. explore scheduling task and system level issue.
4. illustrate client server applications with appropriate security.
5. inspect various services of Linux Apache web server.
6. evaluate various shell scripting.

Module 1: Managing of file using Command Line

History of Linux (GNU/LINUX), Download, installs, update, and manage software packages from Red Hat and yum package repositories. Introduction to BASH, Command-line shortcuts, File Types, Ownership and Permissions, File management and manipulation, Moving users & its directories, Miscellaneous Tools, Editors.

Module 2: Managing Users and Groups

Creating and managing users and group commands, User management Tools, Users and Access Permissions, updating users and group attributes, PAM (Pluggable Authentication Modules) Creating, Viewing, and Editing Text Files: Redirecting Output to a File or Program, I/O Redirection and Pipelines, Editing Text Files from the Shell Prompt, Editing Text Files with a Graphical Editor.

Module 3: Booting and Shutting down

Boot Loaders, The init process, rc scripts, enabling and disabling services, Booting in recovery mode. **File Systems:** Makeup of file systems, managing file systems, adding a new disk, Volume Management, Creating file systems.

Module 4: Core System Services

The init Daemon, xinetd and inetd, The Logging Daemon, Configuring, Logging Daemon, The CRON program, **Simple filter commands:** Filter Commands-pr, head, tail, Filter Commands -cut, sort, Filter using regular expression uniq, tr grep, sed.

Module 5: DNS

Installing DNS Server, Configuring DNS server, DNS records types, setting up BIND database file, The DNS Toolbox, Configuring DNS clients.

Module 6: Apache Web Server

HTTP Protocol, Installing Apache HTTP Server, starting up and shutting down apache, Testing Apache Installation, Configuring Apache, Troubleshooting Apache

Text Book:

Wale Soyinka "Linux Administration: A Beginner's Guide", 7th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, ISBN: 978-0071845366.

Reference Books:

1. Terry Collings, Kurt Wall, "Red Hat Linux Networking and System Administration" 3rd Edition, 2005, ISBN: 978-0-764-59949-1.
2. Christopher Negus, "Linux Bible" 9ed Paperback, 2015, Wiley, ISBN-10: 8126555858

21CA3027	Linux System Administration Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To describe the basic file system in Linux and its file attributes.
2. To appraise different filters, process handling, regular expressions and network handling features using suitable commands.
3. To summarize different Linux commands to write Shell Programs.

Course Outcomes:

After completing the course, the students will be able to

1. demonstrate installation of Linux operating system and understand the importance of Linux.
2. appraise various command usage of files and directories.
3. demonstrate the role and responsibilities of a Linux system administrator.
4. show the working of vi editor in all its modes using various commands.
5. manage shell and processes using various commands.
6. demonstrate the installation and working of Web Server.

List of Experiments:

1. Installation of LINUX operating system.
2. Startup and Shutdown Commands.
3. Basic Commands and file Handling.
4. Do the following changes in Grub file
 - a. Write the path where the grub file is located.
 - b. Change the timeout and title of the system.
5. User Quota Management
6. Process management commands and their execution
7. Package Management
8. Firewall configuration in Linux
9. Installation and Configuration of DNS server
10. Installation and Configuration of Apache Server
11. Setting up Samba Server
12. Configuring mail server

21CA3028	Mobile Forensics	L	T	P	C
		3	0	3	3

Course Objectives:

1. To summarize the fundamentals of Mobile OS, evidence stored on mobile phones, mobile forensics approaches.
2. To explain the internals of iOS devices.
3. To understand how to recover data.

Course Outcomes:

After completing the course, the students will be able to

1. summarize different phases of mobile extraction process.
2. acquire knowledge about the hardware of mobile devices.
3. apply the knowledge to use toolkit.
4. use data analysis and recovery.
5. acquire knowledge about Android framework.
6. explore Android and its data extraction techniques.

Module 1: Introduction to Mobile Forensics

Mobile forensics - Mobile phone evidence extraction process - The preparation phase - The isolation phase - The processing phase - The verification phase - The document and reporting phase - The presentation phase - Practical mobile forensic approaches - Mobile operating systems overview - Mobile forensic tool leveling system - Potential evidence stored on mobile phones.

Module 2: Understanding the Internals of iOS Devices

iPhone models - iPhone hardware - iPad models - iPad hardware - File system - The HFS Plus file system -The HFS Plus volume - Disk layout - iPhone operating system - iOS history 1.x – the first iPhone 2.x – App Store and 3G 3.x

– the first iPad 4.x – Game Center and multitasking 5.x – Siri and iCloud 6.x – Apple Maps 7.x – the iPhone 5S and beyond - The iOS architecture - The Cocoa Touch layer - The Media layer - The Core Services layer - The Core OS layer - iOS security.

Module 3: Data Acquisition from iOS Devices

Operating modes of iOS devices - Physical acquisition - Acquisition via a custom ram disk - Creating and loading the forensic toolkit - Establishing communication with the device - Acquisition via jailbreaking - iTunes backup - iCloud backup.

Module 4: iOS Data Analysis and Recovery and iOS Forensics Tools

Timestamps - SQLite databases - Property lists important plist files - Other important files - Recovering deleted SQLite records - Elcomsoft iOS Oxygen Forensic Suite 2014 - Cellebrite UFED Physical Paraben iRecovery - Open source or free methods.

Module 5: Understanding Android

The Android model - Android security - Android file hierarchy - Android file system - A forensic environment setup - Accessing the connected device - Android Debug Bridge - Accessing the device using adb - Handling an Android device - Gaining root access.

Module 6: Android Data Extraction Techniques

Imaging an Android Phone - Data extraction techniques - Physical data extraction - Imaging a memory (SD) card - Android Data Recovery Techniques - Android App Analysis and Overview of Forensic Tools - Forensic tools overview.

Text book:

1. Rohit Tamma, Oleg Skulkin, Heather Mahalik, Satish Bommisetty, "Practical Mobile Forensics", Packt publishing, IV Edition, 2020, ISBN: 9781838647520.

Reference books:

1. Rohit Tamma, Oleg Skulkin, Heather Mahalik, Satish Bommisetty, "Practical Mobile Forensics", Packt publishing, IV Edition, ISBN: 9781838647520.
2. Andrew Hoog, "Android Forensics: Investigation, Analysis and Mobile Security for Google Android", Illustrated Edition 2011, Syngress. ISBN -13: 978 - 1597496513.
3. Andrew Hoog & Katie Strzempka, "iPhone and iOS Forensics Investigation, Analysis and Mobile Security for Apple iPhone, iPad and iOS devices", Syngress, 2011, ISBN: 9781597496605.
4. Androulidakis, Iosif I., "Mobile phone security and Forensics: A practical approach", Springer – Verlag, New York, 2012, ISBN: 978 - 1 - 4614 - 1650 - 0.

21CA3029	Forensics Investigation	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the importance of Forensic Science, physical evidence in Crime Investigation
2. To describe in-depth knowledge about various scientific techniques used to identify the behavior pattern of criminals from psychologists point of view
3. To illustrate the concepts, procedures and evidences involved in medical jurisprudence.

Course outcomes:

After completing the course, the students will be able to

1. apply the basic principles of forensic science to crime investigation.
2. demonstrate the various types of evidence available in crime scene
3. categorize the types of evidence related to forensic ballistics, toxicology, biological evidence and related branches.
4. apply their knowledge to reconstruct a crime scene and write a report
5. choose scientific and non-scientific methods of profiling various crimes and also access the behaviour of criminals
6. apply the knowledge to explain the concept, procedures and evidences involved in medical Jurisprudence.

Module 1: Introduction

Evolution, Definition and Scope, Locard's Principle, Branches, Tasks, Organizational Setup of Forensic Sciences Department and Units, Nature and Types– Note Taking, Search, Sketching, Photograph, Collection of Evidence- Experts, Preservation of Evidences, Documentation, Chain of Custody, Physical Evidence, Trace Evidence.

Module 2: Forensic Division-I

Ballistics –Firearms, Ammunition-Cartridge, Bullets, Pellets and Wads, Comparison, Determination of Range, Time, Trajectory of Fire; Forensic Toxicology- Poisons, Identification, Classification, Signs, Symptoms, Antidotes and Collection of Samples.

Module 3: Forensic Division-II

Biology, Typology- Biological Evidence, Blood and Other Body Fluids, Collection of Samples, DNA Profiling; Document Examination –Handwriting, Signature; Forensic Psychiatry – Illusion, Delusion, Hallucination, Phobia, Impulse Etc., Forensic Entomology-Insects, Blowfly Life cycle

Module 4: Crime Scene Reconstruction

Basic Principles and Stages Involved– Types and Classification of Reconstruction – Pattern Evidence, Steps, Logic; Reconstruction Report.

Module 5: Criminal Profiling

Criminal Behavior, The Scientific Method, And Logic, Inductive And Deductive Method, Profiling Characteristics, Case Linkage, Victim Profiling –Psychological Autopsy, Geographical Profiling, Serial Killers-Modus Operandi, Targeted Victims, Signature, Detection of deception-Behavioral Cues, Speech Content, Polygraph-Voice Stress Analysis, Narco Analysis, Portrait Parle , Role of Criminal Psychologist , Profiling of cyber criminals

Module 6: Medical Jurisprudence

Inquest- Types, Corpus Delicti, Medical Evidence, Unknown Person, Dead Bodies and Remains, Injuries, Wounds, Burns – Types, Sexual Offences- Rape, Unnatural Sexual Offences; Sexual Perversions, Rape Kit. - Medico Legal Aspects of Wounds, Death – Types, Changes after death, Time of death, Medico- Legal Autopsy, Medico-Legal Reports, Dying Declaration, The Indian Medical Council Act, 1956-Medical Ethics

Text Books:

1. Anthony J.Bertino. Forensic Science- Fundamentals & Investigation, Cengage Learning,2009.
2. Rajesh Bardale, Forensic Medicine and Toxicology, Department of forensic Medicine, Nagpur

References Books:

1. Stuart H. James and Jon J. Nordby (2009). Forensic Science- An Introduction to Scientific and Investigative Techniques, CRC Press
2. Dennis Howitt (2018). Introduction to Forensic and Criminal Psychology, Pearson Edition
3. Bureau of Police Research & Development. (2000). *Working procedures manual ballistics*. New Delhi: BPR&D.
4. Dr. B. R. Sharma. (2016). *Forensic science in criminal investigation and trials*. New Delhi: Universal Law Publishing.
5. Heard, B. J. (1997). *Handbook of firearms and ballistics: Examining and interpreting forensic evidence*. Chichester, England: Wiley.
6. Van Kirk, D. J. (2001). *Vehicular accident investigation and reconstruction*. Boca Raton, Florida: CRC Press.
7. Lee, H., & Palmbach, T. (2001). *Henry Lee's crime scene handbook*. San Diego, California: Academic.
8. Modi, J. P., & Modi, N. (1969). *Modi's a textbook of medical jurisprudence and toxicology* (17th (50th year) ed.). Bombay: N. M. Tripathi.
9. Kocsis, R. (2006). *Criminal Profiling: Principles and Practice*, Totowa, N.J.,Humana Press.

21CA3030	Forensics Investigation Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To learn the techniques used on the evidence collected from the crime scene and its preservation methods.
2. To learn basic psychological tests and interpret the data and its outcome
3. To learn the techniques that are used in document examination

Course Outcome:

After completion of this course, students will be able to:

1. summarize knowledge and insight on basic forensic methodology
2. identify the suitable forensic method for investigation by interpretation of data in the crime scene using Locard's principle
3. outline the ability to collect and examine document evidences.
4. explore to profile the criminals seeing the crime scene

5. create a concise and clear report on behavior of criminals
6. apply theoretical knowledge to the practical problems.

List of Experiments:

1. Lifting of Fingerprint,
2. Casting of Foot Print,
3. Crime Scene Documentation-Search, Sketch, Photography etc.,
4. Collection of Evidence –Trace evidence
5. Tyre marks Analysis
6. Document Examination – Detection
7. Handwriting analysis
8. Forged Documents – Passport, Currency
9. Potrait parle
10. Thematic Appreciation Test (TAT)
11. Criminal profiling – Behaviour analysis
12. Victim Profiling

**DEPARTMENT OF
DIGITAL SCIENCES**

LIST OF NEW COURSES (2020)

Sl. No.	Course Code	Course Title	Credits
1	19CA3001	Data Mining Techniques	3:0:0
2	19CA3002	Machine Learning for Image Processing	3:0:0
3	19CA3003	Artificial Intelligence for Big Data	3:0:0
4	20CA2001	Computational Thinking for Problem Solving	3:0:0
5	20CA2002	Problem Solving using Programming	3:0:0
6	20CA2003	Problem Solving Lab	0:0:2
7	20CA2004	Fundamentals of Information Technology	3:0:0
8	20CA2005	Computer Fundamentals Lab	0:0:2
9	20CA2006	Foundation of Data Science and Analytics	3:0:0
10	20CA2007	Foundation of Data Science and Analytics Lab	0:0:2
11	20CA2008	Essentials of Python Programming	3:0:0
12	20CA2009	Programming in Python Lab	0:0:2
13	20CA2010	Python for Data Science and Analytics	3:0:0
14	20CA2011	Python for Data Science and Analytics Lab	0:0:2
15	20CA2012	Data Structures	3:0:0
16	20CA2013	Data Structures Lab	0:0:2
17	20CA2014	Database Management System	3:0:0
18	20CA2015	Database Management System Lab	0:0:2
19	20CA2016	Operating System and Networking	3:0:0
20	20CA2017	Fundamentals of Business Analytics	3:0:0
21	20CA2018	Big Data Analytics	3:0:0
22	20CA2019	Big Data Analytics Lab	0:0:2
23	20CA2020	Data Mining and Data Warehousing	3:0:0
24	20CA2021	Data Analysis and Visualization	3:0:0
25	20CA2022	Data Visualization Lab	0:0:2
26	20CA2023	Machine Learning	3:0:0
27	20CA2024	Machine Learning Lab	0:0:2
28	20CA2025	Data Security	3:0:0
29	20CA2026	Data Security Lab	0:0:2
30	20CA2027	Professional Ethics	3:0:0
31	20CA2028	Predictive Analytics	3:0:0
32	20CA2029	Artificial Intelligence for Data Science	3:0:0
33	20CA2030	Operating Systems Security	3:0:1
34	20CA2031	Cyber Crimes and Cyber Security	3:0:0
35	20CA2032	Information Security	3:0:0
36	20CA2033	Cyber Forensics	3:0:0
37	20CA2034	Cyber Forensics Lab	0:0:2
38	20CA2035	Computer Networks and Network Security	3:0:0
39	20CA2036	Computer Networks and Network Security Lab	0:0:2
40	20CA2037	Database Security	3:0:0
41	20CA2038	Database Security Lab	0:0:2
42	20CA2039	Biometric Security	3:0:0
43	20CA2040	General Forensic Science	3:0:0
44	20CA2041	Malware Analysis and its Security	3:0:0

45	20CA2042	Security Assessment of Information Systems through Ethical Hacking	3:0:0
46	20CA2043	Ethical Hacking Lab	0:0:2
47	20CA2044	Cyber Security Governance	3:0:0
48	20CA2045	Security of Web Applications	3:0:0
49	20CA2046	Data Mining in Cyber Security	3:0:0
50	20CA2047	Email and Mobile Forensics	3:0:0
51	20CA2048	Python for Network and Security	3:0:0
52	20CA2049	Python for Network and Security Lab	0:0:2
53	20CA2050	Cloud Security	3:0:0
54	20CA2051	Cloud Security Lab	0:0:2
55	20CA2052	Information Security Ethics	3:0:0
56	20CA3001	Cyber Criminology and Criminal Justice Administration	4:0:0
57	20CA3002	Information Security Management	3:0:0
58	20CA3003	Network Security	3:0:0
59	20CA3004	Network Security Lab	0:0:2
60	20CA3005	Cyber Law	4:0:0
61	20CA3006	Digital Forensics	3:0:0
62	20CA3007	Digital Forensic Lab	0:0:2
63	20CA3008	Web Application Security	3:0:0
64	20CA3009	Advanced Digital Forensics	3:0:0
65	20CA3010	Advanced Digital Forensic Lab	0:0:2
66	20CA3011	Business Continuity and Disaster Recovery Management	3:0:0
67	20CA3012	Database Security Management	3:0:0
68	20CA3013	Database Security Management Lab	0:0:2
69	20CA3014	Information Security Governance, Risk and Compliance	3:0:0
70	20CA3015	Internet of Things Security	3:0:0
71	20CA3016	Artificial Intelligence Security	3:0:0
72	20CA3017	Economic Offences	3:0:0
73	20CA3018	Ethical Hacking	3:0:0
74	20CA3019	Ethical Hacking Lab	0:0:2
75	20CA3020	Python for Cyber Security	3:0:0
76	20CA3021	Python for Cyber Security Lab	0:0:2
77	20CA3022	Security in the Cloud	3:0:0
78	20CA3023	Security in the Cloud Lab	0:0:2
79	20CA3024	Social Media Crimes	3:0:0
80	20CA3025	Digital Security	3:0:0

19CA3001	DATA MINING TECHNIQUES	L T P C
		3 0 0 3

Course Objectives:

1. To impart the knowledge on the basic concepts and techniques of Data Mining
2. To develop skills for solving practical problems using Data Mining algorithms
3. To apply the application of data mining techniques for real world problem.

Course Outcomes:

By learning the course, the students will be able to

1. recall the concept of data mining and warehousing
2. learn data mining techniques for problem solving
3. identify the performance evaluation criteria of the model developed

4. build up data mining model for diverse applications
5. design and implement suitable algorithm for a given task
6. apply state of art development frame work and libraries for implementation

Module 1: Introduction to data mining

Data mining concepts, pattern - technologies used in data mining - major issues in data mining - Data objects and attribute types - basic statistical descriptions of data - Data visualization - measuring data similarity and dissimilarity - Data preprocessing: An overview – Data cleaning - Data integrating - Data reduction - Data transformation and Data discretization

Module 2: Data warehousing and online analytical processing

Data warehouse basic concepts, Data ware house modeling, Data ware house design and usage, data warehouse implementation, Data cube technology: Data cube computation concepts and methods, processing queries by exploring cube technology, multidimensional data analysis in cube space

Module 3: Mining frequent patterns

Association and correlations: Basic Concepts - frequent itemset mining methods, pattern evaluation methods Advanced pattern mining: pattern mining in multilevel, multidimensional space, constraint based frequent pattern mining - mining high dimensional data and colossal patterns, mining compressed pattern, pattern exploration and application

Module 4: Classification

Basic concepts - decision tree induction - Bayes classification methods - rule based classification - model evaluation and selection - Techniques to improve classification accuracy

Module 5: Classification Advanced Methods

Bayesian Belief Networks - classification by backpropagation - support vector machine - classification using frequent patterns - Lazy learners - other classification methods - Cluster Analysis - partitioning methods - hierarchical methods - evaluation of clustering

Module 6: Outlier Detection

Outliers and outlier analysis - outlier detection methods - statistical approaches - proximity based approaches - Outlier detection in high dimensional data - mining complex data type - other methodologies of data mining - data mining applications - data mining and society

Text Book:

1. Jiawei Han, Micheline Kamber, “Data Mining – Concepts and Techniques”, Morgan Kaufmann Publishers, Third Edition, 2012, ISBN: 81-8147-049-4

Reference Books:

1. Rajiv Chopra, “Machine Learning”, Khanna Book publishing, 2018, ISBN: 9789386173423
2. Ethem Alpaydin, “Introduction to Machine Learning”, (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014, ISBN-10: 0262028182, ISBN-13: 978-0262028189
3. Kevin Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012, ISBN-10: 0262018020, ISBN-13: 978-0262018029
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning: Data Mining, Inference, and Prediction”, Second Edition (Springer Series in Statistics), 2016, ISBN10: 0387848576, ISBN-13: 978-0387848570
5. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition, Chapman and Hall, Machine Learning and Pattern Recognition Series, 2014, ISBN-10: 1466583282, ISBN-13: 978-1466583283

19CA3002	MACHINE LEARNING FOR IMAGE PROCESSING	L T P C
		3 0 0 0

Course Objectives:

1. To impart the knowledge on machine learning techniques
2. To learn the algorithms used in machine learning

3. To apply machine learning techniques for processing image data

Course Outcomes:

By learning the course, the students will be able to

1. recall the concepts used in machine learning
2. identify the problems that can be solved using machine learning techniques
3. identify the appropriate algorithms for solving problems
4. explore the fundamentals of images and their processing
5. apply machine learning techniques for problem solving
6. apply machine learning for processing images

Module 1: Ingredients of Machine Learning

Tasks – Models – Features – Binary Classification: Classification – Scoring and Ranking – Class Probability Estimation – Beyond Binary Classification: Handling more than two classes – Regression – Unsupervised and Descriptive Learning - Tree Models: Decision Trees – Ranking and Probability Estimation Trees – Tree Learning as Variance Reduction – Tree Models

Module 2: Rule Models

Learning Ordered Rule Lists – Learning Unordered Rule Sets – Descriptive Rule Learning – First-order Rule Learning – Rule Models - Linear Models: The Least Squares Method – The Perceptron – Support Vector Machines – Obtaining Probabilities from Linear Classifiers – Kernel Methods – Distance based Models: Neighbors and Exemplars – Nearest Neighbor Classification – Distance based Clustering – Hierarchical Clustering – From Kernels to Distances

Module 3: Probabilistic Models

Normal Distribution and its Geometric Interpretations – Probabilistic Models for Categorical Data – Discriminative Learning by optimizing Conditional Likelihood – Probabilistic Models with Hidden Variables – Compression based Models – Features: Kinds of Feature – Feature Transformations – Feature Construction and Selection

Module 4: Introduction to Image Processing

Images – Pixels – Image Resolution – PPI and DPI – Bitmap Images – Lossless Compression – Lossy Compression – Image File Formats – Color Spaces – Advanced Image Concepts – Scikit Image: Uploading and Viewing an Image – Getting Image Resolution – Pixel Values – Converting Color Space – Saving an Image – Rotating, Shifting and Scaling Images – Determining Structural Similarity

Module 5: Advanced Image Processing using OpenCV

Blending Two Images – Changing Brightness and Contrast – Adding Text to Images – Smoothing Images – Changing Shape – Image Thresholding – Gradients – Histogram Equalization

Module 6: Image Processing using Machine Learning

Feature Mapping – Image Registration – Image Classification using Artificial Neural Networks – Image Classification using CNNs – Image Classification using Machine Learning Approaches – Real-time Use Cases: Finding Palm Lines – Detecting Faces – Recognizing Faces – Tracking Movements – Detecting Lanes

Text Books:

1. P. Flach, “Machine Learning: The art and science of algorithms that make sense of data”, Cambridge University Press, 2012, ISBN-10: 1107422221, ISBN-13: 978-1107422223.
2. Himanshu Singh, “Practical Machine Learning and Image Processing”, Apress, 2019, ISBN: 978-1-4842-4148-6.

Reference Books:

1. EthemAlpaydin, “Introduction to Machine Learning”, (Adaptive Computation and Machine Learning Series), Third Edition, MIT Press, 2014, ISBN-10: 0262028182, ISBN-13: 978-0262028189
2. Kevin Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012, ISBN-10: 0262018020, ISBN-13: 978-0262018029.

3. Tom Mitchell, “Machine Learning”, McGraw Hill Education, First Edition, 2017, ISBN: 978-1259096952.
4. Simon J.D. Prince, “Computer Vision: Models, Learning and Inference”, Cambridge University Press, First Edition, 2012, ISBN: 978-1107011793

19CA3003	ARTIFICIAL INTELLIGENCE FOR BIG DATA	L	T	P	C
		3	0	0	0

Course Objectives:

1. To impart the concepts of artificial intelligence
2. To explore the analysis of big data
3. To apply artificial intelligence in analysis of big data

Course Outcomes:

By learning the course, the students will be able to

1. learn the concepts of Artificial Intelligence
2. process Big data using distributed processing
3. understand soft computing techniques
4. identify appropriate techniques to solve problems in big data
5. apply Artificial Intelligence for analysis of big data
6. apply artificial intelligence techniques for real time applications

Module 1: Big Data and Artificial Intelligence

Ontology for Big Data: Human Brain and Ontology – Ontology of Information Science – Learning from Big Data: Supervised and Unsupervised Machine Learning – Regression Analysis – Data Clustering – K-means Algorithm – Data Dimensionality Reduction – Singular Value Decomposition – Principal Component Analysis Method – Content based Recommendation Systems

Module 2: Neural Network for Big Data

Fundamentals of Neural Networks and Artificial Neural Networks – Perceptron and Linear Models – Non-linearities Models – Feed Forward Neural Networks – Gradient Descent and Back Propagation – Overfitting – Recurrent Neural Networks

Module 3: Deep Big Data Analytics

Deep Learning Basics and the Building Blocks – Building Data Preparation Pipelines – Practical Approach to implementing Neural Net Architectures – Hyperparameter Tuning – Distributed Computing – Distributed Deep Learning

Module 4: Natural Language Processing

Basics – Text Preprocessing – Feature Extraction – Applying NLP Techniques – Sentiment Analysis – Fuzzy Systems: Fuzzy Logic Fundamentals – ANFIS Network – Fuzzy C-means Clustering – NEFClass

Module 5: Genetic Programming

Genetic Algorithms Structure – KEEL Framework – Weka Framework – Attribute Search with Genetic Algorithms – Swarm Intelligence: Particle Swarm Optimization Model – Ant Colony Optimization Model – Applications in Big Data Analytics – Handling Dynamical Data – Multi-objective Optimization

Module 6: Reinforcement Learning

Algorithms Concept – Reinforcement Learning Techniques – Deep Reinforcement Learning – Cyber Security: Big Data for Critical Infrastructure Protection – Cyber Security Attack Types – Cognitive Computing: Cognitive Science – Cognitive Systems – Application in Big Data Analytics – Cognitive Intelligence as a Service

Text Book:

1. Anand Deshpande and Manish Kumar, “Artificial Intelligence for Big Data”, Packt Publisher, 2018, ISBN: 978-1-78847-217-3.

Reference Books:

1. Prateek Joshi, “Artificial Intelligence with Python”, Packt Publisher, ISBN: 9781786464392.

2. Denis Rothman, “Artificial Intelligence by Example”, Packt Publisher, 2018, ISBN: 978-1788990547.
3. Stuart J. Russel and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Pearson Education India, Third Edition, 978-9332543515.
4. Seema Acharya, Subhashini Chellappan, “Big Data Analytics”, Wiley, Second Edition, 2019, ISBN: 978-8126579518.
5. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley, 2014, ISBN: 978-8126550890.

20CA2001	Computational Thinking for Problem Solving	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the basics of problem solving using computational thinking.
2. To organize and process data using computers.
3. To apply software development procedures.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the basics of computers and data.
2. solve problems using different elements of computational thinking and logic.
3. analyze problems and represent solutions using algorithms and activity diagrams.
4. organize and process data using different data structures.
5. apply software testing procedures.
6. illustrate the importance of the foundations of concurrency and information security.

Module 1: Computational Thinking

Computers - Computers and Computational Thinking – From Abacus to Machine – The first Software – What makes it a Modern Computer? – The first Modern Computer – Moore’s Law – Information and Data: Converting Information into Data – Data Capacity – Data Types and Data Encoding – Data Compression.

Module 2: Logic

Boolean Logic – Applications of propositional logic – Solving Problems: Problem Definition – Logical Reasoning – Decomposition – Abstraction – Class Diagrams and Use Case Diagrams.

Module 3: Algorithmic Thinking

Algorithms – Software and Programming Languages – Actions – Modeling Solutions: Activity Diagrams – Selection in Activity Diagrams – Repetition in Activity Diagrams – Control Abstraction in Activity Diagrams – States and State Diagrams – Including Behavior in State Diagrams – Providing more detail in State Diagrams.

Module 4: Data Organization

Names – Lists – Graphs – Hierarchies – Algorithmic Thinking: Von Neumann Architecture – Spreadsheets – Text Processing – Patterns.

Module 5: Computer Errors

Software Correctness – Verification – Software Testing – White Box Testing – Black Box Testing – Black Box Testing without Equivalence Partitioning – Boundary Value Analysis.

Module 6: Concurrent Activity

Parallelism – Scheduling – Sorting Networks – Measuring Concurrency’s Effect – Information Security: What is Security? – Foundations – Common Forms of Cyber Crime – Securing Data – Securing Techniques – Strategies.

Text Book:

David D. Riley, Kenny A. Hunt, “Computational Thinking for the Modern Problem Solver”, CRC Press, 2014, ISBN: 9781466587793.

Reference Books:

1. Karl Beecher, "Computational Thinking, A Beginner's Guide to Problem Solving and Programming", 2017, ISBN: 9781780173641.
2. Peter J Denning, Matti Tedre, "Computational Thinking", MIT Press, 2019, ISBN: 9780262536561.
3. Paolo Ferragina, Fabrizio Luccio, "Computational Thinking, First Algorithms, Then Code", Springer Publications, 2018, ISBN: 9783319979397.
4. Peter William McOwen, Paul Curzon, "Power of Computational Thinking, The: Games, Magic and Puzzles to help you become a Computational Thinker", World Scientific Europe Ltd, 2017, ISBN: 9781786341846.
5. Paul S. Wang, "From Computing to Computational Thinking", Routledge, 2015, ISBN: 9781482217650.
6. Heidi Williams, "No Fear Coding: Computational Thinking across the K-5 Curriculum", International Society for Technology in Education, 2017, ISBN: 9781564843876.

20CA2002	Problem Solving using Programming	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the basics of computing.
2. To explore the idea of developing programming logic.
3. To build applications using C programming language.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate the basics of computers and programming language.
2. summarize about character sets and data types.
3. apply control structures in programming.
4. develop C programs to solve computational problems using functions.
5. construct C programs using arrays and strings.
6. develop C programs for solving problems using structures and union.

Module 1: Introduction to Programming

Generation of Programming Languages- Design and Implementation of efficient program- Program Design Tools- Types of Errors- Introduction to C- Structure of a C program- Files used in C Program.

Module 2: Variables and Expressions

Comments – C Tokens- Character set in C – Keywords – Identifiers- Basic Data type - Variables – Constants – Input / Output Statements in C- Operators- Type Conversion and Type Casting - Scope of variable- Storage Classes.

Module 3: Control Structures

Introduction to Decision Control Statements – Conditional Branching Statements- Iterative Statements- Nested Loops – Break and Continue - Goto Statements.

Module 4: Functions

Introductions – Using Functions- Function Declaration/ Function Prototype –Function Definition-Function Call- Return Statement-Passing Arguments to Function-Recursion.

Module 5: Arrays and Strings

Introduction – Declaration of Arrays- Accessing the Elements of an Array- Passing Arrays to Functions- Storing Values in Arrays-Two Dimensional Arrays-Introduction to Strings- Operation on Strings.

Module 6: Pointers, User Defined Data Type and Files

Understanding the Computer's Memory – Introduction to Pointers – Declaring Pointer Variable- Pointer Expressions and Pointer Arithmetic – Passing Arguments to Functions- Structures-Unions-Enumerated Data Type- Files in C.

Text Book:

Reema Thareja, "Programming in C", Oxford University Press, 2018, ISBN: 9780199492282.

Reference Books:

1. Herbert Schildt, "The Complete Reference C", McGraw Hill Education, 4th Edition, 2017, ISBN: 9780070411838.
2. Stephen G. Kochan, "Programming in C", Pearson Education, 4th Edition, 2015, ISBN: 9789332554665.
3. Brian W. Kernighan, Dennis Ritchie, "The C Programming Language", Pearson Publications, 2015, ISBN: 9332549443.
4. Yashavant Kanetkar, "Let Us C", BPB publications, 16th edition, 2017, ISBN: 9789387284494.
5. K. R Venugopal, Sudeep R Prasad, "Mastering C", McGraw Hill Education, Second Edition, 2015, ISBN: 9789332901278.

20CA2003	Problem Solving Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize the concepts of C language in developing programs.
2. To solve problems using arrays and functions.
3. To develop programs using user defined data type.

Course Outcomes:

By learning the course, the students will be able to

1. write efficient coding using structured programming.
2. use modular programming approach for solving problem.
3. develop programs using different programming constructs.
4. apply data structures for solving problems.
5. develop applications using files.
6. construct programs using user defined data types.

List of Experiments

1. Usage of I/O Functions
2. Usage of Operators
3. Decision making statements
4. Usage of Iterative Statements
5. User defined Functions
6. Pointers and Functions
7. Arrays
8. Multidimensional Arrays
9. String handling
10. Usage of Structures
11. Enumerated Data Type
12. Files

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2004	Fundamentals of Information Technology	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize about different types of data.
2. To acquire knowledge about networks, databases and the Internet.
3. To explore about Information Technology.

Course Outcomes:

By learning the course, the students will be able to

1. understand the different types of data.
2. understand data storage in the computer.
3. develop knowledge about the CPU, networks and output devices.
4. understand the database concepts.
5. acquire knowledge about data processing and the Internet.
6. learn about applying IT techniques for societal impact.

Module 1: Data and Information, Acquisition of Numbers, Textual Data and Image Data

Data and Information: Introduction, Types of Data, a Simple Model of a Computer, Data Processing Using a Computer, Desktop Computer. Acquisition of Numbers and Textual Data: Introduction - Input Units - Internal Representation of Numeric Data - Representation of Characters in Computers - Error-Detecting Codes. Acquiring Image Data: Introduction - Acquisition of Textual Data - Acquisition of Pictures - Storage Formats for Pictures - Image Compression Fundamentals - Image Acquisition with a Digital Camera.

Module 2: Acquiring Audio Data, Acquisition of Video and Data Storage

Acquiring Audio Data: Introduction - Basics of Audio Signals - Acquiring and Storing Audio Signals - Compression of Audio Signals. Acquisition of Video: Introduction - Capturing a Moving Scene with a Video Camera - Compression of Video Data - MPEG Compression Standard. Data Storage: Introduction - Storage Cell - Physical Devices Used as Storage Cells - Random Access Memory - Read Only Memory - Secondary Storage - Compact Disk Read Only Memory – Archival store.

Module 3: Central Processing Unit, Computer Networks and Output Devices

Central Processing Unit: Introduction - Structure of a Central Processing Unit - Specifications of a CPU - Interconnection of CPU with Memory and I/O Units - Embedded Processors –Conclusions. Computer Networks - Introduction - Local Area Network (LAN) - Applications of LAN - Wide Area Network (WAN) - Internet - Naming Computers Connected to Internet - Future of Internet Technology. Output Devices: Introduction - Video Display Devices - Touch Screen Display - E-Ink Display - Printers - Audio Output.

Module 4: Data Organization and Processing Numerical Data

Data Organization: Introduction - Organizing a Database - Structure of a Database - Database Management System - Example of Database Design - Non-Text Databases - Archiving Databases. Processing Numerical Data - Introduction - Use of Spreadsheets - Numerical Computation Examples.

Module 5: Processing and Displaying Textual Data, Processing Multimedia Data and Some Internet Applications

Processing and Displaying Textual Data: Introduction - Word Processor - Desktop Publishing - Page Description Language - Markup Languages. Processing Multimedia Data: Introduction - Graphics Processing - Audio Signal Processing. Some Internet Applications: Introduction - Email - World Wide Web - Information Retrieval from the World Wide Web - Other Facilities Provided by Browsers - Audio on the Internet - Accessing Pictures and Video via Internet.

Module 6: Electronic Commerce and Societal Impacts of Information Technology

Electronic Commerce: Introduction - Business to Customer E-Commerce - Business to Business E-Commerce - Customer to Customer E-Commerce - Advantages and Disadvantages of e-Commerce. Societal Impacts of Information Technology: Introduction - Social Uses of World Wide Web - Privacy, Security and Integrity of Information - Disaster Recovery - Intellectual Property Rights - Careers in Information Technology.

Text Book:

V. Rajaraman, “Introduction to Information Technology”, PHI Learning Private Limited, Second Edition, 2013, ISBN: 9788120347311.

Reference Books:

1. Alexis Leon and Mathews Leon, “Introduction to Computers”, Vikas Publishing, 2009, ISBN: 978818209234.
2. Brian K. Williams and Stacey C. Sawyer, “A Practical Introduction to Computers & Communications Complete Version”, 2011, ISBN: 9780072485554.

3. O'Reilly, "Introduction to Information Technology", Pearson Education India, Second Edition, 2012, ISBN: 9789332525146.
4. Peter Norton, "Introduction to Computers", McGraw Hill, Seventh Edition, 2013, ISBN: 9780070671201.
5. Peter L Dordal, "An Introduction to Computer Networks", Minneapolis, 2014, ISBN: 9780070671201.
6. Darrell W Hajek and Cesar Herrera, "Introduction to Computers", CreateSpace Independent Publishing Platform, 2017, ISBN: 9781545236468.
7. Eric Frick, "Information Technology Essentials: An Introduction to Information Technology", Frick Industries LLC, 2017, ISBN: 9781733009423.

20CA2005	Computer Fundamentals Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize the features of MS-Word.
2. To construct Power Point presentations with effects and Animation.
3. To provide hands-on experience in MS-Excel and MS-Access.

Course Outcomes:

By learning the course, the students will be able to

1. perform documentation by analyzing and applying appropriate techniques.
2. develop presentations using MS-PowerPoint.
3. perform basic text editing functions by keying text into a document.
4. evaluate the appropriate means for inserting text, values and formulas into a worksheet.
5. generate tables and charts.
6. perform accounting operations.

List of Experiments:

1. Preparing resume
2. Creating Presentation
3. Usage of functions
4. Conditional statements
5. Conditional Formatting
6. Text Function
7. Creating database
8. Sorting and filtering
9. Mail Merge
10. Pivot table and chart
11. Forecasting models
12. Business Modelling

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2006	Foundations of Data Science and Analytics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the basics of data science and analytics.
2. To identify the mathematical foundation of data analytics.
3. To explain the importance of data communication and machine learning.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the basics of data science.

2. categorize data and process them.
3. identify the mathematical foundations of data science.
4. inspect the role of probability and statistics in data analytics.
5. formulate the fundamentals of machine learning techniques in data exploration.
6. apply data analytics to real world problems.

Module 1: Introduction to Data Science

What is Data Science? – Basic Terminology – Why Data Science? – Sigma Technologies – The Data Science Venn Diagram – The Math – Spawner Recruit Models – Computer Programming – Python Practices - Example of Basic Python – Parsing a Single Tweet – Domain Knowledge – Terminologies.

Module 2: Data Categorization and Processing

Flavors of Data – Why look at these distinctions? – Structured vs Unstructured Data – Examples of Data Preprocessing – Quantitative vs Qualitative Data – The Four Levels of Data - Five Steps of Data Science: Introduction to Data Science – Overview of the Five Steps – Explore the Data – Exploration Tips for Qualitative Data.

Module 3: Foundations of Data Analytics

Mathematics as a Discipline – Basic Symbols and Terminology – Linear Algebra - Basic Definitions of Probability – Bayesian versus Frequentist – Compound Events – Conditional Probability – The Rules of Probability – Collectively Exhaustive Events – Bayesian Ideas – Random Variables - What are statistics? – How do we obtain Sample Data – Sampling Data – How do we measure statistics? The Empirical Rule – Point Estimates of Advanced Statistics – Sampling Distributions – Confidence Intervals – Hypothesis Tests.

Module 4: Data Communication and Visualization

Communicating Data: Why does Communication matter? – Identifying effective and ineffective visualizations – When graphics and statistics lie? – Verbal Communication.

Module 5: Machine Learning Essentials

Machine Learning Essentials: What is machine learning? – How does Machine learning work? – Types of Machine learning – Types of Supervised Learning – Unsupervised Learning – Reinforcement Learning – Overview of the types of Machine Learning – Naïve Bayes Classification – Decision Trees – Unsupervised Learning – When to use unsupervised learning? K-means Clustering – Feature extraction and Principal Component Analysis.

Module 6: Case Studies

Automating Government Paper Pushing – Marketing Dollars – Job Description - Predicting stock prices based on social media.

Text Book:

Sinan Ozdemir, “Principles of Data Science”, Packt Publishing Ltd, 2016, ISBN: 9781785887918.

Reference Books:

1. Joel Grus, “Data Science from Scratch: First Principles with Python”, O’Reilly Media, 2015, ISBN: 978-1491901427.
2. Cathy O’Neil and Rachel Schutt, “Doing Data Science, Straight Talk From The Frontline”, O’Reilly, 2014, ASIN: B00FRSNHDC.
3. Jiawei Han, Micheline Kamber and Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition, 2011, ISBN: 0123814790.
4. Mohammed J. Zaki and Wagner Miera Jr, “Data Mining and Analysis: Fundamental Concepts and Algorithms”, Cambridge University Press, 2014, ASIN: B00HAFNUIW.
5. Matt Harrison, “Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization, O’Reilly, 2016, ASIN: B01GIE03GW.
6. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, O’Reilly Media, 2012, ISBN: 9789352136414.

20CA2007	Foundations of Data Science and Analytics Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To identify the concepts of data science and analytics.
2. Analyze different types of data.
3. Interpret the data by visualization.

Course Outcomes:

By learning the course, the students will be able to

1. interpret the data into knowledge.
2. outline the mathematical operations.
3. interpret the data using charts.
4. apply data mining techniques to model the data.
5. utilize hypothesis testing.
6. apply data analytics to solve real world problems.

List of Experiments

1. Counting the number of words and vowels in a piece of text
2. Parsing a Tweet
3. Operations on Levels of Data (Measures of Centre, Measures of variation)
4. Exploring a dataset using pandas
5. Matrix operations using numpy
6. Set operations using numpy
7. Plotting Discrete Random Variable
8. Plotting Continuous Random Variable
9. Comparison of Websites in Marketing
10. T-test/Chi-square test
11. Plotting of Data
12. Decision Tree

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2008	Essentials of Python Programming	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain about python programming concepts.
2. To examine the data structures in python.
3. To acquire knowledge on object oriented concepts.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the basics about python programming.
2. demonstrate the use of control flow statements in python.
3. develop modules for reusability of code.
4. infer the concept of collections in python.
5. illustrate object-oriented concepts.
6. make use of file handling concepts.

Module 1: Introduction to Python

Basics - Variables – Naming Conversion - Assignment Operator – Statements - Comments in Code- Scripts Versus Programs - Python Strings - String Functions - String Formatting - String Templates - Types of Numbers- Integers- Floating Point Numbers- Complex numbers - Boolean values - Arithmetic Operators - Assignment numbers - None value.

Module 2: Control Flow Statements

Flow of Control using IF Statements - Comparison Operators- Logical Operators- If Statement- Working with an if Statement-Else in an If Statement-The Use of elif- Nested If Statements-If Expressions- Introduction to Iteration- While Loop-For Loop-Break Loop Statement-Continue Loop Statement-For Loop with Else.

Module 3: Functions and Scope

Structured Analysis and Function Identification- Functional Decomposition- Functional Flow- Functions- How Functions Work- Types of Functions-Defining Functions - Returning Values from Functions- Docstring -Function Parameters - Anonymous Functions – Recursion - Scope and Lifetime of Variables: Local Variables- The Global Keyword- Non-Local Variable.

Module 4: Collections

Python Collection Types- Tuples- Lists- Sets- Working with sets- Set Operations, methods- Dictionaries- Working with Dictionaries- Dictionary Methods-map filter and reduce.

Module 5: Object Oriented Programming

Introduction- Class Definition- Objects- Class Comments- Instance Methods- del keyword- Automatic Memory Management- Intrinsic Attributes- Class Side Data- Class Side Methods-Static Method- Class Inheritance- Operator Overloading- Inheritance- method overriding

Module 6: File handling

Exception Handling- Introduction to files- Reading and writing files- Graphical User Interface

Text Book:

John Hunt, “A Beginners Guide to Python 3 Programming”, Springer, 2020, ISBN: 9783030202903.

Reference Books:

1. John Hunt, “Advanced Guide to Python 3”, Springer, 2019, ISBN: 9783030259426.
2. John V. Guttag, “Introduction to Computation and Programming using python”, MIT press Cambridge, 2013, ISBN: 978-0-262-525008.
3. R. Nageswari Rao, “Core Python Programming”, Dreamtech, 2018, ISBN: 9789386052308.
4. Jeeva Jose, “Taming Python Programming”, Khanna Publishing, 2019, ISBN: 9789386173348.
5. Ashok Namdev Kamthane, Amit Ashok Kamthane, “Programming and problem solving with python”, McGrawHill, 2018, ISBN:9789387067578.
6. Reema Thareja, “Python Programming Using Problem Solving Approach”, Oxford Higher Education, 2017, ISBN: 9780199480173.

20CA2009	Programming in Python Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize the basics of python programming concepts.
2. To develop program using object oriented features.
3. To Construct Graphical User Interface.

Course Outcomes:

By learning the course, the students will be able to

1. demonstrate control and iterative statements in python.
2. experiment with data structures used in python.
3. apply object-oriented programming in python.
4. Utilize functions and file handling operations.
5. build Graphical User Interface applications.
6. develop database applications.

List of Experiments:

1. Decision making Statements
2. Iterative statement
3. Employee list using lists

4. Tuple operations
5. String manipulation
6. Function
7. Recursion
8. Inheritance
9. Method overriding
10. File handling
11. GUI application
12. Database connectivity

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2010	Python for Data Science and Analytics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To identify data preprocessing techniques.
2. To compare various data analysis processes.
3. To develop models using numpy and pandas library in python.

Course Outcomes:

By learning the course, the students will be able to

1. make use of data preprocessing techniques.
2. analyze data using numpy library.
3. infer the interaction with database
4. demonstrate about data wrangling
5. explore data to solve data science problems.
6. interpret the data by visualization.

Module 1: Introduction to Data Processing

Introduction- Python Libraries- Data Representation- Data Cleaning - Data Integration – Data Transformation – Data in Different Scales- Data Discretization-Train and Test Data –Supervised Learning, Unsupervised Learning- Reinforcement Learning- Performance Metrics

Module 2: Data Analysis and Libraries

Python libraries in Data Analysis- NumPy Arrays and Vectorized Computation: Numpy Arrays- Array functions - Data processing using Arrays

Module 3: Data Analysis with Pandas

An overview of the pandas package- The Pandas data structure- The essential basic functionality- Indexing and Selecting data- Working with missing data- Advanced uses of pandas and data analysis TimeSeries

Module 4: Interacting with database

Interacting with data in text format- Interacting with data in binary format- Interacting with data in MongoDB, Interacting with data in Redis

Module 5: Data Wrangling

Subsetting a dataset- Generating random numbers and their usage-Generating random numbers following probability distributions- Grouping the data

Module 6: Data Visualization

Data Visualization: The Matplotlib API primer, Exploring plot types, Legends and annotations, Plotting functions with pandas, Case Studies: Modelling stock market data, Driving visual analyses with automobile data.

Text Books:

1. Rohan Chopra, Aaron England and Mohammed Noordeen Alaudeen, “Data Science with python”, Packt publishers, 2019, 9781838552862.

- Phuong Vo. T. H, Martin Czygan, Ashish Kumar, Kirthi Raman, “Python: Data Analytics and Visualization, Packt Publishing Ltd, 2017, ISBN: 9781788290098

Reference Books:

- Dr. Ossama Embark, “Data Analysis and Visualization using python”, Apress publications, 2018, ISBN:9781484241080
- Fabio Nelli, “Python Data Analytics”, Apress publication, 2015, ISBN:9781484209592.
- Wes McKinney, “Python for Data Analysis Data Wrangling with pandas, Numpy, and ipython”, O’Reilly,2018, 9781491957660
- Jesus Rogel-Salazar, “Data Science and Analytics with Python”, CRC Press, ISBN: 9781498742092,
- Alberto Boschetti, Luca Massaron, “Python Data Science Essentials- Third Edition, Packt, 2018, ISBN: 9781789537864.
- David Taieb, “Data Analysis with Python”, Packt, 2018, ISBN: 9781789950069

20CA2011	Python for Data Science and Analytics Lab	L	T	P	C
		0	0	2	2

Course Objectives:

- To summarize the basics of data preprocessing.
- Analyze different types of data.
- To interpret the data by visualization.

Course Outcomes:

By learning the course, the students will be able to

- interpret the data into Knowledge.
- understand the mathematical operations.
- interpret the data using charts.
- apply data mining techniques to model the data.
- learn about hypothesis tests.
- apply data analytics to solve real world problems.

List of Experiments:

- Mathematical operations
- Reading and Writing data
- Data preprocessing
- Hierarchical Indexing
- Data aggregation and group operations
- Creating data frame containing both numeric and string values
- Pivot table and cross tabulations
- Time series
- Creating application oriented analyses using tax data
- Weather forecasting
- Stock market prediction
- Natural Language Processing

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2012	Data Structures	L	T	P	C
		3	0	0	3

Course Objectives:

- To summarize the different methods of organizing large amounts of data.
- To implement the different data structures.

3. To implement solutions for specific problem Prerequisites.

Course Outcomes:

By learning the course, the students will be able to

1. Outline the different ways of arranging and handling collection of data.
2. organize data in arrays and perform operations.
3. organize and manipulate data using linked lists.
4. organize and manipulate data using stacks and queues.
5. understand searching and sorting techniques.
6. organize and manipulate data in trees and graphs.

Module 1: Introduction to Data Structures and Algorithms

Basic Terminology – Classification of Data Structures – Operations on Data Structures – Algorithms – Different Approaches in Designing an algorithm – Time and Space Complexity. **Arrays:** Introduction – Declaration of Arrays – Accessing the elements of an array – Storing values in arrays – Operations on Arrays – Passing Arrays to Functions.

Module 2: Linked Lists

Introduction. Linked List: Introduction – Singly Linked Lists – Circular Linked Lists – Doubly Linked Lists.

Module 3: Stacks and Queues

Introduction – Array Representation of Stacks – Operations on Stack – Linked Representation of Stacks – Operations on a Linked Stack – Applications of Stacks – Introduction to Queues – Array Representation of Queues – Linked Representation of Queues – Applications of Queues.

Module 4: Searching and Sorting

Introduction to Searching – Linear Search – Binary Search – Bubble Sort – Insertion Sort – Selection Sort – Merge Sort – Quick Sort – Shell Sort.

Module 5: Trees

Introduction – Types of Trees – Creating a Binary Tree from a General Tree – Traversing a Binary Tree.

Module 6: Graphs

Introduction – Graph Terminology – Representation of Graphs – Graph Traversal Algorithms.

Text Book:

Reema Thareja, “Data Structures using C”, Oxford University Press, 2nd Edition, 2014, ISBN: 9780198099307.

Reference Books:

1. Dr. Besant Agarwal, Benjamin Baka, “Hands-on Data Structures and Algorithms with Python”, Second Edition, Packt Publishing, 2018, ISBN: 9781788995573.
2. Atul S. Khot, Raju Kumar Mishra, “Learning Functional Data Structures and Algorithms”, Packt Publishing, 2017, ISBN: 9781785888731.
3. Adam Drozdek, “Data Structures and Algorithms in C++”, Fourth Edition, Cengage Learning, 2013, ISBN: 9781133608424.
4. Mark A. Weiss, “Data Structures and Algorithm Analysis in C++”, Fourth Edition, Pearson Education, 2013, ISBN: 032144146X.
5. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Computer Algorithms C++”, 2011, ISBN: 9780929306421.
6. Hemant Jain, “Data Structures and Algorithms in Go”, 2019, ISBN: 9781099552069.

20CA2013	Data Structures Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To organize data using data structures.
2. To utilize data structures in applications.
3. To identify appropriate data structures in problem solving.

Course Outcomes:

By learning the course, the students will be able to

1. organize data using data structures.
2. apply data structures for solving problems.
3. utilize data structures in application.
4. illustrate the usage of data structures.
5. identify appropriate data structures for problem solving.
6. analyze the efficiency of algorithms

List of Experiments:

1. Array Manipulation
2. Singly Linked List
3. Sorting a Linked List
4. Circular Linked List
5. Doubly Linked List
6. Checking a Palindrome using a Stack
7. Queue Operations
8. Josephus Problem
9. Selection Sort
10. Bubble Sort
11. Insertion Sort
12. Linear Search

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2014	Database Management System	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the role of a database management system in an organization.
2. To explain the basic database concepts, including the structure and operation of the relational data model.
3. To explore database for concurrent use.

Course Outcomes:

By learning the course, the students will be able to

1. evaluate business information problem and find the requirements of a problem in terms of data.
2. summarize about database schema and need for normalization.
3. design the database schema with the use of appropriate data types for storage of data in database.
4. use different types of physical implementation of database
5. construct simple and moderately advanced database queries using Structured Query Language (SQL).
6. facilitate students to understand the concept of triggers.

Module 1: Introductory concepts of DBMS

Introduction and applications of DBMS, Purpose of data base, Data, Independence, Database System architecture- levels, Mappings, Database, users and DBA

Module 2: Relational Model

Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries, tuple relational calculus Entity-Relationship model : Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features – generalization, specialization, aggregation, reduction to E-R database schema

Module 3: Relational Database design

Functional Dependency – definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization – 1NF, 2NF, 3NF, Decomposition using FD- dependency preservation, BCNF, Multi- valued dependency, 4NF, Join dependency and 5NF

Module 4: Transaction Management

Transaction concepts, properties of transactions, serializability of transactions, testing for serializability, System recovery, Two- Phase Commit protocol, Recovery and Atomicity, Log-based recovery, concurrent executions of transactions and related problems, Locking mechanism, solution to concurrency related problems, deadlock, two-phase locking protocol, Isolation, Intent locking

Module 5: SQL Concepts

Basics of SQL, DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions – numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All, view and its types. transaction control commands – Commit, Rollback, Savepoint

Module 6: PL/SQL Concepts

Cursors, Stored Procedures, Stored Function, Database Triggers

Text Book:

C J Date, “An Introduction to Database Systems”, Addition-Wesley, Eight Edition, 2008, ISBN: 9788177585568

Reference Books:

1. Abraham Silberschatz, Henry F. Korth & S. Sudarshan, “Database System Concepts”, McGraw Hill, 6th edition, 2013, ISBN: 9789332901384.
2. Martin Gruber, “Understanding SQL”, BPB, ISBN: 978-0895886446
3. Ivan bayross, “SQL, PL/SQL the Programming Language of Oracle”, BPB Publications, 2010, ISBN: 9788176569644
4. Jeffrey A. Hoffer, Mary B. Prescott, and Fred R. McFadden, “Modern Database Management”, 8th Edition, 2007, Prentice-Hall
5. Elmasri, R. and S. B. Navathe, “Fundamentals of Database Systems”, 5th Edition, 2007, Addison Wesley

20CA2015	Database Management System Lab	L	T	P	C
		0	0	2	2

Course objectives:

1. To summarize the database concepts, technology and practice to groom students into well-informed database application developers.
2. To explore SQL programming through a variety of database problems.
3. To develop database applications using front-end tools and back-end DBMS.

Course Outcomes:

By learning the course, the students will be able to

1. explore various commands
2. summarize about aggregate functions
3. analyzing the business requirements and producing a viable model.
4. illustrate the usage of database.
5. convert the entity-relationship diagrams into relational tables.
6. develop appropriate Databases to a given problem that integrates ethical, social, legal, and economic concerns.

List of Experiments

1. E-R Diagrams
2. Data Definition Language (DDL) commands

3. Data Manipulation Language (DML)
4. Transaction control Languages (TCL)
5. Aggregate functions
6. Sub Queries and Joins
7. Index
8. Views
9. Procedures
10. Cursors
11. Triggers
12. Normalization

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2016	Operating System and Networking	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the basics of Operating System.
2. To compare different types of Operating Systems.
3. To explain about the Internet.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the basic concepts of Operating System.
2. analyse the types of Operating Systems.
3. summarize the basics of Networking.
4. create, share and customize the Networking accounts.
5. explore the networks at different levels.
6. illustrate the importance of the networking standards.

Module 1: Overview of an Operating System

Introducing Operating Systems – Early Memory Management Systems – Virtual Memory

Module 2: Role of Operating System

Processor Management – Process Synchronization - Concurrent Processes - Device Management - File Management

Module 3: Operating Systems in Practice

Unix Operating Systems - Windows Operating Systems - Linux Operating Systems - Unix Operating Systems

Module 4: Fundamental of Networks

Introduction to Computer Networks and Data Communication - Fundamentals of Data and Signals – Conducted and Wireless Media – Making Connections

Module 5: Error in Networks

Multiplexing and Compression – Errors, Error Detection and Error Control

Module 6: Types of Networks

Local Area Networks – Metropolitan Wide Area Networks - The Internet – Voice and Data Delivery Networks

Text Books:

1. Ann McHoes, Ida M. Flynn, “Understanding Operating Systems”, 8th Edition, Cengage Learning, 2017, ISBN-13: 978-1305674257.
2. Curt M. White, “Data Communications & Networks – A Business User’s Approach”, 8th Edition, Cengage Learning, 2016, ISBN-13: 978-1305116634.

Reference Books:

1. William Stallings, “Data and Computer Communication”, Eight Editions, Pearson Prentice Hall, 2009, ISBN: 978-81-317-1536-9.
2. Abraham Silberschatz, Galvin and Gagne, “Operating System Concepts”, Ninth Edition, 2012, Wiley. ISBN: 9781118063330.
3. A.M. Lister and R.D. Eager, “Fundamentals of Operating Systems”, Fifth Edition, Springer, 2013, ISBN: 1475722524 (Print) 978-1-4757-2252-9 (Online).
4. Ruth A. Watson, “Introduction to Operating Systems and Networks”, Pearson Education (US), 2003, ISBN13 9780131118942

20CA2017	Fundamentals of Business Analytics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the fundamental knowledge of business intelligence.
2. To analyze business data in a wide range with different tools available into the current market.
3. To explain BI terminologies and framework, basics of data integration (Extraction Transformation Loading), multi-dimensional data modeling.

Course Outcomes:

By learning the course, the students will be able to

1. construct an end-to-end data warehousing solution for business intelligence involving various data sources, ETL, multi-dimensional modeling, OLAP, reporting and analytics.
2. differentiate between Transaction Processing and Analytical applications and describe the need for Business Intelligence.
3. demonstrate the understanding of technology and processes associated with Business Intelligence framework.
4. apply the BI process across the organization and make predictive analytics.
5. identify the metrics, indicators and make recommendations to achieve the business goal for a given business scenario.
6. apply BI process into daily management activities with reporting.

Module 1: Introduction to Business Intelligence

Introduction to Business Intelligence – Equipping the organization for effective decision making- Making the most of what You’ve got – using Business Intelligence- Seeking the Source- the source of Business Intelligence – First Steps Beginning the development of Business Intelligence.

Module 2: Types of digital data

Types of digital data – Introduction – Getting to know structured data - Getting to know unstructured data - Getting to know semi-structured data – Difference between semi- structured and structured data – Introduction to OLTP and OLAP- OLTP – OLAP.

Module 3: BI Framework

BI Framework - BI Component Framework – Who is BI for? – BI users – BI Applications – BI roles and responsibilities - Basics of Data Integration – Need for Data warehouse – Definition of Data ware house- what is Data Mart? – Extract - Transform - Load - Data Integration.

Module 4: Data Quality

Introduction to data quality - Why data quality matters – What is Data Quality – How do we maintain Data Quality - data profiling concepts and applications – Introduction to Multi-Dimensional Data Modeling – Data Modelling Basics – Types of Data model – Data Modelling Techniques.

Module 5: Dimensional Models

Fact Table – Dimension Table – Typical Dimensional models - Business metrics and KPIs – Understanding Measures and Performance – Measurement System Terminology – Fact Based Decision Making and KPIS – KPI usage.

Module 6: Enterprise Reporting

Basics of Enterprise Reporting – Reporting perspectives – Report standardization and presentation practices – Enterprise reporting – Balanced Scorecard.

Text Book:

R N Prasad and Seema Acharya, “Fundamentals of Business Analytics”, Wiley-India, 2011, ISBN: 978-91-265-32032

Reference Books:

1. Brain and Larson, “Delivering Business Intelligence with Microsoft SQL server 2008”, 2nd Edition, McGraw Hill, 2009, ISBN-13: 858-0001276991.
2. David Loshin, “Business Intelligence -The Savvy Manager's Guide”, Morgan Kaufmann Publishers 2012, ISBN: 978-0-12-385889-4.
3. Galit Shmueli, Nitin R. Patel and Peter C. Bruce, “Data Mining for Business Intelligence”, John Wiley and Sons, 2011, ISBN: 9781118126042.
4. Cindi Howson, “Successful Business Intelligence: Secrets to making Killer BI Applications”, Tata McGraw Hill, 2nd Edition, 2014, ISBN: 9780071809191.
5. William H. Inmon, “Building the Data Warehouse”, 2010, Wiley India Ltd.
6. Jay Liebowitz, “Big Data and Business Analytics”, CRC Press, Taylor and Francis Group, Computer Science and Technology, 2013, ISBN- 978-1-4822-1851-0

20CA2018	Big Data Analytics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explore about Big Data.
2. To explain Hadoop.
3. To summarize various features of Hive.

Course Outcomes:

By learning the course, the students will be able to

1. understand the fundamental of Big Data.
2. understand the concepts of Hadoop.
3. develop solutions to problems using Big Data.
4. acquire knowledge about MongoDB.
5. apply Big Data to solve real world problems.
6. illustrate the role of map reduce programming in various scenarios.

Module 1: Introduction to Big Data

Types of Digital Data-Classification of Digital Data- Introduction to Big data- Characteristics of Data-Evolution of Big data- Definition of Big data- Challenges with big data- What is big data- Why big data-data warehouse environment – hadoop environment.

Module 2: Big data Analytics and The Big Data Technology Landscape

What is Big data Analytics- Classification of Analytics- Top Challenges facing big data- Why is big data analytics important – Data Science- Terminologies used in big data environment - BASE- NoSQL- Hadoop.

Module 3: Hadoop

Introducing Hadoop- Why Hadoop- Why not RDBMS- RDBMS versus Hadoop- Distributed Computing Challenges- History of Hadoop – Hadoop Overview – Use case of Hadoop- Hadoop Distributors – HDFS- Processing Data with Hadoop- Mapping Resources and Applications with Hadoop YARN – Interaction with Hadoop Ecosystem.

Module 4: MangoDB and Pig

What is MongoDB – Why MongoDB –Terms used in RDBMS and MongoDB – Data Types in MongoDB – MongoDB Query Language - Analyzing Data with Pig

Module 5: Mapreduce Programming:

Mapreduce Introduction –Mapper – Reducer – Combiner –Partitioner – Searching – Sorting – Compression.

Module 6: Introduction to Hive and Machine Language

What is Hive- Hive Architecture – Hive Data Types- Hive File Format – Hive Query Language – RC File Implementation – SerDe- User Defined Function – Introduction to Machine Learning – Machine Learning Algorithms.

Text Book:

Seema Acharya, Subhashini Chellappan, “Big data and Analytics”, First Edition, Wiley, 2016, ISBN: 9788126554782.

Reference Books:

1. Anil Maheshwari, “Big data”, Print Edition, McGraw Hill Education Publication 2017, ISBN: 9789352604548.
2. Marz, Nathan, James Warren “Big data: Principles and Best Practices of Scalable Realtime Data Systems”, Manning Publications, 2015, ISBN: 9781617290343.
3. Sandeep Karanth, “Mastering Hadoop”, Packt publishing, 2014, ISBN: 978-1783983643.
4. DT Editorial Services, “Big Data, Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization”, DreamTech Press, 2016, ISBN: 9789351199311.
5. Raj Kamal and preeti Saxena “Big data and Analytics”, McGraw Hill Education (India) Private Limited ISBN (13): 978-93-5316-496-6.
6. Eric Sammer, “Hadoop Operations”, O'Reilley, 2012, ISBN: 9781449327057.

20CA2019	Big Data Analytics Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To summarize the Hadoop Environment.
2. To explore about MongoDB and Mapreduce Programming.
3. To explore about machine learning.

Course Outcomes:

By learning the course, the students will be able to

1. design, device, and query relational databases for operative data.
2. evaluate the key concepts of big data analytics.
3. recognize on the fundamental concepts of big data analytics
4. design, implement, populate and query data warehouses for informational data .
5. integrate very large data sets to make business decisions.
6. examine and apply appropriate business analytic techniques and methods.

List of Experiments

1. Hadoop installation
2. Hadoop lab - hellohdfs
3. File management in hadoop
4. To perform nosql database using mongodb to create, update and insert.
5. To study and implement basic functions and commands in r programming.
6. Pig latin language – pig
7. Pig commands
8. Pig latin modes, programs
9. Hive
10. Hive operations
11. Creating cassandra nosql database and table
12. Inserting data

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2020	Data Mining and Data Warehousing	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the need for Data Mining
2. To explore the techniques in Data Mining
3. To infer the functions of Data Warehousing

Course Outcomes:

By learning the course, the students will be able to

1. summarize the need for Data Mining.
2. acquire knowledge on Data Preprocessing and Classification techniques.
3. infer the concept of Clustering.
4. explore the concepts of Association Mining.
5. understand the need for Data Warehousing.
6. infer the role of Online Analytical Processing.

Module 1: Introduction to Data Mining

Introduction to Data Mining - Need of Data Mining - What Can Data Mining Do and Not Do? - Data Mining Applications - Data Mining Process - Data Mining Techniques: Predictive modelling - Database segmentation - Link analysis - Deviation detection - Difference between Data Mining and Machine Learning

Module 2: Data Preprocessing & Classification

Need for Data Preprocessing - Data Preprocessing Methods: Data cleaning - Data integration - Data transformation - Data reduction – Classification: Introduction to Classification - Types of Classification - Input and Output Attributes - Working of Classification - Guidelines for Size and Quality of the Training Dataset - Introduction to the Decision Tree Classifier - Naive Bayes Method - Understanding Metrics to Assess the Quality of Classifiers

Module 3: Cluster Analysis

Introduction to Cluster Analysis - Applications of Cluster Analysis - Desired Features of Clustering - Distance Metrics - Major Clustering Methods/Algorithms - Partitioning Clustering - Hierarchical Clustering Algorithms (HCA)

Module 4: Association Mining

Introduction to Association Rule Mining - Defining Association Rule Mining - Representations of Items for Association Mining - The Metrics to Evaluate the Strength of Association Rules - The Naive Algorithm for Finding Association Rules - Approaches for Transaction Database Storage - The Apriori Algorithm - Closed and Maximal Itemsets - Direct Hashing and Pruning (DHP) - Dynamic Itemset Counting (DIC) - Mining Frequent Patterns without Candidate Generation (FP Growth)

Module 5: Data Warehouse and Data Warehouse Schema

The Need for an Operational Data Store (ODS) - Operational Data Store - Data Warehouse - Data Marts - Comparative Study of Data Warehouse with OLTP and ODS - Data Warehouse Schema: Introduction to Data Warehouse Schema - Star Schema - Snowflake Schema - Fact Constellation Schema (Galaxy Schema) - Comparison among Star, Snowflake and Fact Constellation Schema

Module 6: Online Analytical Processing

Introduction to Online Analytical Processing - Representation of Multi-dimensional Data - Improving efficiency of OLAP by pre-computing the queries - Types of OLAP Servers - OLAP Operations

Text Book:

Parteek Bhatia, “Data Mining and Data Warehousing - Principles and Practical Techniques”, Cambridge University Press, 2019, ISBN: 9781108727747.

Reference Books:

1. Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining - Concepts and Techniques”, 3rd Edition, Morgan Kaufmann, 2012, ISBN: 9780123814791

2. Jared Dean, “Big Data, Data Mining, and Machine Learning”, Wiley, 2014, ISBN: 978-118-61804-2
3. Alejandro Vaisman, Esteban Zimanyi, “Data Warehouse Systems: Design and Implementation”, Springer, 2014, ISBN: 978-3-642-54654-9
4. Christopher Adamson, “Mastering Data Warehouse Aggregates: Solutions for Star Schema Performance”, Wiley Publishing Inc, 2006, ISBN: 978-0471777090
5. Galit Shmueli, Peter C. Bruce, Mia I. Stepiens, Nitin R. Patel, “DATA MINING FOR BUSINESS ANALYTICS: Concepts, Techniques, and Applications”, John Wiley & Sons, 2017, ISBN: 9781118729274
6. Salvador García, Julián Luengo, Francisco Herrera, “Data Preprocessing in Data Mining”, Springer International, 2015, ISBN: 978-3-319-10246-7

20CA2021	Data Analysis and Visualization	L	T	P	C
		3	0	0	3

Course Objectives:

1. To illustrate the brief history of the practice of data visualization.
2. To outline the key design principles and techniques for visualizing data.
3. To develop an understanding of the fundamentals of communication and alignment around concepts that are required for effective data presentation.

Course Outcomes:

By learning the course, the students will be able to

1. collect and process data, create an interactive visualization, and use it to demonstrate or provide insight into a problem, situation, or phenomenon.
2. employ best practices in data visualization to develop charts, maps, tables, and other visual representations of data.
3. summarize the basic knowledge needed to critique various visualizations (good and bad), and to identify design principles that make good visualizations effective using tableau.
4. illustrate the basic understanding of some of the challenges present in making data understandable across a wide range of potential audiences.
5. create, compelling, interactive dashboards to combine several visualizations into a cohesive and functional whole.
6. demonstrate their own skills in identifying a visualization that can be improved, completing their own design and/or analysis on the underlying data, and working to publish or promote acceptance of their presentation.

Module 1: Introduction to Data Visualization

Introduction to the Art and Science of Data Visualization- What is Data Visualization and why does it matter? - Brief History of Data Visualization Current visualization practitioners of note - Introduction to Tableau Importing Data / Connecting to External Sources Interface Overview Creating Sheets and Dashboard.

Module 2: Data Modelling

Design Fundamentals- Design Principles - Colors and “Chart Junk”- Design perspectives from the experts - The Shaffer 4 C’s of Data Visualization- Not-so-best practices (examples) Critique and redesign. Creating a good data set for analysis Data modelling fundamentals for analytics selecting data for your KPIs. Advanced Excel Techniques Data Bars, sparklines, Box Plots, Mapping, and Bullet Charts. In Depth Design Fundamentals. Storytelling with Data What are the main approaches to storytelling with data? - Dashboards vs. Storyboards vs. Infographics, Designing with the user in mind, The Duell Rules for Actionable Visualizations.

Module 3: Interactive Visualization

Advanced Tableau Topics: Interactive Visualization Features –build interactive visualization, Actions and filters, calculated measures, Data blending, joins, and custom queries, Custom Shape File. Infographics and

other Visualizations, Infographics Examples, OECD Better Life Index. Geocoding and Mapping: Geocoding Digital Cartographer Eric Fischer and John Nelson Using geocoded data in Tableau Map Projections.

Module 4: Analytics

Advanced Tableau: Advanced Chart types, Custom Color Palettes, WMS Servers, R- Integration, Business Alignment and Leadership, what are the social aspects of visualization, BI, and analytics? Creating a vision and alignment among stakeholder.

Module 5: Integrating Tableau with R

Trends in Data Visualization and Other Tools, Stanford Visualization Group, Data Wrangler, D3.js, R and Shiny.

Module 6: Data Analysis in Tableau

Data Preparation - Using data interpreter and pivot – Using legacy jet driver – using schema.ini to resolve data type issues – pivoting columns – using union – using join – using blend

Text Book:

Donabel Santos, “Tableau 10 Business Intelligence Cookbook”, Packt Publishing, 2016, ISBN: 9781786465634.

Reference Books:

1. Dona M. Wong, W. W, The Wall Street Journal Guide to Information Graphics: The Dos and Don'ts of Presenting Data, Facts, and Figures, Norton & Company, 2010.
2. Stephen Few, Information Dashboard Design: Displaying Data for At-a-Glance Monitoring, O'Reilly Media, 2013.
3. Stephen Few, Show Me the Numbers: Designing Tables and Graphs to Enlighten, Analytics Press, 2004.
4. Nathan Yau, Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics, Wiley, 2011.
5. Edward Tufte, The Visual Display of Quantitative Information, Graphics Press, 2nd Edition, 2001.

20CA2022	Data Visualization Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To explain the overview and practice of data visualization.
2. To explore different types of graphs
3. To create dash boards

Course Outcomes:

By learning the course, the students will be able to

1. analysis the datasets
2. summarize about views
3. exploring various types of charts
4. summarize about merging datasets
5. creating dashboards for visualization
6. summarize about parameters.

List of Experiments:

1. Opening Datasets in Tableau - Connecting to a Data Source
2. Creating a view
3. Refining the view
4. Map View
5. Sorting and filtering tabular data
6. Creating a Bar Graph
7. Creating a Line Graph
8. Creating Simple Scatter Plots and Merging Datasets

9. Creating a Tree Map
10. Creating a Stacked Bar Chart and Using Parameters
11. Creating a Dashboard
12. Building a Story

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2023	Machine Learning	L	T	P	C
		3	0	0	3

Course Objectives:

1. To familiarize the students with basic concepts of Machine Learning and its applications.
2. To develop skills of students to use supervised and unsupervised algorithms to solve the practical problems.
3. To implement machine learning techniques in industrial applications.

Course Outcomes:

By learning the course, the students will be able to

1. define the terminologies of Machine learning.
2. describe the concepts of Naïve Bayes theory and decision trees.
3. apply the algorithm of Support vector machines and Logistic regression in the real time problems.
4. analyze the regression models.
5. design unsupervised Learning algorithms using k-means clustering and Association analysis.
6. modify the data using principal component and singular value decomposition.

Module 1: Machine learning basics and KNN

Machine learning basics: What is machine learning? - Key terminology - Key tasks of machine learning - Getting started with the NumPy library. Classifying with k-Nearest Neighbors - Classifying with distance measurements - Example: a handwriting recognition system.

Module 2: Splitting datasets one feature at a time - decision trees and naïve Bayes classifier: Tree construction - Plotting trees in Python with Matplotlib annotations - Constructing a tree of annotations - Testing and storing the classifier – Example - Classifying with probability theory: naïve Bayes - Classifying with Bayesian decision theory - Conditional probability - Classifying with conditional probabilities - Document classification with naïve Bayes

Module 3: Logistic regression and Support vector machines

Logistic regression - Classification with logistic regression and the sigmoid function - Using optimization to find the best regression coefficients. Support vector machines - Separating data with the maximum margin - Finding the maximum margin - Efficient optimization with the SMO algorithm - Example: revisiting handwriting classification.

Module 4: Forecasting numeric values with regression and Tree-based regression:

Forecasting numeric values with regression - Finding best-fit lines with linear regression - Locally weighted linear regression - Example: predicting the age of an abalone. Tree-based regression: Locally modeling complex data - Building trees with continuous and discrete features - Using CART for regression Example: comparing tree methods to standard regression.

Module 5: Grouping unlabeled items using k-means clustering and Association analysis:

Grouping unlabeled items using k-means clustering: The k-means clustering algorithm - Bisecting k-means - Example: clustering points on a map. Association analysis with the Apriori algorithm - Association analysis - The Apriori principle - Finding frequent itemsets with the Apriori algorithm - Efficiently finding frequent itemsets with FP-growth.

Module 6: Simplify data using principal component analysis and singular value decomposition

Using principal component analysis to simplify data: Dimensionality reduction techniques - Principal component analysis - Example: using PCA to reduce the dimensionality of semiconductor manufacturing

data. Simplifying data with the singular value decomposition: Applications of the SVD - Matrix factorization - SVD in Python.

Text Book:

Peter Harrington, “Machine Learning in Action”, Manning Publications Co., 2012, ISBN 9781617290183.

Reference Books:

1. Ian H. Witten and Eibe Frank, “Data Mining Practical Machine Learning Tools and Techniques”, Morgan Kaufmann, second edition, 2012, ISBN: 0-12-088407-0.
2. Shai Shalev-Shwartz and Shai Ben-David, “Understanding Machine Learning: From Theory to Algorithms”, Cambridge University Press, 2014, ISBN 978-1-107-05713-5.
3. Jared DeanBrett Lantz, “Big Data, Data Mining, and Machine Learning”, Wiley, 2014, ISBN: 978-1-118-92069-5.
4. Ethem Alpaydin, “Introduction to Machine Learning”, The MIT Press Cambridge, Massachusetts London, England, 2014, ISBN: No. 978-0-262-01243-0.
5. Brett Lantz, “Machine Learning with R”, Packt Publishing, Mumbai, Second Edition¹, 2015, ISBN: 978-1-78216-214-8.
6. Bruce Ratner, “Statistical and Machine-Learning Data Mining Techniques for Better Predictive Modeling and Analysis of Big Data”, CRC Press - Taylor & Francis Group, Third Edition, 2017, ISBN: 978-1-49879-760-3.
7. Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems”, O’Reilly Media, Inc., 2017, ISBN: 9781491962299.
8. Taweh Beysolow, “Applied Natural Language Processing with Python Implementing Machine Learning and Deep Learning Algorithms for Natural Language Processing”, APress, USA, 2018, ISBN-13 (pbk): 978-1-4842-3732-8.

20CA2024	Machine Learning Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To develop the students skills in manipulating the dataset.
2. To utilize libraries used in Tools.
3. To make use of Dimensionality reduction Techniques.

Course Outcomes:

By learning the course, the students will be able to

1. understand and apply statistical functions
2. implement various libraries.
3. Implement algorithms.
4. evaluate the image dataset.
5. identify the missing values in the dataset.
6. apply transformation functions on the dataset for data conversion and reduction.

List of Experiments

1. Find Sum, Mean and Product of Vector
2. Program to Add Two Vectors.
3. Program to Generate Random Number from Standard Distributions
4. Program to Sample from a Population
5. Program to Sort a Vector
6. Find the eigenvalues and eigenvectors of a square matrix using R.
7. Create, Append, Select, Subset.
8. Import Data: Read CSV and Excel Files
9. Apply classification on Iris dataset
10. Apply clustering on Iris dataset

11. Generate Bar Chart and Histogram for Iris dataset
12. Analysis of Agriculture dataset.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2025	Data Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the need for information privacy and security.
2. To familiarize the students with the issues in information security and risk management.
3. To develop skills to perform secure communications using security technologies.

Course Outcomes:

By learning the course, the students will be able to

1. understand information security and the need for security.
2. define the issues, laws and policies in information security.
3. analyze the risks occur in information security.
4. apply the cryptography for needed circumstances.
5. analyze physical security in the day-to-day life.
6. create employment policies and practices.

Module 1: Introduction to Information Security and the Need for Security

Introduction to Information Security: Introduction - The History of Information - What Is Security? - CNSS Security Model - Components of an Information System - Balancing Information Security and Access - Approaches to Information Security Implementation - Security in the Systems Development Life Cycle - Security Professionals and the Organization - Communities of Interest - Information Security: Is It an Art or a Science? - The Need for Security: Introduction - Threats and Attacks - Compromises to Intellectual Property - Deviations in Quality of Service - Espionage or Trespass - Forces of Nature - Human Error or Failure - Information Extortion - Sabotage or Vandalism - Software Attacks - Technical Hardware Failures or Errors - Technical Software Failures or Errors - Technological Obsolescence.

Module 2: Legal, Ethical, and Professional Issues in Information Security & Planning for Security

Legal, Ethical, and Professional Issues in Information Security: Introduction - Law and Ethics in Information Security - Relevant U.S. Laws - International Laws and Legal Bodies - Ethics and Information Security - Codes of Ethics of Professional Organizations - Key U.S. Federal Agencies. Planning for Security – Introduction - Information Security Planning and Governance - Information Security Policy, Standards, and Practices - The Information Security Blueprint - Security Education, Training, and Awareness Program - Continuity Strategies.

Module 3: Risk Management and Security Technology

Risk Management – Introduction - An Overview of Risk Management - Risk Identification - Risk Assessment - Risk Control - Quantitative Versus Qualitative Risk Management Practices - Recommended Risk Control Practices. Security Technology: Introduction - Access Control - Firewalls - Protecting Remote Connections.

Module 4: Intrusion Detection and Prevention Systems, and Cryptography

Intrusion Detection and Prevention Systems, and Other Security Tools: Introduction - Intrusion Detection and Prevention Systems - Honeypots, Honeynets, and Padded Cell Systems - Scanning and Analysis Tools. Cryptography: Introduction - Foundations of Cryptology - Cipher Methods - Cryptographic Algorithms - Cryptographic Tools - Protocols for Secure Communications.

Module 5: Physical Security and Implementing Information Security

Physical Security – Introduction - Physical Access Controls - Fire Security and Safety - Failure of Supporting Utilities and Structural Collapse - Interception of Data - Securing Mobile and Portable Systems - Special Considerations for Physical Security. Implementing Information Security: Introduction -

Information Security Project Management - Technical Aspects of Implementation - Nontechnical Aspects of Implementation - Information Systems Security Certification and Accreditation.

Module 6: Security and Personnel, and Information Security Maintenance

Security and Personnel: Introduction - Positioning and Staffing the Security Function - Credentials for Information Security Professionals - Employment Policies and Practices - Security Considerations for Temporary Employees, Consultants, and Other Workers. Information Security Maintenance – Introduction - Security Management Maintenance Models - Digital Forensics.

Text Book:

Michael E. Whitman and Herbert J. Mattord, “Principles of Information Security”, Sixth Edition, Cengage, 2018.

Reference Books:

1. Mark Stamp, “Information Security: Principles and Practice”, Second Edition, Wiley Publications, 2011.
2. Michael E. Whitman Michael and Herbert J. Mattord Michael, “Principles of Information Security”, Cengage, 2012.
3. Mark Rhodes and Ousley, “Information Security: The Complete Reference”, second Edition, Mcgraw Hill, 2013.
4. B. Raghunathan, “The Complete Book of Data Anonymization: From Planning to Implementation”, Auerbach Pub, 2013.
5. Seymour Bosworth, Michel E. Kabay and Eric Whyne, “Computer Security Handbook”, Sixth Edition, Wiley, 2014.
6. Charles P. Pfleeger, Shari Lawrence Pfleeger and Jonathan Margulies, “Security in Computing”, fifth edition, Pearson Education, Inc., 2015.
7. Matt Bishop, “Computer Security: Art and Science”, First Edition, Addison-Wesley, 2015.
8. Michael Whitman, Herbert J. Mattord, “Management of Information Security”, Course Technology, 2019.

20CA2026	Data Security Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To implement the security in real-world.
2. To exhibit knowledge to protect personal data, and secure computer networks in an Organization.
3. To explore with an expertise in academics to design and implement security solutions.

Course Outcomes:

By learning the course, the students will be able to

1. implement and analyse different substitution techniques.
2. create a transposition technique
3. design and develop an encryption algorithm.
4. create key exchange algorithms.
5. implement hashing techniques.
6. design signature scheme.

List of Experiments:

1. Write a program to implement simple substitution technique named Caesar cipher
2. Write a program to implement the Playfair Substitution technique.
3. Write a program to implement the rail fence transposition technique.
4. Write a program to implement the hill cipher substitution techniques.
5. Implement the Vigenere cipher substitution technique.
6. Write a program to implement the RSA encryption algorithm.
7. Implement the Diffie-Hellman Key Exchange algorithm.
8. Write a program to implement Data Encryption Standard (DES).

9. Implement the SHA-I hashing technique.
10. Implement the MD5 hashing technique.
11. Write a program to implement the signature scheme named digital signature standard (Euclidean Algorithm).
12. Write a C ++program to implement the BlowFish algorithm logic.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2027	Professional Ethics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the basics of ethics and values.
2. To enable the students to know about the ethical codes and standards.
3. To learn about the human values and attitudes.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the basics of ethics and values.
2. solve professional problems using ethical codes.
3. analyze ethical codes and audit.
4. organize the life supporting ethics.
5. apply attitudes in the various situations of personal life.
6. Illustrate the importance of the ethical standards in day-to-day lives.

Module 1: Basics of Ethics and Values

Introduction to Professional Ethics: Basic Concepts- Governing Ethics-Personal & Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence-Thoughts of Ethics-Value Education-Dimensions of Ethics- Profession and Professionalism: Profession, Professional, Professional Associations, Professional Risks, Professional Accountabilities, Professional Success, Ethics and Profession.

Module 2: Theories of Ethics

Ethical Theories: Basic Ethical Principles- Moral Developments- Some Basic Theories- Moral Issues-Moral Dilemmas-Moral Autonomy-Religion and Ethics- Types of Enquiry- Use of Ethical Theories.

Module 3: Professionals

Responsibilities and Rights of Professionals: Rights and Responsibilities as Citizens, Professional Responsibilities, Professional Rights

Module 4: Forms of Ethics

Global issues in Professional Ethics: Introduction- Current Scenario- Business Ethics-Corporate Social Responsibility- Case Studies- Environmental Ethics- Computer Ethics-Media Ethics- War Ethics- Bio Ethics- Research Ethics- Intellectual Property Rights- Professionals and Ethics.

Module 5: Ethical Codes & Ethical Audit

Ethical Codes: Need for Ethical Codes- Sample Codes- Corporate Codes- Development of Codes, Implementation of Codes- Limitations of Codes, Ethics Audit: Need for Ethics Audit- Ethics Profile of Organizations- Consideration for Ethics Audit- Ethics Standards and Benchmarking- Audit Brief- Ethics Auditors- Procedure for Ethics Audit- Ethics Audit Report.

Module 6: Human Values and Ethical Living

Human Values and Attitudes: Domains of Learning- Human Values- Value System- Degeneration of Values- Acquiring Values- Attitudes-Values- Attitudes, and Professionals, Ethical Living: Needs of Life-Some Thoughts on Life- Ethical Living-Setting Goals in Life-Ethical Living for Professionals.

Text Book:

R. Subrananian, "Professional Ethics", Oxford University Press, 2017, ISBN: 9780199475070

Reference Books:

1. Carolin Whitbeck, "Ethics in Engineering Practice & Research, 2nd Edition, Cambridge University Press, 2015, 978-0521723985.
2. Charles E Harris Jr., Michael S Pritchard, Michael J Rabins, Engineering Ethics, Concepts Cases, 6th Edition, Cengage learning, 2019, ISBN:9781337554527.
3. Manuel G Velasquez, "Business Ethics Concepts & Cases", 6th edition, PHI, 2008, ISBN: 9788120329706.
4. R.S. Nagarajan, A Text Book on Professional Ethics and Human Values, 2nd Edition, New Age International Publishers, ISBN: 9788122439724.
5. M. Govindarajan, S. Natarajan, V.S. Senthilkumar, Professional Ethics and Human Values, PHI, 2013, ISBN: 978-81-203-4816-5.
6. R. R. Gaur, Rajeev Sangal and G.P. Bagaria, A Foundation Course in Human Values and Professional Ethics, New Delhi: Excel Books, 2010, ISBN: 978-81-7446-781-2.

20CA2028	Predictive Analytics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the fundamentals of predictive analytics.
2. To illustrate the application of machine learning for predictive analytics.
3. To utilize predictive analysis models for solving problems.

Course Outcomes:

By learning the course, the students will be able to

1. illustrate the steps involved in predictive analytics and modeling.
2. demonstrate data cleaning procedures and preprocessing.
3. examine association rule mining and descriptive modeling for prediction.
4. utilize Machine learning in predictive analytics.
5. discover the role of ensembles and text mining methods.
6. apply predictive modeling for solving real world problems.

Module 1: Overview of Predictive Analytics and Modeling

What is Analytics? – What is Predictive Analytics? – Business Intelligence - Predictive Analytics vs. Business Intelligence - Predictive Analytics vs. Statistics - Predictive Analytics vs. Data Mining - Challenges in Using Predictive Analytics - Predictive Analytics Processing Steps: CRISP-DM - Business Understanding - Defining Data for Predictive Modeling - Defining the Target Variable - Defining Measures of Success for Predictive Models - Doing Predictive Modeling.

Module 2: Data Exploration and Pre-processing

Data Preparation: Variable Cleaning – Feature Creation.

Module 3: Association Rule Mining and Descriptive Modeling

Item sets and Association Rules – Parameter Settings – Data Organization – Measures of Interesting Rules – Deploying Association Rules – Building Classification Rules from Association Rules - Descriptive Modeling: Data Preparation Issues with Descriptive Modeling – Principal Component Analysis – Clustering Algorithms - Interpreting Descriptive Models: Standard Cluster Model Interpretation.

Module 4: Utilizing Machine Learning in Predictive Modeling

Predictive Modeling: Decision Trees – Logistic Regression – Neural Networks – K-Nearest Neighbor – Naïve Bayes – Regression Models – Linear Regression – Other Regression Algorithms.

Module 5: Ensemble Modeling and Text Mining

Model Ensembles: Motivation for Ensembles – Bagging – Boosting – Improvements to Bagging and Boosting – Model Ensembles and Occam's razor – Interpreting Model Ensembles - Text Mining: Motivation – A Predictive Modeling Approach – Structured vs Unstructured Data – Why Text Mining is Hard – Data Preparation Steps – Text Mining Features – Modeling with Text Mining Features - Regular Expressions - Model Deployment: Considerations – Deployment Steps.

Module 6: Application of Predictive Analytics to solve Problems

Case Studies: Survey Analysis – Help Desk.

Text Book:

Dean Abbot, “Applied Predictive Analysis”, Wiley, 2014. ISBN: 9781118727966.

Reference Books:

1. Daniel T. Larose, Chantal T. Larose, Data Mining and Predictive Analytics, Wiley, 2015, ISBN: 9781118116197.
2. Eric Siegel, Predictive Analytics, Wiley, Kindle Edition, ASIN: B019HR9X4U.
3. Anasse Bari, Mohamed Chaouchi, Tommy Jung, Predictive Analytics for Dummies, 2nd Edition, Kindle Edition, For Dummies, ASIN: B01LWWNQFK.
4. Kjell Johnson, Max Kuhn, Applied Predictive Modeling, Springer, 2016, ISBN: 9781461468486.
5. Thomas W. Miller, Modeling Techniques in Predictive Analytics, Pearson FT Press, 2014, ISBN: 978-0133892062.
6. Alvaro Fuentes, “Hands on Predictive Analytics with Python”, Packt Publishing, 2018, ISBN: 9781789138719.

20CA2029	Artificial Intelligence for Data Science	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize the fundamentals of artificial intelligence and agents.
2. To illustrate various forms of learning.
3. To apply artificial intelligence for solving problems.

Course Outcomes:

By learning the course, the students will be able to

1. relate artificial intelligence to natural intelligence.
2. summarize problem solving techniques in games.
3. examine different forms of learning from nature.
4. utilize logic-based reasoning and learning.
5. discover the role of Artificial intelligence in natural languages.
6. inspect the applications of Artificial Intelligence in Diverse Fields.

Module 1: Overview of Artificial Intelligence and Intelligent Agents

Overview of Artificial Intelligence – Foundations of AI – History of AI – State of the Art – Intelligent Agents: Agents and Environment – Concept of Rationality – The Nature of Environments – The Structure of Agents.

Module 2: Problem Solving

Solving Problems by Searching: Problem Solving Agents – Example Problems – Searching for Solutions – Uninformed Search Strategies – Informed (Heuristic) Search Strategies – Heuristic Functions – Adversarial Search: Games – Optimal Decision in Games – Alpha-Beta Pruning – Imperfect Real-time Decisions – Stochastic Games – Partially Observable Games.

Module 3: Learning from Examples

Learning from Examples: Forms of Learning – Supervised Learning – Learning Decision Trees – Evaluating and Choosing the best Hypothesis – The Theory of Learning – Regression and Classification with Linear Models – Artificial Neural Networks – Nonparametric Models – Support Vector Machines – Ensemble Learning – Practical Machine Learning.

Module 4: Forms of Learning

Knowledge in Learning: A Logical Formulation of Learning – Knowledge in Learning – Explanation-based Learning – Learning using Relevance Information – Inductive Logic Programming – Introduction to Reinforcement Learning – Passive Reinforcement Learning – Active Reinforcement Learning – Generalization – Policy Search – Applications.

Module 5: Natural Language Processing

Natural Language Processing: Language Models – Text Classification – Information Retrieval – Information Extraction – Phrase Structure Grammars – Syntactic Analysis – Augmented Grammars and Semantic Interpretation – Machine Translation – Speech Recognition.

Module 6: Computer Vision and Robotics

Perception: - Image Formation – Early Image Processing Operations – Object Recognition by Appearance – Reconstructing the 3D World – Object Recognition from Structural Information – Using Vision – Introduction to Robotics – Robot Hardware – Robotic Perception – Planning to Move – Planning Uncertain Movements – Moving – Robotic Software Architectures – Application Domains.

Text Book:

Stuart J Russell, Peter Norvig, “Artificial Intelligence, A Modern Approach”, Prentice Hall, 2010, Third Edition, ISBN: 9780136042594.

Reference Books:

1. Zsolt Nagy, “Artificial Intelligence and Machine Learning Fundamentals”, Packt Publishing, 2018, ISBN: 978-1-78980-165-1.
2. Anand Deshpande, Manish Kumar, “Artificial Intelligence for Big Data”, Packt Publishing, 2018, ISBN: 978-1-78847-217-3.
3. Dheeraj Merhotra, “Basics of Artificial Intelligence and Machine Learning”, Norton Press, ISBN: 9781645872825.
4. Prabhat Kumar, “Artificial Intelligence, Reshaping Life and Business”, BPB Publications, 2019, ISBN: 978-9388511094.
5. Prateek Joshi, “Artificial Intelligence with Python”, Packt Publishing, ISBN: 978-1786464392.
6. Eugene Charniak, Drew McDermott, “Introduction to Artificial Intelligence”, Pearson Education India, ISBN: 978-8131703069.

20CA2030	Operating Systems Security	L	T	P	C
		3	0	1	4

Course Objectives:

1. To summarize students the overview of system software.
2. To describe the various functions of operating system.
3. To illustrate operating system security policies.

Course Outcomes:

By learning the course, the students will be able to

1. describe the Operating System concepts.
2. explain the Operating Structure and Storage hierarchy.
3. state process management.
4. show the capability in handling efficiently the Protection mechanism and the storage.
5. discuss the Operating System Security and Protection mechanism
6. outline the kernel exploit.

Module 1: General concepts

System software and application software, Assemblers- Design of assembler, Macros and Macro-processor, Macro definitions& Instructions, Features of macro facility, Nested macros calls.

Module 2: Operating System

Introduction to Operating System – Concept of Batch systems – Input / Output structure – Storage structure – Storage hierarchy – system components - Operating System services – Operating System structures - Case Study on Design and Implementation of Operating System

Module 3: Process Management

Process concept, process scheduling, operations on processes, cooperating processes, inter process communication, communication in client server systems, threads, overview, multithreading models, CPU scheduling, scheduling criteria, CPU scheduling algorithms, process synchronization, critical-section problem semaphores, deadlocks, prevention, avoidance and detection.

Module 4: Storage Management

Memory management, contiguous memory allocation, paging, segmentation, segmentation with paging, virtual memory, demand paging, page replacement, I/O hardware, I/O Software, Disks – Disk Scheduling, File organization, File system implementation, allocation methods, Security, Protection mechanism - Case Study on Memory Management Linux/Windows

Module 5: Operating System Security and Protection

Domain protection – Access matrix – Implementation of access matrix – Revocation of Access rights – Authentication – One-time passwords – Program threats – System threats – Threats monitoring – Computer Security Classification - Case Study on Operating System Security

Module 6: Kernel Exploitation

Kernel Land Attack – Memory Corruption Vulnerabilities – Integer issues – Race Conditions – Logic Bugs – Architecture Level – Execution Step – The Triggering Step – The Information-Gathering Step – Attacking Remote Vulnerabilities – Executing the First Instruction – Remote Payloads – Kernel Attacks – Kernel Defense – Beyond Kernel Bugs: Virtualization

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (Addison Wesley), “Operating System Concepts: 9th Edition, Wiley, ISBN: 978-1118063330
2. Achyut Godbole, Atul Kahate, “Operating Systems”, 3rd Edition, McGraw Hill Education, , ISBN-10: 0070702039, ISBN-13: 978-0070702035

Reference Books:

1. Silberschatz, Galvin, Gagne, “Operating System Concepts”, John Wiley; 9 edition, ISBN-10: 8126554274, ISBN-13: 978-8126554270
2. Michael Palmer, “Guide to Operating Systems Security”, Paperback – Import, Course Technology Inc, ISBN-10: 0619160403, ISBN-13: 978-0619160401
3. Enrico Perla, Massimiliano Oldani, “A Guide to Kernel Exploitation: Attacking the Core”, Syngress; 1st edition, 2010, ISBN-13: 978-1597494861.
4. William Stallings, “Operating Systems: Internals and Design Principles”, Pearson Education, New Delhi, ASIN: B07RY51L19.
5. Charles P Pfleeger and Shari Lawrence Pfleeger, “Security in Computing”, Prentice Hall, New Delhi, ASIN: B00S88TJV2

Lab Experiments:

1. Searching Techniques
2. Managing Files
3. CPU Scheduling Algorithm
4. Disk Scheduling Algorithm
5. Page Placement Algorithm
6. File allocation strategy
7. File organization techniques
8. Memory allocation techniques
9. Deadlock Avoidance
10. Deadlock Prevention
11. Semaphores
12. Dining Philosopher problem

The faculty conducting the laboratory will prepare a list of 6 experiments and get the approval of HoD/Director and notify it at the beginning of each semester

20CA2031	Cyber Crimes and Cyber Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To categorize and familiar with computer-related crime.
2. To explain the basic concepts of cryptographic technology.
3. To develop adequate countermeasures to secure the systems.

Course Outcomes:

By learning the course, the students will be able to

1. categorize the changes in society associated with the advent of technological changes and the introduction of the Internet
2. explain computer-related crime.
3. develop a working knowledge of the classifications of motive for modern computer intruders and how they relate to each other in the digital security realm.
4. discuss the basic concepts of cryptographic technology and the major mathematical principles used by cryptographic systems.
5. describe the risks posed by the various types of malicious code objects and develop adequate countermeasures to protect the systems.
6. access and mitigate vulnerabilities.

Module 1: Introduction to Cyber Crime

Definition – Role of Electronic Communication devices and Communication technologies in cyber crime – Crimes associated with mobile electronic communication devices – Classification of Cyber Criminals – Tools used – Factors influencing cyber crime – Challenges to cyber crimes – Strategies to prevent cyber Crimes – Extent of cyber crime.

Module 2: Classification of cyber crime

Cyber Crime against individuals – Cyber Crimes against property – Cyber crimes against nation – present and future of cyber crime – Cryptocurrency – Bitcoin – Ethereum – Comparison between Bitcoin and Ethereum – Blockchain – Ransomware – Deep web and dark web – Deep web and Dark web challenges – Cyber Crime case studies

Module 3: Contemporary Computer Crime

Web based criminal activity – Malware – Theft of Information, Data Manipulation and Web encroachment – Neo traditional Crime – Ancillary Crimes

Module 4: Cyber Security

Information assurance fundamentals – basic cryptography – symmetric key encryption - public key encryption – Domain Name system – Firewalls – Virtualization – Microsoft windows security.

Module 5: Attacker Techniques

Phishing, Smishing - Mobile malicious code – Rogue antivirus – Click fraud –Threat infrastructure – proxies – Tunneling techniques

Module 6: Techniques to gain foothold

Shellcode – Integer overflow vulnerabilities – Buffer overflows – SQL injection – Brute force and Dictionary attacks – Cross site scripting – Social Engineering.

Text Book:

James Graham, Richard Howard, Ryan Olson, “Cyber Security Essentials”, Auerbach Publications; 1st Edition, 2011, ISBN: 9781439851265

Reference Books:

1. Deje, Murugan, “Cyber Forensics”, Oxford University Press; First edition, 2018, ISBN: 9780199489442.
2. Chuck Easttom, “CCFPSM Certified Cyber Forensics Professional Certification ALL-IN-ONE (Exam Guide)”, McGraw-Hill Education, 2015, ISBN: 9780071836111.
3. Britz, “Computer Forensics and Cyber Crime: An Introduction”, Pearson Education India; 3rd edition, 2013, ISBN: 9780132677714

4. Nina Godbole Sunit Belapure, “Cyber Security”, Wiley (2011), ISBN: 9788126521791.
5. Raef Meeuwisse, “Cybersecurity for Beginners”, Cyber Simplicity Ltd; 2nd Revised edition, 2017, ISBN: 9781911452034
6. Thomas J. Holt, Adam M. Bossler and Kathryn C. Seigfried-Spellar, “Cybercrime and Digital Forensics”, Second Edition, ISBN: 9781138238725.

20CA2032	Information Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the fundamental concepts of all security perceptions.
2. To debate the safeguards to protect the organization’s information resources from theft, abuse, misuse and any form of damage.
3. To discuss the security controls in the software development life cycle processing.

Course Outcomes:

By learning the course, the students will be able to

1. explain information security concepts and how they relate to one another helps security professionals design and implement secure systems.
2. apply applying various concepts, methodology, techniques and provide user access to resources
3. classify information based on its value to the organization.
4. apply security in the software development life cycle and assess the effectiveness of software security.
5. discuss about the ongoing, day-to-day management of security functions.
6. explain the basic terminology of cryptography and apply various key algorithms.

Module 1: Basic Security Concepts

Information Security – Confidentiality, integrity, availability triad - Identification, Authentication and Authorization- Attack - Threats, Vulnerabilities and Risk, Risk Management – Security Governance - Information classification - Controls

Module 2: Access Controls

Access Control - Purpose – Control combinations – Access Control Models – Access Control Techniques – Access Control administration – Access control methods – Access Control Types - Accountability – Access control practices – Access Control Monitoring – Threats to access control – Database access control - Physical & Logical Security

Module 3: Asset Management

Defining Sensitive data – Personally Identifiable Information – Protected Health Information – Defining Classifications – Data Security requirements – sensitive data: Understanding, managing, handling, storing, destroying – Retaining assets – Identifying data roles – Protecting Privacy

Module 4: Software Development Security

Introduction - Security approaches – Software Engineering areas – Threats, Vulnerabilities and Attacks in Software Development lifecycle -Software Development Lifecycle - Capability Maturity Model

Module 5: Operational Security

Introduction – Goals of Operation Security – Operations controls – Configuration Change Management – Patch Management – Auditing - Monitoring - Intrusion Detection System – Business Continuity and Disaster Recovery Planning – Organizational Information Security Management Case Studies

Module 6: Cryptography

Plain Text, Cipher Text, Encryption and Decryption Techniques, Block cipher, Stream cipher - Data Encryption Standard (DES) - Cipher Block Chaining (CBC) – Multiple Encryption DES - International Data Encryption Algorithm (IDEA) - Advanced Encryption Standard (AES)

Text Book:

Mark Rhodes-Ousley, “Information Security: The Complete Reference”, McGraw Hill Education; Second edition ,2013, ISBN: 9780071784368

Reference Books:

1. James M. Stewart, Mike Chapple, Darril Gibson, “(ISC)2 Certified Information Systems Security Professional Official Study Guide) – CISSP”, Seventh Edition, Sybex, 2015 ISBN: 9781119042716
2. Thomas R. Peltier, “Information Security Fundamentals”, 2 edition, Auerbach Publications, 2014, ISBN: 9781439810637
3. Umesha Nayak, Umesh Rao, “The InfoSec Handbook: An Introduction to Information Security”, 1st ed. Edition, Apress, 2014, ISBN-13: 9781430263821.
4. Adam Gordon, “Official (ISC)2 Guide to the CISSP CBK ((ISC)”, Auerbach Publications; 4 edition, 2015, ISBN: 978-1482262759
5. Jason Andress “The Basics of Information Security: Understanding the Fundamentals of InfoSec in Theory and Practice”, Syngress; 2 edition, 2014, ISBN-13: 978-0128007440.
6. Michael E. Whitman, Herbert J. Mattord, “Principles of Information Security”, 6th edition, Cengage Learning India Private Limited, 2018, ISBN-13: 978-9387994232.
7. John Vacca, “Computer and Information Security”, Handbook, 3rd edition, Morgan Kaufman, 2017, ISBN: 9780128038437.

20CA2033	Cyber Forensics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the basic principles of digital forensics
2. To choose appropriate digital forensics tools to identify, classify, locate and recover the evidence
3. To infer the emerging digital forensic trends and technologies

Course Outcomes:

By learning the course, the students will be able to

1. describe cyber forensics and the knowledge required to do the forensic analysis
2. extend Scientific approaches to forensics that helps to identify, classify, locate and recover the evidence
3. choose and apply current cyber forensics tools.
4. devise basic network forensic analysis
5. identify the emerging forensic technology
6. show the required knowledge and expertise to become a proficient forensic investigator

Module 1: Introduction to Forensics

Cyber forensics – Understanding the science of forensics – cyber forensics knowledge needed: Operating Systems, Hardware, Networks – fundamental principles of cyber forensics – maintaining the chain of custody – law and cyber forensics

Module 2: Principles and methods

Scientific approaches to forensics – Identify and classify evidence – Locations where evidence may reside: storage media, Hardware interfaces, File systems, file format, file types, header analysis – Recovering data – media file forensic steps

Module 3: Forensic Analysis

Hard drive specifications – Recovering data from the damaged media – Operating system specifics – Extracting deleted files – Encrypted files - Cryptography – Steganography – Cryptanalysis - Log tampering – Other techniques: spoofing, wiping, Tunneling – Case notes and reports

Module 4: Network Forensics

Network packet analysis – Wireless – Router forensics – Firewall forensics – Logs to examine – Operating system utilities – network structure

Module 5: Emerging forensics technology

Social Networks – New devices: Google Glass, Cars, Medical devices – control systems and infrastructure – Online gaming – Electronic discovery: types of investigation, liability and proof, big data, steps in electronic data discover, disaster recovery

Module 6: Digital Forensics - Present and future

Forensic tools – Open source forensic suite – Proprietary forensic suite – Drive Imaging and validation tools – forensic tool for integrity verification and hashing – forensic tools for Password recovery – Applying Digital Forensics in Social media

Text Book:

Chuck Easttom, “CCFPSM Certified Cyber Forensics Professional Certification ALL-IN-ONE (Exam Guide)”, McGraw-Hill Education, 2015, ISBN: 9780071836111.

Reference Books:

1. Deje, Murugan, “Cyber Forensics”, First edition, Oxford University Press, 2018, ISBN: 9780199489442
2. Bill Nelson Amelia Phillips Christopher Stuart, “Guide to Computer Forensics and Investigations: Processing Digital Evidence”, Fifth Edition, Cengage Learning, ISBN: 9781285060033.
3. Cory Altheide, Harlan Carvey, “Digital Forensics with Open Source Tools”, Elsevier, 2011, ISBN: 9781597495868
4. John Sammons, “The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics”, Elsevier, 2012, ISBN: 9781597496612
5. John Vacca, “Computer Forensics: Computer Crime Scene Investigation”, Laxmi Publications; First edition, 2015, ISBN: 9788170083412.
6. Marjie T. Britz, “Computer Forensics and Cyber Crime: An Introduction”, 3rd Edition, Prentice Hall, 2013, ISBN: 978-0132677714.

20CA2034	Cyber Forensics Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To explain the basic principles of digital forensics
2. To choose appropriate digital forensics tools to identify, classify, locate and recover the evidence
3. To infer the emerging digital forensic trends and technologies

Course Outcomes:

By learning the course, the students will be able to

1. describe cyber forensics and the knowledge required to do the forensic analysis
2. extend Scientific approaches to forensics that helps to identify, classify, locate and recover the evidence
3. choose and apply current cyber forensics tools.
4. devise basic network forensic analysis
5. identify the emerging forensic technology
6. show the required knowledge and expertise to become a proficient forensic investigator

Lab Experiments:

1. Perform Digital evidence identification and isolation.
2. Examination of Windows event log and perform log correlation.
3. Perform forces analysis on last activity (LastActivityView).
4. Windows Password cracking (Hiren's.Boot).
5. Perform Mobile data analysis using forensics tool (SUNTOKU_0.5).
6. Perform USB and HDD write blocker for forensic acquisition.
7. Capture volatile memory and perform analysis (FTK).
8. Analysis on Digital photography image (<https://29a.ch>).
9. Creating MAC timeline of a directory (Mac-Robber)

10. Windows malware detection and mitigation (Sysinternals Suite).

11. Perform browser forensic analysis.

12. Forensics - md5sum, sha1sum, and sha256sum

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2035	Computer Networks and Network Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain key networking protocols, and their hierarchical relationship in the context of a conceptual model, such as the OSI and TCP/IP framework
2. To demonstrate analytical skills in identifying and troubleshooting networking, security, and performance issues
3. To analyze a given architecture, discern vulnerabilities, and recommend physical, logical, or administrative controls to mitigate the threat

Course Outcomes:

By learning the course, the students will be able to

1. describe OSI and TCP/IP model, compare and contrast network topologies and also select the appropriate cabling type based on implementation requirements
2. explain various router components, remotely access routers, and test network connectivity
3. demonstrate a detailed knowledge of the operation and configuration of switches
4. configure and understand the components and operation of a wireless LAN (WLAN).
5. demonstrate expertise in configuring host and network level technical security controls
6. identify core networking and infrastructure components and design an IT infrastructure including devices, topologies, protocols, systems software, management, and security

Module 1: Network Fundamentals

Network Basics – Basic Network structure – OSI Model – TCP/ IP models – Firewalls – Access points – Wireless controllers – Three tier architecture – Topologies – Cabling – Ipv4 – Ipv6 – Subnetting - Troubleshooting methodologies

Module 2: Switching Concepts

Introduction – Ethernet frame – Access ports – Default Virtual LAN (VLAN) – trunk ports – Spanning Tree Protocol (STP) protocols - troubleshoot STP related features – Layer 2 protocols – Layer 3 protocols - switch stacking - chassis aggregation - Troubleshooting methodologies

Module 3: Router Configuration

Routing concepts – routing table components – VLAN – Static routing – Dynamic routing – Distance vector and link state routing protocols – Interior and exterior routing protocols – OSPF – EIGRP – RIP - Troubleshooting methodologies

Module 4: Wireless concepts

Introduction - WAN topology – WAN operations – WAN terminologies – WAN devices – WAN access - Troubleshooting methodologies

Module 5: Infrastructure services and Security

DNS lookup operation – Dynamic host control protocol - Configure and verify DHCP on a router – NAT - NTP operating in a client/server mode – troubleshoot Port Security - access layer threat mitigation techniques - troubleshoot basic device hardening

Module 6: Network Defense Solutions Firewall, Virtual Private Networks, Intrusion Detection and Prevention system, Honey pots – Device Management - device-monitoring protocols - device configuration - device maintenance – Security Standards – Network Security case studies

Text Book:

Jeffrey S. Beasley and Piyasat Nilkaew, “Practical Guide to Advanced Networking”, Pearson Education, Third Edition, 2013, ISBN: 9780789749048

Reference Books:

1. W. Stallings, Cryptography and Network Security: Principles and Practice, 4th Ed. Boston: Prentice Hall, 2010. ISBN: 9780136108054.
2. McCabe James, "Network Analysis, Architecture, and Design", Morgan Kaufmann Publishers, Third Edition, 2010, ISBN: 008054875X.
3. Vilas S. Bagad and Iresh A. Dhotre, "Computer Networks", Technical Publications, 2010, ISBN: 9788184312591.
4. M. Rhodes-Ousley, "Network security the complete reference", 2nd ed. New York, USA: McGraw-Hill Professional Publishing, 2013. ISBN: 9781597495356
5. D. R. Stinson, Cryptography: Theory and Practice, 3rd Ed. Boca Raton, FL: Chapman Hall/CRC, 2005, ISBN: 9781584885085.

20CA2036	Computer Networks and Network Security Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To explain key networking protocols, and their hierarchical relationship in the context of a conceptual model, such as the OSI and TCP/IP framework
2. To demonstrate analytical skills in identifying and troubleshooting networking, security, and performance issues
3. To analyze a given architecture, discern vulnerabilities, and recommend physical, logical, or administrative controls to mitigate the threat

Course Outcomes:

By learning the course, the students will be able to

1. describe OSI and TCP/IP model, compare and contrast network topologies and also select the appropriate cabling type based on implementation requirements
2. explain various router components, remotely access routers, and test network connectivity
3. demonstrate a detailed knowledge of the operation and configuration of switches
4. configure and understand the components and operation of a wireless LAN (WLAN).
5. demonstrate expertise in configuring host and network level technical security controls
6. identify core networking and infrastructure components and design an IT infrastructure including devices, topologies, protocols, systems software, management, and security

Lab Experiments:

1. Creating a LAN network with HUB and SWITCH
2. Inter connecting two different networks
3. Static Routing
4. Dynamic routing by using RIP protocol
5. Dynamic routing by using RIP protocol version 1 and Version 2
6. Configuring of Dynamic Host Configuration Protocol
7. Configuring Standard Access Control list
8. Configuring of Network Address Translator
9. Dynamic routing by using EIGRP
10. Configuring of Dynamic routing by using OSPF
11. Basic router configuration
12. Domain Name System

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2037	Database Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain about the various issues that arise in securing database.
2. To illustrate designing security policies and use tools to protect data loss and data theft.
3. To describe database backup and recovery and database auditing.

Course Outcomes:

By learning the course, the students will be able to

1. design and develop database.
2. write efficient and complex queries.
3. identify proper authentication and authorization techniques for Database applications.
4. design multilevel security scheme for database.
5. perform database auditing and database performance tuning.
6. perform database backup and recovery.

Module 1: Database Design

Database Concepts and Architecture, ER Relational Data Model and Relational Database Constraints, Normalization, Files structures, Hashing and Indexing – Case Study on Database Design

Module 2: Query processing & Transactions

Indexing structure, Strategies of Query processing, Query Optimization, Transaction processing concepts, Concurrency Control Techniques – Case study on Query Optimization

Module 3: Authentication & Authorization

Introduction – Strong Authentication – Proxy Authentication & Proxy Authorization – Single sign – Profiles – Privileges – Roles - Case Study on Authentication Technologies in Banking /Healthcare industry

Module 4: Multilevel Security

Concepts of Database security, Multilevel Database Security basics and implementation, Fundamentals of Information Encryption, Encryption based Multilevel Database Model, Concurrency control in Multilevel Relational Database - Case Study on Enterprise, Database Security

Module 5: Database Auditing

Auditing Techniques, Auditing Architectures, Auditing Models, Application Data Auditing, Auditing Database Activities.

Module 6: Database Backup and Recovery

Backup and Recovery concepts, Recovery, Protecting Backup Environment, RAID, Replications, Mirroring - Case Study on Database Backup and Recovery

Text Book:

Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Pearson, 7th edition, 2015. ISBN: 9780133970777.

Reference Books:

1. Osama S. Faragallah, El-Sayed M. El-Rabaie, Fathi E. Abd El-Samie, “Multilevel Security for Relational Databases”, Auerbach Publications, 1st edition, 2014, ISBN: 9781482205398.
2. Andy Oppel, “Databases DeMYSTiFieD”, McGraw-Hill Education; 2nd edition, 2010, ASIN: B004E9SYJC.
3. Michael Gertz, Sushil Jajodia, “Handbook of Database Security Applications and Trends”, Springer, ISBN: 9780387485324.
4. Michael J. Hernandez, “Database Design for Mere Mortals: A Hands-On Guide to Relational Database Design”, 3rd Edition, 2013, Addison-Wesley Professional, ISBN-13: 978-0321884497
5. Preston de Guise, “Enterprise Systems Backup and Recovery: A Corporate Insurance Policy”, Auerbach Publications, 2017, ISBN: 9781138440425.
6. Bettina Kemme, Ricardo Jienez Peris, Marta Patino-Matinez, “Database Replication Synthesis Lectures on Data Management”, Morgan and Claypool Publisher, 2010, ISBN: 9781608453818.

20CA2038	Database Security Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To explain about the various issues that arise in securing database.
2. To illustrate designing security policies and use tools to protect data loss and data theft.
3. To describe database backup and recovery and database auditing.

Course Outcomes:

By learning the course, the students will be able to

1. design and develop database.
2. write efficient and complex queries.
3. identify proper authentication and authorization techniques for Database applications.
4. design multilevel security scheme for database.
5. perform database auditing and database performance tuning.
6. perform database backup and recovery.

Lab Experiments:

1. Table Management
2. Queries
3. Packages
4. Cursor
5. Triggers
6. Index and Partitions
7. Roles and Privileges
8. Recovering data and revert database
9. Export and Import
10. Query Optimization
11. User Managed Recovery
12. Database Vault Administration

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2039	Biometric Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To develop knowledge in the field of biometrics
2. To explain the various modules constituting a bio-metric system
3. To debate the challenges and limitations associated with bio-metrics

Course Outcomes:

By learning the course, the students will be able to

1. describe the basic principles of bio-metric systems.
2. recognize the various modules constituting a bio-metric system.
3. explain different types of bio-metric traits
4. analyze basic biometric system applications.
5. identify the sociological and acceptance issues associated with the design and implementation of biometric system
6. infer the challenges and limitations associated with bio-metrics.

Module 1: Introduction

Biometric fundamentals – Biometric technologies – Biometrics Vs traditional techniques – Characteristics of a good biometric system – Benefits of biometrics

Module 2: Physiological Biometrics

Leading technologies: Finger-scan – Facial-scan – Iris-scan – Voice-scan – components, working principles, competing technologies, strengths and weaknesses – Other physiological biometrics

Module 3: Automated Biometric system and Behavioural Biometrics

Automated fingerprint identification systems - Leading technologies: Signature-scan – Keystroke scan – components, working principles, strengths and weaknesses

Module 4: Biometric Applications

Categorizing biometric applications – application areas: criminal and citizen identification, surveillance, PC/network access, ecommerce and retail/ATM – costs to deploy – other issues in deployment

Module 5: Privacy and standards in Biometrics

Assessing the Privacy Risks of Biometrics – Designing Privacy-Sympathetic Biometric Systems – Need for standards – different biometric standards.

Module 6: Case studies of Biometric system

Case Studies of bio-metric system, Bio-metric Transaction. Bio-metric System Vulnerabilities - Case study of 3D face recognition and DNA matching - Recent trends in Bio-metric technologies and applications in various domains

Text Book:

Anil K. Jain , Arun A. Ross, Karthik Nandakumar, “Introduction to Biometrics”, Springer; 2011, ISBN 9780387773254

Reference Books:

1. Yingzi (Eliza) Du, “Biometrics: From Fiction to Practice”, Jenny Stanford Publishing; 1st 2013, ISBN: 9789814310888.
2. Anil K Jain, Patrick Flynn, Arun A Ross, “Handbook of Biometrics”, Springer; First edition, 2018, ISBN: 9781493977284.
3. Shimon K. Modi, “Biometrics in Identity Management: Concepts to Applications (Artech House Information Security and Privacy)”, Artech House Publishers; 2011, ISBN: 9781608070176
4. Ravindra Das, “Biometric Technology: Challenges and Solutions”, Routledge; 1st edition, 2016, ISBN: 9781498717441
5. Khalid Saeed, “New Directions in Behavioral Biometrics”, CRC Press; 1st 2016, ISBN: 978-1498784627.
6. David Zhang, Guangming Lu, “3D Biometrics: Systems and Applications”, Springer; 2015, ISBN: 9781489993427.

20CA2040	General Forensic Science	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the history and development of forensic science.
2. To relate the roles of different types of professionals involved in evaluating a crime scene, analysis of crime exhibits and expert witness.
3. To outline the methodology to collect, preserve and present evidence in a professional (courtroom) setting.

Course Outcome:

By learning the course, the students will be able to

1. explain the history of the forensic sciences
2. define the roles of different types of professionals involved in evaluating a crime scene and collecting the evidence
3. state the aspects of the justice system followed.
4. outline the methodology of collecting & interpreting data, avoiding contamination, and preservation of chain of custody
5. state the importance pertaining to forensic examination

6. show the evidence in a professional (courtroom) setting

Module 1: Introduction to Forensic Science

History and Development of Forensic Science - Functions of the Forensic Scientist – Divisions of Forensic Science – Forensic Setup in India - Evolving Forensic Science Services- Role of forensic expert in the court of law - Aspects of the Criminal Justice System - Aspects of Trials.

Module 2: Crime Scene Investigation

Concepts – Nature and type of crime scene – Crime scene search methods: Recovery and packaging of evidences – Crime scene documentation - Preservation of evidences – National and International scenario on crime scene investigation – Physical evidences

Module 3: Crime Scene Reconstruction (CSR)

Nature and importance of CSR– Basic principles and stages involved – Types and classification of reconstruction – Pattern evidence and shooting scene reconstruction – Manual and computer -assisted reconstruction of BPA – Role of logic in CSR – Writing a reconstruction report – Correlation of crime scene analysis with behavioural analysis – Cases of special importance pertaining to forensic examination

Module 4: Forensic Analysis

Basics of Forensic Biology – Forensic Serology – DNA Typing – Forensic Chemistry – Forensic Toxicology – Forensic Medicine.

Module 5: Cyber Crime & Computer Forensics

How Does the Computer Work - How Data Is Stored -Processing the Electronic Crime Scene - Evidentiary Data – Cyber Crimes – Computer Crime Scene Investigation – Computer Forensic Analysis – Exposure to Information Technology Act, 2000.

Module 6: Emerging Cyber Crimes & Analytical Techniques

Cyber terrorism – Cyber defamation – Crime related to Intellectual Property Rights — Voice identification – Forensic Psychology – Polygraph - Narco - analysis – Brain fingerprinting – Criminal profiling and their legal status in India

Text Books:

1. Barry A. J. Fisher, William J. Tilstone, Catherine Woytowicz, “Introduction to Criminalistics”, Pearson; 2009, ISBN: 9780120885916.
2. Ross M. Gardner “Practical Crime Scene Processing and Investigation”, Second Edition, ISBN: 9781439897782.

Reference Books:

1. Safarstein R, “Criminalistics – An Introduction to Forensic Science”, Pearson, 2014, ISBN: 9781292062020.
2. Barry A. J. Fisher, David R. Fisher “Techniques of Crime Scene Investigation”, CRC Press, 2012, ISBN: 9781439810057.
3. Gardner, R., & Bevel, T, “Practical crime scene analysis and reconstruction”, Boca Raton, Florida: CRC Press, 2009, ISBN: 9781420065510.
4. James, S, “Forensic science: An introduction to scientific and investigative techniques”, 2nd edition, Boca Raton, Florida: CRC Press, 2015, ISBN: 9781439853832.
5. Marcella, “Cyber Forensics A Field Manual”, Auerbach Publication, ISBN: 9780849383281.

20CA2041	Malware Analysis and its Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the fundamentals of malware, types and its effects
2. To identify and analyze various malware types
3. To outline the detection, analysis, understanding, controlling, and eradication of malware

Course Outcomes:

By learning the course, the students will be able to

1. explain the concept of malware analysis, types of malware analysis and differentiate malware and a virus.
2. classify and compare the malware samples and Extract strings, functions, and metadata associated with the file.
3. use Dynamic analysis tools and understand their features, steps involved in dynamic analysis.
4. describe the possibilities that can make experience with sandboxes and multi-AV scanners even better.
5. identify and correlate information regarding domains, hostnames, and IP addresses.
6. discuss the challenges encountered in the field of malware analysis.

Module 1: Malware Analysis Introduction

Malware – Malware Analysis – Why malware analysis - Malware categories – Malware analysis techniques: Static malware analysis – Dynamic Malware Analysis – Analysis tools – Sandbox tools and techniques

Module 2: Static Analysis

Identifying file type using manual method, using tools – Hashing – Multiple antivirus scanning – String extraction – File obfuscation – Inspecting PE header information – Comparing and classifying the malware

Module 3: Dynamic Analysis

Monitoring system and networks – dynamic analysis tools: Monitoring with process monitor, viewing processes with process explorer, Comparing registry snapshots with Regshot, Packet sniffing with Wireshark - Dynamic Analysis steps

Module 4: Scanning and Analyzing Malware

Scanning files with virus total, Jotti, NovirusThanks – Multi-Antivirus Scanner Comparison - Analyzing malware with threat expert, CW sandbox, Anubis - Identifying malware passwords - Bypassing authentication - Advanced malware analysis Virus, Trojan.

Module 5: Domain and IP addresses research

Researching domains - WHOIS with Sysinternals on Windows – Resolving DNS hostnames on Windows – Researching IP addresses - Researching with Passive DNS and Other Tools – Performing a reverse IP search with domain tools – Brute force attack – Reverse Brute Force attack

Module 6: Malware Challenges

Antimalware – Anti malware strategy – Anti malware engine – Common challenges – Scanning approaches - Virtual environment - Live internet connection - Real, fake, and virtual services -Anti-debug – Case Studies

Text Book:

Monnappa K A, “Learning Malware Analysis”, Packt Publishing, 2018, ISBN: 9781788392501

Reference Books:

1. Michael Hale Ligh, Steven Adair, Blake Hartstein, Matthew Richard, “Malware Analyst’s Cookbook and DVD: Tools and Techniques for Fighting Malicious Code”, Wiley Publishing, 2011, ISBN: 9780470613030
2. Cameron H. Malin, Eoghan Casey, James M. Aquilina, Curtis W. Rose, “Malware Forensics Field Guide for Windows Systems”, Elseier, 2012, ISBN: 9781597494724.
3. M. Sikorski and A. Honig, “Practical Malware Analysis: The Hands-on Guide to Dissecting Malicious Software”, San Francisco: No Starch Press San Francisco, CA, 2012, ISBN: 9781593272906.
4. Gerard Johansen, “Digital Forensics and Incident Response”, Packt Publishing, 2017, ISBN 9781787288683.
5. Victor Marak, “Windows Malware Analysis Essentials”,Packt Publishing,2015,ISBN 9781785281518.
6. Mihai Christodorescu Somesh Jha, Douglas Maughan, Dawn Song, Cliff Wang, “Malware Detection”,Springer, 2007, ISBN: 9780387327204.

20CA2042	Security Assessment of Information Systems through Ethical Hacking	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain ethical hacking methodology
2. To explain the techniques, skills and modern tools necessary to gather the information and to identify the vulnerabilities
3. To identify the exploits in various operating systems and Wireless environment

Course Outcomes:

By learning the course, the students will be able to

1. determine the security threats and vulnerabilities in computer networks using ethical hacking techniques
2. identify various attacks in various domains of cyber space
3. select the tools to gather the information regarding the vulnerabilities
4. use techniques, skills and modern tools necessary to gather the information and to identify the vulnerabilities
5. discuss about the exploits in various operating systems and Wireless environment
6. identify the vulnerabilities associated with various network applications and database system

Module 1: Ethical Hacking Overview

Introduction - Certified Ethical Hackers – Hacking Methodology - Process of Malicious Hacking - Legal Issues and Law Enforcement.

Module 2: Foot printing and Social Engineering

Foot printing Tools – Conducting Competitive Intelligence - DNS Zone Transfers – Introduction to Social Engineering

Module 3: Port Scanning

Introduction to Port Scanning – Types of Port Scan – Port Scanning Tools - Conducting Ping Sweeps

Module 4: Web Servers Hacking

Web application and its vulnerabilities - Tools for web attackers and security testers - Hacking wireless network: Technology - Standards - Authentication - Wardriving - Wireless hacking - Protecting networks with security devices.

Module 5: Hacking Operating Systems

Windows: Vulnerabilities - Choosing tools - Information gathering - RPC - Null sessions - Share permissions - Hardcore vulnerability exploitation, Linux: Vulnerabilities - Information gathering - Unconnected services - .rhosts and hosts.equiv files - NFS - File permissions - Buffer overflow.

Module 6: Hacking Applications

Messaging systems, Web applications, Mobile applications, Databases, Reporting results - Case Study on vulnerabilities found in websites and networks

Text Book:

Michael T. Simpson, Kent Backman, James Corley, Hands - On Ethical Hacking and Network Defense, Delmar Cengage Learning, 2012, ISBN: 9781133935612.

Reference Books:

1. Stuart McClure, Joel Scambray, “Hacking Exposed Network Security Secrets & Solutions”, Tata Mcgrawhill Publishers, 2012, ISBN: 9780071780285.
2. Allen Harper, Shon Harris, “Gray Hat Hacking The Ethical Hackers Handbook”, Third Edition, McGraw Hill Education, 2011, IBSN: 9780071742559.
3. Dafydd Stuttard, Marcus Pinto, The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, Second Edition, Wiley, 2011, ISBN: 9781118026472.
Stuart McClure, Joel Scambray, George Kurtz, Hacking Exposed 7: Networking Security Secrets and Solutions, Seventh Edition McGraw Hill Education, 2012, ISBN-13: 978-0071780285
4. Mike Shema, “Anti-Hacker Tool Kit”, 4th Edition, 2014, Mc Graw Hill, ISBN: 978-0071800143

20CA2043	Ethical Hacking Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To explain ethical hacking methodology
2. To explain the techniques, skills and modern tools necessary to gather the information and to identify the vulnerabilities
3. To identify the exploits in various operating systems and Wireless environment

Course Outcomes:

By learning the course, the students will be able to

1. determine the security threats and vulnerabilities in computer networks using ethical hacking techniques
2. identify various attacks in various domains of cyber space
3. select the tools to gather the information regarding the vulnerabilities
4. use techniques, skills and modern tools necessary to gather the information and to identify the vulnerabilities
5. discuss about the exploits in various operating systems and Wireless environment
6. identify the vulnerabilities associated with various network applications and database system

Lab Experiments:

1. Passive Reconnaissance using —Who is and Online tools
2. Active Reconnaissance using —Sampad and web site details
3. Information Gathering using shodan
4. Information Gathering using using google dorks
5. Full Scan, Half Open Scan and Stealth scan using —nmap
6. DP and Ping Scanning using —Advance Lan Scanner and —Superscan
7. Packet crafting using —Packet creator tools
8. Installation and configuration of kali linux and victim machines
9. Exploiting NetBIOS vulnerability using Metasploit
10. Exploiting linux machine using Metasploit
11. Privilege escalation using SQLMAP
12. Packet analysis using Wireshark

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2044	Cyber Security Governance	L	T	P	C
		3	0	0	3

Course Objectives:

1. To summarize about the basics of cyber security policy
2. To outline effective cyber security governance to protect the information assets
3. To select the appropriate control frameworks and standards

Course Outcomes:

By learning the course, the students will be able to

1. explain the basics of cyber security governance
2. develop an Information Security strategy
3. state the need for resilience management
4. describe the existing and emerging security strategy
5. select a governing control or standards framework
6. discuss the various compliance laws

Module 1: Cyber Security & Governance

Introduction – Cyber Security analysis – Corporate Security and Corporate Intelligence – Cyber Security threats – Enterprise Risk management – Issues Governance: Definition – Information Security Governance – Outcomes of cyber Security governance – Benefits

Module 2: Risk and Strategic context

Introduction – Risk – Vulnerability – Risk Assessment policy – IT and Risk Management – Business Continuity in the context of IT – Business Continuity Management Planning framework - Strategic management framework – Cyber Security Strategy – Cloud Computing – Communication Risk Management strategy

Module 3: Resilience Management

Introduction – Need for Resilience – Resilience domains and features – Formulating a resilience policy – Security awareness

Module 4: Current State and Developing a Security strategy

Current state of Security – Current state of risk management – Gap Analysis – Strategy failure – Attributes of good security strategy – Strategy resources and constraints – Case Study

Module 5: Security Governance objectives

Security Architecture – COBIT – Capability maturity model – ISO/ IEC 27001/ 27002 – Other approaches

Module 6: Compliance Law

Civil law versus Criminal Law – Computer Security Act – Sarbanes Oxley Act – Gramm Leach Bailey Act – Health Insurance Portability and Accountability Act – Federal Information Security Management Act

Text Books:

1. Dr Peter Trim, Dr Yang-Im Lee, “Cyber Security Management: A Governance, Risk and Compliance Framework”, Routledge; 1st Edition, 2014, ISBN: 9781472432094
2. Krag Brotby, “Information Security Governance: A Practical Development and Implementation approach”, Wiley; 1st edition, ASIN: B074VDFVVT

Reference Books:

1. Todd Fitzgerald, Information Security Governance Simplified, 2012 by Taylor & Francis Group, ISBN 13: 9781439811658.
2. L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph Weiss “Cyber Security Policy Guidebook”, John Wiley & Sons., 2017, ISBN: 9788126569977.
3. Richard Phillips, Rayton R. Sianjina, “Cyber Security for Educational Leaders: A Guide to Understanding and Implementing Technology Policies”, Routledge; 1st edition, 2013, ASIN: B00EVWHRVI.
4. Amos N. Guiora, “Cybersecurity: Geopolitics, Law, and Policy”, Routledge; 1st edition, 2017, ISBN: 9781138033290.
5. Graham James Et.Al, “Cyber Security Essentials”, CRC Press-Reprint Year 2018, ISBN: 9780815351429.
6. Josiah Dykstra, “Essential Cybersecurity Science”, O'Reilly; 1st edition, 2015, ISBN: 9781491920947.

20CA2045	Security of Web Applications	L	T	P	C
		3	0	0	3

Course Objectives:

1. To develop the web application designing skill in students.
2. To prepare the students for identifying and fixing vulnerabilities and threats in web applications.
3. To demonstrate the knowledge necessary to perform an effective database audit and code audit.

Course Outcomes:

By learning the course, the students will be able to

1. explain Web Application architecture and technologies.
2. identify and handle Web Application Attacks.

3. defend web browser from attacks.
4. state the importance of web authentication and authorization.
5. exhibit privacy for users.
6. exhibit the skills in securing Web server.

Module 1: Web Application

Architecture components, Software components, Technologies, Security Development Life Cycle, Vulnerability Management, Security Development Life Cycle, Web Application Scanning Flow, Features of Web Application Scanner.

Module 2: Web Application Attacks

Cross-site Scripting, Cross-Site request forgery, SQL Injection, Server Misconfiguration and Predictable Pages, Breaking Authentication Schemes, Logic Attacks, Web Distrust – Case studies on Web Application attacks

Module 3: Web Browser Hacking

Web Browser Security, Control Initiating Techniques, Attacking Users, Attacking Browsers, Attacking Plugins, Attacking Web Applications

Module 4: Authentication & Authorization

Passwords, Biometrics, Digital Signatures, Digital Certificates, Certification Authorities, Public Key Infrastructure, Session Management

Module 5: Privacy and Security for users

Log Files, Understanding Cookies, Web Bugs, Picking Great Password, Avoiding Spam and Junk Email, Identity Theft, Blocking Ads and Crushing Cookies, Anonymous Browsing, Securing Email.

Module 6: Web Server Security

Physical Security for Servers, Host Security for servers, Security for Web Applications, Deploying SSL Server Certificates, Securing Web Services

Text Book:

1. Mike Shema, “Web Application Security for Dummies”, John Wiley & Sons, Ltd, ISBN: 9781119-994879

Reference Books:

1. Wade Alcorn, Christian Frichot, The Browser Hacker’s Handbook, John Wiley & Sons, Inc, ISBN: 9781118662090,
2. Gene Spafford and Simson Garfinkel, Web Security, Privacy & Commerce, O’Reilly Media, Inc., ISBN-13: 978-0596000455, 2001
3. Andrew Hoffman, Web Application Security, O’Reilly Media, Inc., ISBN: 9781492053101, 2020
4. Dafydd Stuttard, Marcus Pinto, The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws, 2ed, ISBN-13: 978-81265334042011
5. Hanqing Wu, Liz Zhao, Web Security: A WhiteHat Perspective, Auerbach Publications 1st Edition, ISBN 9781466592612, 2015.
6. Steven Splaine, Testing Web Security: Assessing the Security of Web Sites and Applications 1st Edition, John Wiley & Sons, Inc, ISBN-13: 978-0471232810, 2002
7. Saumil Shah, Shreeraj Shah, Web Hacking: Attacks and Defense, Addison Wesley, ISBN-13: 978-0201761764, 2002

20CA2046	Data Mining in Cyber Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To transfer Data Warehouse designing skills to students.
2. To demonstrate Data Mining techniques.
3. To prepare students in using right technique in securing privacy information and network from external attacks.

Course Outcomes:

By learning the course, the students will be able to

1. explain various components and processes of data warehouse.
2. design and implement Data Warehouse to industrial requirements.
3. apply in association rule and classification technique in handling organizational problems.
4. identify pattern and knowledge hidden in complex types of data.
5. identify and handle anomaly detection in network.
6. apply appropriate data mining technique in handling Malware attacks

Module 1: Data Warehouse Introduction

Need for Data Warehousing, Building Blocks, Trends in Data Warehousing, Architectural Components, Delivery Process, System Process, Process architecture, Database Schema, Partitioning strategy, Aggregations.

Module 2: Data Warehouse Design and Implementation

DataMart, Metadata, Data Design and Data preparation, OLAP, Implementation and Maintenance.

Module 3: Association Rule Mining and Classification

Data Mining, Data mining functionalities, Data mining architectures, Association Rules, Single dimensional Boolean association rule, Multilevel association rules, Constrained base association mining, Classification, issues regarding classification, Decision tree induction, Bayesian classification

Module 4: Cluster Analysis and Mining Complex Types of Data

Cluster analysis, Types of cluster analysis, Partitioning methods, Hierarchical methods, Density-Based methods, Grid-Based methods, Model-Based methods, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence data, Mining Text Database, Mining World Wide Web

Module 5: Data Mining for Privacy preservation and Anomaly detection

Privacy preservation Association rule, Privacy preservation Decision Tree, Privacy preservation KNN, Privacy preservation K-means Clustering, Clustering-based Anomaly detection, Anomaly detection using Outliner mining, Anomaly detection Association rules - Case studies on Privacy preservation

Module 6: Malware Attacks Detection

Data Mining for Email Worm Detection, Data Mining for Detecting Malicious Executables, Data Mining for Detecting Remote Exploits, Stream Mining for Security Applications

Text Book:

Jiawei Han, Jian Pei, Micheline Kamber, “Data Mining Concepts and Techniques”, Morgan Kaufmannm, 3rd edition, 2011, SBN: 9780123814791.

Reference Books

1. Paulraj Ponniah, Data Warehousing Fundamentals for IT Professionals, Wiley-Blackwell, 2nd edition, 2010, ISBN: 9780470462072.
2. Sam Anahory, Dennis Murray, Data Warehousing in the Real World, Pearson Education India, 2009, ISBN: 9788131704592.
3. Parteek Bhatia, Data Mining and Data Warehousing Principles and Practical Techniques, Cambridge University Press, 2019, ASIN: B07R8VPLSH.
4. Zhengxin Chen, Intelligent Data Warehousing from Data Preparation to Data Mining, CRC Press, 2002, ISBN: 0849312043.
5. Sumeet Dua, Xian DU, Data Mining and Machine Learning in Cybersecurity, Auerbach Publications, 1st edition, 2011, ISBN: 9781439839423.
6. Galit Shmueli, Peter C. Bruce , Inbal Yahav, Nitin R. Patel, Kenneth C. Lichtendahl, “Data Mining for Business Analytics: Concepts, Techniques and Applications in R”, Wiley, 2018, ISBN: 9788126577392.
7. Dhruva Kumar Bhattacharyya, Jugal Kumar Kalita, Network Anomaly Detection: A Machine Learning Perspective, Taylor & Francis, 2014, ISBN: 9781466582095.

20CA2047	Email and Mobile Forensics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the role of email in investigation
2. To identify and investigate malicious email
3. To outline the mobile device acquisition procedures and android forensics

Course Outcomes:

By learning the course, the students will be able to

1. explain the role of client and server in email and the role of email in investigation
2. identify, Analyze and investigate the malicious email
3. state the need to secure the e-mail service
4. outline Mobile device proliferation and their functionalities
5. identify and investigate data from mobile devices using forensically sound and industry standard tools
6. analyze mobile devices, their backup files, and artifacts for forensic evidence

Module 1: Email Investigation

Introduction – Email - Email Forensic Analysis - Email Architecture - Exploring the role of email in investigation – Role of client and server in email – Examining email messages – Viewing Email Headers – Examining additional email files – Tracing an email message - Network email logs

Module 2: Email Analysis

Understanding Email Servers – OS Forensics to recover email – Using Hex editor to carve email messages – recovering outlook files – Sender Policy Framework – Domain keys Identified Mail – SMTP Headers – Anatomy of a Header– Analyzing message headers – Forging message headers – Email forensic tools – Case Studies

Module 3: Security Issues

Risks to an email infrastructure: Users, Mail Clients/ Mail Server, SMTP, POP3, IMAP, Mail in transit, Mail in store – Securing the email infrastructure – Controls implementation to secure the email infrastructure: user, email client, email server and email server application – Controls and Countermeasures Analysis

Module 4: Mobile Devices

Introduction of mobile devices - Evolution of mobile device forensics - Carriers, Spectrum, Communication Topology - SIM Cards - SQLite Database - Forensic Tools Introduction - Metadata including EXIF and GPS

Module 5: Mobile Device Acquisition

Software Acquisition - Hardware Acquisition: Chip-Off, JTAG, ISP - Backup Files - Server/Cloud Acquisitions - Non-traditional and older device acquisition & analysis - Android Device Acquisition & Analysis

Module 6: Android forensics

Procedures for handling an android device, imaging android USB mass storage devices - Decrypting of encrypted files - analysis of database files – File Recovery - Mobile application security - Voice, SMS and Identification data interception in GSM

Text Books:

1. Steven Furnell, Paul S. Dowland, IT Governance Publishing “E-Mail Security: A Pocket Guide”, It Governance Publishing (November 30, 2010), ISBN: 978-1-84928-097-6
2. Iosif I. Androulidakis, “Mobile phone security and forensics: A practical approach”, Springer publications, 2012, ISBN: 9781461416500

Reference Books:

1. Les Hatton, E-mail Forensics: Eliminating Spam, Scams and Phishing, Bluespear Publishing (1 October 2011), ISBN-13: 978-1908422002

2. Jim Doherty, “Wireless and Mobile Device Security (Jones & Bartlett Learning Information Systems Security & Assurance)”, Jones & Bartlett Learning; 2014, ISBN-13: 978-1284059274
3. Neil Bergman, Mike Stanfield, Jason Rouse, Joel Scambray, Sarath Geethakumar, Swapnil Deshmukh, Scott Matsumoto, John Steven, “Hacking Exposed Mobile: Security Secrets & Solutions”, McGraw-Hill Education; (2017), ISBN-13: 978-9351342786
4. Andrew Hoog, “Android Forensics: Investigation, Analysis and Mobile Security for Google Android”, Syngress, 2011, ASIN: B005PLWT0S
5. Himanshu Dwivedi, Chris Clark, David Thiel – “Mobile Application Security”, McGraw Hill, 2010, ISBN: 978-0-07-163357-4.

20CA2048	Python for Network and Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain students the security practices in Python.
2. To help students improve their knowledge in using Python for cyber security.
3. To prepare students for designing new cyber security tool or improve upon an existing cyber security tool.

Course Outcomes:

By learning the course, the students will be able to

1. write Socket program
2. scan network and gather information
3. perform ethical hacking
4. encrypt and decrypt and validate images
5. perform forensics analysis
6. build ecommerce application

Module 1: Network Programing

Socket Programming, Authentication mechanism, Analyzing Network Traffic, Gathering Information from server, Interacting with FTP, SSH and SNMP servers, Nmap scanners, Interacting with Vulnerability scanner, Identifying Sever Vulnerabilities in Web application.

Module 2: Security

Reverse Cipher, Caesar cipher, Hacking Caesar cipher, Encryption and Decryption with Transposition Cipher, Encryption and Decrypting files, Hashing, Strong Encryption,

Module 3: Hacking

Hacking Password, Using a Key logger to Gain information, Man in the Middle Attacks, Create Malware program, Retrieve deleted items in Recycle bin.

Module 4: Digital Image Processing

Image manipulation and transformation, Image Enhancement, Image Restoration, Image Classification, Objection Detection in image, Face recognition and Image captioning

Module 5: Digital Forensics

Essential Scripting and File information recipes, Extracting Embedded Metadata Recipes, Reading Email and taking Names recipes, Log-Based Artifact Recipes, Forensic Evidence Container Recipes, Exploring Windows Forensics Artifacts Recipes

Module 6: Ecommerce

Creating a Django, Models for sale, shopping cart, creating user accounts, Product images, Ajax, Web security

Text Books:

1. R. Nageswara Rao, “Core Python Programming”, Dreamtech Press, 2nd edition ISBN-13: 978-9386052308, 2018
2. Joseph Mining, “Learn Python Programming”, Packt Publishing; 2nd Revised edition, ISBN-13: 978-1788996662, 2018

Reference Books:

1. Jose Manuel Ortega, “Mastering Python for Networking and Security: Leverage Python scripts and libraries to overcome networking and security issues”, Packt Publishing, 2018, ISBN-13: 978-1788992510
2. Samuel Bowne, “Hands-On Cryptography with Python: Leverage the power of Python to encrypt and decrypt data”, Packt Publishing, 2018, ISBN-13: 978-1789534443.
3. Seth James Nielson, Christopher K. Monson Practical, “Cryptography in Python: Learning Correct Cryptography by Example”, Apress; 1st edition, 2019, ISBN-13: 978-1484248997.
4. Hacking Studios, Hacking: World Class Hacking, “Python and Cyber Security Strategies For Up-and-Coming Hackers”, CreateSpace Independent Publishing Platform, ISBN-13: 978-19763669562017
5. Evan Lane, Hacking with Python: Beginner's Guide to Ethical Hacking, “Basic Security, Penetration Testing, and Python Hacking”, Amazon.com Services LLC, ASIN: B06XK3Z9N4, 2017
6. Justin Seitz, “Black Hat Python: Python Programming for Hackers and Pentesters”, No Starch Press; 1 edition, ASIN: B00QL616DW, 2014

20CA2049	Python for Network and Security Lab	L 0	T 0	P 2	C 2

Course Objectives:

1. To explain students the security practices in Python.
2. To help students improve their knowledge in using Python for cyber security.
3. To prepare students for designing new cyber security tool or improve upon an existing cyber security tool.

Course Outcomes:

By learning the course, the students will be able to

1. write Socket program.
2. scan network and gather information.
3. perform ethical hacking.
4. encrypt and decrypt and validate images.
5. perform forensics analysis.
6. build ecommerce application.

Lab Experiments:

1. Generating Password
2. Encrypting and Decrypting files
3. Keylogger
4. Analysing Network Traffic
5. Vulnerability Scanner
6. Chat application
7. Man in the Middle
8. Image Validation
9. Image enhancement
10. Email parser
11. Detect and Extract object
12. Image encryption and decryption

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2050	Cloud Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the basic concepts of Cloud Computing
2. To demonstrate new technologies in Cloud Computing
3. To debate cloud computing risk issues and challenges

Course Outcomes:

By learning the course, the students will be able to

1. compare the deployment models versus service models of cloud computing.
2. illustrate the architecture and categorize the services using cloud computing.
3. identify the known threats, risks, vulnerabilities and privacy issues associated with cloud based IT services.
4. explain the concepts and guiding principles for designing and implementing appropriate safeguards and countermeasures for cloud based IT services.
5. describe the industry security standards, regulatory mandates, audit policies and compliance requirements for cloud based infrastructures.
6. state the governance in the cloud.

Module 1: Cloud computing fundamentals

Cloud computing – Essential characteristics – Architectural influences – Technological influences – Operational influences

Module 2: Cloud Computing Architecture and Software Security

Cloud Delivery models – Cloud deployment models – Cloud Security Services – Cloud Computing and Business Continuity planning/ Disaster recovery

Module 3: Cloud Computing risk issues

CIA Triad – Privacy and compliance risks – Threats to infrastructure, data and access control – cloud service risk provider – Case Studies on Cloud Computing risk issues

Module 4: Cloud Computing security architecture and challenges

Architectural consideration – Identity Management and access control – Automatic security – Security Policy implementation – Virtualization security management

Module 5: Cloud Computing Life cycle issues

Industry Standards Organizations and Groups associated with Cloud Computing – Incident Response – Key Management and Encryption – retirement

Module 6: Governance in the cloud

Need for IT governance in cloud computing, Cloud Governance Solution: Access Controls, Financial Controls, Logging and Auditing, API integration. Legal Issues: Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations

Text Book:

1. Ronald L Krutz and Russel Dean Vines, “Cloud Security: A Comprehensive Guide to Secure Cloud Computing”, 1 edition, Wiley India, New Delhi, ISBN: 9780470589878

Reference Books:

1. John W Rittinghouse and James F Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, Boca Raton, 2009, ISBN: 9781439806807
2. Ben Halpert, “Auditing Cloud Computing – A Security and Privacy Guide”, John Wiley and Sons, New Jersey, ISBN: 9780470874745
3. Rajkumar Buyya, James Broberg and Andrzej Goscinski, “Cloud Computing: Principles and Paradigms”, John Wiley and Sons, New Jersey, ISBN: 9780470887998
4. Danielle Ruest and Nelson Ruest, “Virtualization: A Beginners Guide”, Tata McGraw Hill, New Delhi, ISBN: 9780071614016

5. Tim Mather, Subra Kumaraswamy and Shahed Latif, “Cloud Security and Privacy”, O’Reilly Publishers, USA, ISBN: 9780596802769
6. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, 2009, McGraw-Hill Osborne Media, ASIN: B00ME3OQP6

20CA2051	Cloud Security Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To explain the basic concepts of Cloud Computing
2. To demonstrate new technologies in Cloud Computing
3. To debate cloud computing risk issues and challenges

Course Outcomes:

By learning the course, the students will be able to

1. compare the deployment models versus service models of cloud computing.
2. illustrate the architecture and categorize the services using cloud computing.
3. identify the known threats, risks, vulnerabilities and privacy issues associated with cloud based IT services.
4. explain the concepts and guiding principles for designing and implementing appropriate safeguards and countermeasures for cloud based IT services
5. describe the industry security standards, regulatory mandates, audit policies and compliance requirements for cloud based infrastructures.
6. state the governance in the cloud.

Lab Experiments:

1. To study and implementation of Storage as a Service
2. Working of Google Drive to make spreadsheet and notes.
3. Installation and Configuration of Justcloud.
4. Working in Cloud9 to demonstrate different language.
5. Working in Codenvy to demonstrate Provisioning and Scaling of a website.
6. Installation and Configuration of Hadoop/Eucalyptus
7. Working and installation of Google App Engine
8. Working and installation of Microsoft Azure
9. Working with Mangrasoft Aneka Software
10. Working with Amazon s3 service
11. Working with amazon encrypted EBS
12. To Study Cloud Security management in AWS.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA2052	Information Security Ethics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the need for issues regarding ethics to information security
2. To assess professional ethics, privacy, property rights, access, and reliability.
3. To adapt several codes of ethics, from general to specific in nature

Course Outcomes:

By learning the course, the students will be able to

1. identify the issues of professional conduct in information technology
2. analyses the relationship with machines, and in particular with the technological devices that we use most in our everyday communication

3. assess the impact of the privacy laws
4. illustrate the issues related to intellectual property
5. adapt several codes of ethics, from general to specific in nature
6. state the ethical issues that the software manufacturers face in making trade-offs between project schedules, project costs, and software quality

Module 1: Overview of Ethics

Ethics – Ethics in business world – Ethical consideration in decision making – Ethics in Information Technology – Ethics for IT professionals – Ethics for IT users

Module 2: Ethics of Communication Devices

Considerations – Brief history of media in the last century – Computer ethics and deontology – Smartphone ontology and ethics – Robots, Communication and Ethics

Module 3: Ethics of Communication Environment

Communication as an environment – Ethics and virtuality – internet and its phases – ethics and the Internet – Ethics and Social networks – Ethics and Internet of Things

Module 4: Information Privacy & Intellectual Property

Privacy protection and the law – key privacy and anonymity issues – Copyrights – Patents – Trade secrets – key Intellectual property issues – Case Studies on privacy and anonymity issues

Module 5: Security Operations

Professional Ethics – common fallacious about ethics – Codes of Ethics – Personnel Security principles – Code of Ethics – ISC2 ethics – ISO code of ethics

Module 6: Software Development Ethics

Importance of Software Quality - Software Development Process - Capability Maturity Model Integration - Key Issues in Software Development: Development of Safety-Critical Systems, Quality Management Standards -

Text Book:

1. George W. Reynolds, “Ethics in Information Technology”, Fifth Edition, Cengage Learning, 2015, ISBN-13: 978-1-285-19718-0

Reference Books:

1. Adriano Fabris, “Ethics of Information and Communication Technologies”, Springer, ISBN 978-3-319-75510-6
2. Chuck Easttom, “CCFPSPM Certified Cyber Forensics Professional Certification ALL-IN-ONE (Exam Guide)”, McGraw-Hill Education, 2015, ISBN: Book p/n 978-0-07-183611-1
3. David Kim, Michael G. Solomon, “Fundamentals of Information Systems Security”, Jones & Bartlett Learning, Third edition, 2018, ISBN 9781284116458
4. Melissa Jane Dark, “Information Assurance and Security Ethics in Complex Systems: Interdisciplinary Perspectives”, IGI Global, 2010, 978-1-61692-245-0
5. Ziska Fields, “Handbook Of Research On Information And Cyber Security In The Fourth Industrial Revolution”, IGI Global/IRMA, 2018, ISBN: 1522547630, 9781522547631
6. James Michael Stewart, Ed Tittel, Mike Chapple, “Certified Information Systems Security Professional Study Guide”, Fifth Edition, 2011 by Wiley Publishing, 978-0-470-94498-1

20CA3001	Cyber Criminology and Criminal Justice Administration	L	T	P	C
		4	0	0	4

Course Objectives:

1. To explain the concept of crimes, various forms of crimes and cyber crimes
2. To state Cyber Crime from Sociological, Psychological and Criminological Perspectives
3. To discuss the Role of Criminal Justice Administration and Cyber Crimes

Course Outcomes:

By learning the course, the students will be able to

1. explain the concepts of crime and cyber crimes.

2. outline the principles of crime, cause and extent of cyber crimes.
3. discuss various forms of cyber crimes.
4. debate the cyber frauds happening in the major sectors such as Banking sector, Telecom sector, Health sector, Travel sector.
5. give theoretical perspectives of cyber crimes.
6. describe the Role of Criminal Justice Administration and Cyber Crimes.

Module 1: Basic Concepts of Crime, Law and Criminal Justice

Crime, Tort, Misdemeanor, Juvenile Delinquency, Status Offences, Conventional Crimes Vs Cyber Crimes, Economic Offences, White Collar Crime, Media and Crime, Terrorism, Criminal Law, Indian Penal Code, Criminal Procedure and Evidence, Criminal Justice Administration.

Module 2: Principles and Concepts of Cyber Criminology

Cyber Space, Cyber Crime, Cyber Criminology, Information Security, Penetration Testing, Incident Response, GRC, Significance of Cyber Crime, Causes and Extent of Cyber Crimes, Types of Cyber Criminals – Modus Operandi of Cyber Criminals – Profiling of Cyber Criminals - Tools and Techniques adopted by Cyber Criminals

Module 3: Forms of Cyber Crimes

Types of Cyber Crimes – Cyber Crimes Against property, Person, Nation and Organizations – Cyber Theft, Phishing, Denial of Service, Distributed Denial of Service, Malwares, Cyber Bullying, Cyber Stalking, Cyber Pornography, Cyber Espionage, Cyber Defamation, Web Defacement, Hacking, Cracking, Chat Room Crimes, Cyber Terrorism, Cyber Warfare, Data Theft, Data Diddling, Cyber Violence, Cyber Vandalism, Insider Threats, National and International Cyber Crimes, Cyber based Political Crimes, IPR related frauds, social engineering, .

Module 4: Forms of Cyber Frauds

Internet Frauds, Cyber Scams, Job Frauds, Electronic Mailing Frauds, Card frauds, charity frauds, online marketing frauds, banking frauds, telecom frauds, frauds in health sector, frauds in travel sectors, E-Commerce and E-Business related frauds.

Module 5: Theoretical Perspectives of Cyber Crimes

Criminological Theories and Cyber Crime – Routine Activity Theory, Social Learning Theory, Differential Association Theory, Differential Opportunity Theory, Media and Crime and latest theories and other related theories Psychological theories relating to cyber criminals – Personality, Motivation, Learning, Intelligence and Emotions.

Module 6: The Role of Criminal Justice Administration and Cyber Crimes

Police: Organizational structure of Police in India – Different wings in the Central ,States and Districts and their functions - Police & Law Enforcement – F.I.R. – cognizable and non-cognizable offences, bailable and non-bailable offences – on line complaints search & , seizure, search of cyber crimes and digital evidence, Online Surveillance – Investigation Procedures and Issues in the Investigation of Cyber Crimes and collection of digital evidences– charge sheet – Cyber crime cells – structure & investigation of cyber crime cases –Courts – Cyber Appellate Court / Tribunals / Powers – Proceedings in the court: trial, sentencing. Role of National and International agencies in the prevention of Cyber Crimes

Text Books:

1. Roger Hopkins Burke, “An Introduction to Criminological Theory”, Routledge; 3rd edition (2009), ISBN-13: 978-1-84392-407
2. Dejeu, Murugan, “Cyber Forensics”, Oxford University Press; First edition, 2018, ISBN-13: 978-0199489442

Reference Books:

1. Larry J Siegel, “Criminology: Theories, Patterns and Typologies”, Cengage Learning; 13th edition, 2017, ISBN-13: 978-1337091848
2. Chuck Easttom, “CCFPSM Certified Cyber Forensics Professional Certification ALL-IN-ONE (Exam Guide)”, McGraw-Hill Education, 2015, ISBN: Book p/n 978-0-07-183611-1

3. Britz, "Computer Forensics and Cyber Crime: An Introduction", Pearson Education India; 2nd edition, 2011, ISBN-13: 978-8131764015
4. Katherine S Williams, "Textbook on Criminology", Oxford University Press; 7th edition, 2012, ISBN-13: 978-0199592708
5. Thilagaraj, R and Latha, S, "Readings in Criminology", Gyan Book House, Delhi, 2012, ISBN - 9788121211444
6. Prof. N. V. Paranjape, "Criminology, Penology and Victimology", Central Law Publications (CLP), 2017, ISBN-13: 978-9384961961

20CA3002	Information Security Management	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the need for security management.
2. To identify the various techniques and control mechanisms to safeguard information.
3. To establish safeguards to protect the organization's information resources.

Course Outcomes:

By learning the course, the students will be able to

1. explain the fundamental concepts of information security.
2. describe the need for development of information security policies, and identify guidelines and models for writing policies.
3. outline how the organization has to equip itself for effective implementation of information security.
4. relate the importance of privacy and how they impact the information security.
5. state the importance of access controls and the need for an access control.
6. recommend suitable controls and procedures for ensuring security.

Module 1: Information System Security

Information Security – Definition, types, advantages and disadvantages - Information System Security – Tenets of Information Systems Security – Seven domains of a typical IT infrastructure – Weakest link in the Security of an IT infrastructure – IT Security policy framework - Data classification standards – Security policies, standards, baselines, guidelines

Module 2: Asset Security

Personnel security: Employees, Vendor, consultant and contractor control compliance- governance - Information Rights Management: Overview - Evolution from Encryption to IRM - IRM Technology - Storage security - Storage Security Evolution - Modern storage security.

Module 3: Privacy concepts

Privacy Concepts - Privacy Principles and Policies -Authentication and Privacy - Data Mining -Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies – Case Studies on Privacy Concepts

Module 4: Access Control

Access control –access control types – Authorization policies – Methods and guidelines for identification – Processes and requirements for authentication – Policies and procedures for accountability – Effects of breaches in access control – Centralized (RADIUS, TACACS, DIAMETER) and Decentralized Access control

Module 5: Risk Management

Risk Management concepts – Risk Terminology – Identify threats and vulnerabilities – Risk Assessment – Risk Assignment – Countermeasures selection and assessment – Implementation – Types of Control – Monitoring and Measurement – Asset valuation – Continuous Improvement – Risk framework

Module 6: Security Operations

Security Administration – Compliance – Professional Ethics – Infrastructure for an IT Security policy – Data classification standard – Configuration management – Change management – Applications software security – Software Development and Security

Text Book:

1. David Kim, Michael G. Solomon, "Fundamentals of Information Systems Security", Third Edition, 2018 by Jones & Bartlett Learning, 2018, ISBN 9781284116458

Reference Books:

1. James M. Stewart, Mike Chapple, Darril Gibson, "(ISC)2 Certified Information Systems Security Professional Official Study Guide) – CISSP", Seventh Edition, 2015, Sybex, ISBN: 978-1-119-04271-6
2. Thomas R. Peltier, "Information Security Fundamentals", Auerbach Publications; 2nd edition, 2017, ISBN-13: 978-1138436893
3. Umesha Nayak, Umesh Rao, "The InfoSec Handbook: An Introduction to Information Security", Apress; 1st edition, 2014, ISBN-13: 978-1430263821
4. Adam Gordon, "Official (ISC)2 Guide to the CISSP CBK ((ISC)", Auerbach Publications; 4th edition, 2015, ISBN-13: 978-1482262759
5. Jason Andress "The Basics of Information Security: Understanding the Fundamentals of InfoSec in Theory and Practice", Syngress, 2nd edition, 2014, ISBN-13: 978-0128007440
6. Michael E. Whitman, Herbert J. Mattord, "Principles of Information Security", 6th edition, Cengage Learning India Private Limited, 2018, ISBN-13: 978-9387994232
7. John Vacca, "Computer and Information Security", Handbook, 3rd edition, Morgan Kaufman, 2017, ISBN: 9780128038437.
8. Mark Rhodes-Ousley, "Information Security: The Complete Reference", McGraw Hill Education; Second edition, 2013, ISBN-13: 978-1259098345

20CA3003	Network Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To generate a comprehensive understanding of networks with the OSI seven-layer model, TCP/IP model
2. To describe the essential introductory aspects of Routing
3. To apply various principles of cryptosystems, hashing algorithms and digital signatures.

Course Outcomes:

By learning the course, the students will be able to

1. define the concepts of protocols and their relationship to each other
2. explain different network types, IP address, sub-netting, network address translation and IP versions4 to IPv6
3. identify the various TCP/IP protocols used for the networking application
4. demonstrate routing protocols used for different networks
5. comprehend the cryptography concepts
6. evaluate network and internet security

Module 1: Introduction

Internetworking - OSI reference model - Ethernet networks – Ethernet cabling – Data encapsulation – TCP/IP – IP addressing – IP address types – Subnetting - Virtual Local Area Network (VLAN) – Network devices security – Network Address Translation – Network Access Control – Demilitarized zone – Remote Access - Troubleshooting methodologies

Module 2: TCP/IP Basics

Static IP addressing, Dynamic IP addressing, Special IP addresses - Transport layer protocols – port numbers - registered ports, connection status, rules for determining good vs. bad communications – Common TCP/IP applications - the world wide web, Telnet, Email, FTP, Internet applications - Troubleshooting methodologies

Module 3: Routing

Routers - Routing tables, Network Address Translation - Dynamic routing – distance vector, link state – EIGRP – Dynamic routing – Working with routers - Connecting to routers, basic router configuration, router problems - Troubleshooting methodologies

Module 4: Cryptography

Introduction – Symmetric key cryptography – public key encryption – Cryptographic hash functions – Message authentication code – Digital Signatures – End point authentication – Windows and Linux Encryption – Hashing – Cracking Passwords – Hamming – Rainbow Tables

Module 5: Internet Security

Kerberos V1 - Kerberos V2 - Electronic mail security - Introduction - Pretty good privacy - S/MIME - Domain Keys Identified Mail-IP Security - IPSec - Modes of IPSec -Web security -Secure Socket Layer - Transport Layer Security - Troubleshooting methodologies

Module 6: Network Security and countermeasures

Server Administration - Network security attack- Threats to Network Communications - Wireless Network Security - Network Security - Firewalls - need for firewalls-firewall characteristics-types of firewalls - Intrusion Detection and Prevention Systems - Network Management – Case Studies on Network Security

Text Book:

Mark Ciampa, “Security+ Guide to Network Security Fundamentals”, Fourth Edition, 2012, Cengage Learning, ISBN-13: 978-1-111-64012-5

Reference Books:

1. W. Stallings, Cryptography and Network Security: Principles and Practice, 5th Edition, Boston, Prentice Hall, 2010, ISBN: 978-0-13-609704-4.
2. William (Chuck) Easttom II, “Network Defense and Countermeasures: Principles and Practices”, Pearson IT Certification; 3rd edition, 2018, ISBN-13: 978-0789759962
3. McCabe James, “Network Analysis, Architecture, and Design”, Morgan Kaufmann Publishers, Third Edition, ISBN-13: 978-0123704801
4. Vilas S. Bagad and Iresh A. Dhotre, “Computer Networks”, Technical Publications, 2010, ISBN: 9788184312591.
5. M. Rhodes-Ousley, Network security the complete reference (complete reference), 2nd ed. New York, USA: McGraw-Hill Professional Publishing, 2013, ISBN: 978-1-59749-535-6
6. D. R. Stinson, Cryptography: Theory and Practice, 3rd Edition, Boca Raton, FL: Chapman Hall/CRC, 2005, ISBN: 978-1-58-488508-5.
7. Michael Meyers, “CompTIA Network+ Certification All-in-One Exam Guide (Exam N10-005)”, McGraw-Hill Education, 10th edition, 2019, ISBN-13: 978-1260454031

20CA3004	Network Security Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To generate a comprehensive understanding of networks with the OSI seven-layer model, TCP/IP model
2. To describe the essential introductory aspects of Routing
3. To apply various principles of cryptosystems, hashing algorithms and digital signatures.

Course Outcomes:

By learning the course, the students will be able to

1. define the concepts of protocols and their relationship to each other.
2. explain different network types, IP address, sub-netting, network address translation and IP versions4 to IPv6.
3. identify the various TCP/IP protocols used for the networking application.
4. demonstrate routing protocols used for different networks.
5. comprehend the cryptography concepts.

6. evaluate network and internet security.

Lab Experiments

1. Analyzing Network Traffic and analyzing Telnet Network Traffic
2. Basic Network utilities and Configuring Windows Firewall
3. Configuring IP table rules
4. Preventing IP Spoofing
5. Static Routing
6. Dynamic routing by using RIP protocol
7. Dynamic routing by using EIGRP
8. Implementing an IDS
9. Enabling Bit Locker
10. Encrypting a folder using EFS
11. Hashing
12. Cracking Passwords

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA3005	Cyber Law	L	T	P	C
		4	0	0	4

Course Objectives:

1. To understand the laws relating to cyber laws with an overall perspective.
2. To know about e-commerce and its related aspects like electronic signatures, electronic governance, cyber security, penalties and offences under the IT Act, dispute resolution'
3. To understand aspects like jurisdiction issues, IPR convergence with cyberspace and taxation issues in online transaction can be understood.

Course Outcomes:

By learning the course, the students will be able to

1. learn techno-legal regulations of the Internet.
2. outline the overall regulatory framework of cyberspace in India and developing countries.
3. develop the understanding of relationship between commerce and cyberspace.
4. understand the Information Technology Act and legal frame work of right to Privacy, Data Security and Data Protection.
5. analyze the legal constraints in the enforceability of IT Act and related legislations.
6. understand the tools in cyber forensics, cyber investigation and also relate to other contemporary issues like law relating to cloud technology, Block chain and crypto currencies in India.

Module 1: Introduction, Meaning and Evolution

Important features of computer and internet technology – Evolution of cyberspace-significance of Information Technology- Need for regulating Cyber space- Cyber regulations in India- Global Jurisdictional Issues – Theories of Jurisdiction- Dispute resolution mechanism -. Issues relating to law & technology – Emergence of New technologies like Block chain and Cloud and its relevance to law. - Net neutrality issues – Internet governance

Module 2: Information Technology Act – regulatory features

Salient features of IT Act 2000 -Freedom of Speech and Expression in Cyberspace-Access to Internet-Right to Privacy-Right to data Protection – Adjudicating authorities under the Act – Cyber Appellate tribunal - Civil and Criminal Remedies – jurisdiction ascertainment and issues- Privacy issues – Powers of the government and its constraints- Need for more international cooperation- Role of UN and other organizations – Amendments and its implications – Judicial perspectives of Regulatory aspects of the IT Act 2000.

Module 3: Legal Recognition of Electronic Records

Digital Signatures - UNCITRAL Model Law -.public and private key-Authentication of electronic records using digital signature -Asymmetric cryptosystem and encryption –Hash Function-Public Key infrastructure-Role of Controller of certifying Authorities-Certifying authorities –Subscriber, -Electronic records- Administrator of Electronic records- Electronic Health records-E-Governance and Electronic records Evidentiary value of Electronic records- Powers of the Central Government- power to intercept information- Judicial perspective.

Module 4: E-commerce and E contract

Types of electronic contracts-Email and Standard form of contracts- Shrink wrap and Click Wrap Contract-Formation of E-Contracts-Application of Contract Act -Legal Validity of E- Contract- Electronic Data Interchange- E-Commerce - Models of E-Commerce; E- Governance- Meaning of E-Governance-E Governance policy in India - E-Courts Mission Mode Project of India; E-Banking transaction and frauds – Digital payment and disputes- Taxation issues in Cyberspace – Meaning and significance of Permanent Establishment- Double Taxation-Online dispute Resolution mechanism.

Module 5: Cyber Crimes

Nature and types of Cyber Crimes- cyber offences under the IT Act – Jurisdiction Issues – Extra territorial jurisdiction - Cybercrime against person, property- Hacking, online forgery - pornography - Child pornography under IT Act and POSCO Act - Cyber Stalking, Cyber Bullying , Phishing, spoofing, Cyber murder, Virus Attack, Cyber terrorism, Cyber warfare, Cyber defamation , Right to privacy - data frauds in internet – Cyber Investigation –Powers and functions of the authorities – Investigation Issues and constraints – Digital Evidence and Issues – applicability and importance of cyber forensics- Need for a separate cyber Court – Cyber expert evidence – Valid and acceptable Digital Evidencing.

Module 6: Intellectual Property Issues in Cyberspace

General issues of IPR in Cyberspace-Interface with Copyright Law-Copyright Protection of Computer softwares- Copyright Infringement in Cyberspace - Technological Protection Measures and Anti Circumvention measures - Liability of Internet Service provider –DRM –IP issues with online entertainment industry - Patentability of Software and hardware – Business Method Patent and its online applicability - Trademarks and Domain Name Related issues- Cyber squatting – typo squatting – Framing – Meta tags-Pop Up Advertisements- Linking-UDRP.-Indian Domain name policy- Judicial perspectives.

Text Books:

1. Vakul Sharma, “Information Technology - Law and Practice (Law and Emerging Technology, Cyber Law & E-Commerce)”, Universal Law Publishing Co. (ULPC) (an imprint of Lexis Nexis), 2018, ISBN-13: 978-9386515919
2. Karnika Seth, “Computers, Internet and New Technology Laws-A Comprehensive Reference Work with Special Focus on Developments in India”, Lexis Nexis; First edition, 2016, ISBN-13: 978-9350357514

Reference Books:

1. Kamath Nandan, “Law Relating to Computers Internet & E-commerce - A Guide to Cyber laws & the Information Technology Act, Rules, Regulations and Notifications along with Latest Case Laws”, 2012 (Reprint), Universal Law Publishing - An imprint of LexisNexis; Fifth edition, 2016, ISBN-13: 978-9350351819
2. Kamlesh K. Bajaj, Debjani Nag, “E-Commerce: The Cutting Edge of Business”, McGraw Hill Education; 2nd edition, 2017, ISBN-13: 978-0070585560
3. Apar Gupta, Akshay Sapre, “Commentary On Information Technology Act– With Rules, Regulations, Orders, Guidelines, Reports And Policy Documents”, Lexis Nexis; First edition, 2015, ISBN-13: 978-9351437116
4. Aparna Viswanathan, “Cyber Law - Indian and International Perspectives on Key Topics including Data Security, E-Commerce, Cloud Computing and Cyber Crimes”, Lexis Nexis; First edition, 2012, ISBN-13: 978-8180387395

- Prashant Mali, “Cyber Law and Cyber Crimes”, Cyber Infomedia, Fourth Edition, 2017, ASIN: B071XW8Y28

20CA3006	Digital Forensics	L	T	P	C
		3	0	0	3

Course Objectives:

- To define digital forensics and examine how it's being used.
- To explain how computers create and store digital information and choose appropriate digital forensics tools to identify, classify, locate and recover the evidence.
- To discuss the emerging digital forensic trends and technologies.

Course Outcomes:

By learning the course, the students will be able to

- summarize the technical aspects related to Digital Forensics.
- explain Windows operating system and all of its functions.
- devise network forensics, evidence collection and network forensics analysis.
- apply the art of steganography.
- choose and apply current computer forensics tools.
- outline investigative process and codes of ethics.

Module 1: Introduction to Forensics

Digital forensics –Fundamental principles of Digital forensics – Locard's Exchange principles - Bits, Bytes and Numbering systems – File extensions and file storage – Storage and memory – Computing environments – Data types – File systems – Allocated and unallocated space – Hard drives – Digital Forensics tools – hashing – Carving – Forensic Imaging

Module 2: Windows system artifacts and Antiforensics

Introduction – Deleted data – Hibernation file – Registry – Event logs - Print spooling – Recycle bin – Metadata – Thumbnail cache – Recently used files – Restore points and shadow copy – Prefetch files and Link files – Windows Executables – Password attacks – Data destruction

Module 3: Network Forensics

Introduction – Network Packet Analysis- Wireless – Router forensics – Firewall basics – Windows log examination – Linux log examination – Netstat – Netsessions – Open files – Network structures

Module 4: Network evidence collection and analysis

Network diagram – Configuration details – Log details – Network device evidence – Packet capture: tcpdump, WinPcap, RawCap, Wireshark – Evidence collection – Analyzing packet captures: Command line tools, Wireshark, xPlico – Analyzing network log: DNS blacklists, SIEM, ELK stack

Module 5: Forensic Analysis and validation

File analysis concepts - Validating forensic data – Hiding data, Hiding files – Hiding partitions – Marking bad clusters – Bit shifting – Steganalysis – Examining the encrypted files – Recovering passwords

Module 6: Forensic Investigation

Forensics casework - Investigative process: Chain of custody, securing the scene, documentation, authority and objectives, Examination –Forensic Tools- Ethical conduct – ethical investigation – evidence management– Qualities of an expert - Recent trends in Cyber forensic technique.

Text Book:

- John Sammons, “The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics”, 2012, Elsevier, ISBN 978-1-59749-661-2

Reference Books:

- Chuck Easttom, “CCFPSPM Certified Cyber Forensics Professional Certification ALL-IN-ONE (Exam Guide)”, McGraw-Hill Education, 2015, ISBN: Book p/n 978-0-07-183611-1
- Dejey, Murugan, “Cyber Forensics”, Oxford University Press; First edition (1 June 2018), ISBN-13: 978-0199489442

3. Bill Nelson Amelia Phillips Christopher Stuart, "Guide to Computer Forensics and Investigations: Processing Digital Evidence", Fifth Edition, Cengage Learning, ISBN: 978-1-285-06003-3
4. Cory Altheide, Harlan Carvey, "Digital Forensics with Open Source Tools", 2011, Elsevier, ISBN: 978-1-59749-586-8
5. John Vacca, "Computer Forensics: Computer Crime Scene Investigation", Charles River Media; Second Edition, ISBN-13: 978-1-58450-389-7
6. Marjie T. Britz, "Computer Forensics and Cyber Crime: An Introduction", 3rd Edition, Prentice Hall, ISBN-13: 978-0-13-267771-4

20CA3007	Digital Forensic Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To define digital forensics and examine how it's being used.
2. To explain how computers create and store digital information and choose appropriate digital forensics tools to identify, classify, locate and recover the evidence.
3. To discuss the emerging digital forensic trends and technologies.

Course Outcomes:

By learning the course, the students will be able to

1. summarize the technical aspects related to Digital Forensics.
2. explain Windows operating system and all of its functions.
3. devise network forensics, evidence collection and network forensics analysis.
4. apply the art of steganography.
5. choose and apply current computer forensics tools.
6. outline investigative process and codes of ethics.

Lab Experiments:

1. Digital evidence identification and seizing.
2. Perform file recovery File recovery.
3. Windows forensic using Sysinternals Suite
4. Perform digital forensics data analysis using "Sleuth Kit".
5. Network forensics analysis using "Wireshark".
6. Windows registry analysis (FRAT).
7. Perform Volatile memory collection and analysis (Volatility).
8. Perform Digital forensic incidence response (Helix2008R1).
9. SIM card analysis data acquisition using SIM card reader.
10. Perform forensic analysis using SIFT.
11. Perform Data extraction from a raw image.
12. Perform File Carving using Scalpel, Recover jpeg

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA3008	Web Application Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the fundamental techniques adopted in developing secure web-based applications.
2. To identify the vulnerabilities of web-based applications and to protect those applications from attacks.
3. To discuss security-related issues in Web-based systems and applications.

Course Outcomes:

By learning the course, the students will be able to

1. explain the fundamentals of web application, web security vulnerabilities and principles.

2. describe high level security principles and also learn some popular methods of classifying threats and prioritizing.
3. discuss the authentication to be performed and the best practices in performing it.
4. outline the terminology, methodology and dangers involved in web application authorization.
5. explain two common vulnerabilities cross site scripting and cross site request forgery.
6. apply secure development and deployment methodologies.

Module 1: Introduction to Web application

Introduction - Web Application Security - Defence Mechanisms - Handling User Access - hacker methodologies - Review of hackers - Managing the Application - The OWASP Top Ten List – Web Application Security case studies (OWASP)

Module 2: Web application Security fundamentals

HTML – HTTP – Client side scripting – Server side scripting – Input validation – Blacklist validation – White list validation – Defence in depth – Attack surface reduction – Classifying and prioritizing threats

Module 3: Web Authentication

Authentication Fundamentals- Two Factor and Three Factor Authentication – Web application authentication - Secured Password Based Authentication: Attacks against Password, Importance of Password Complexity - Design Flaws in Authentication Mechanisms – Implementation Flaws in Authentication Mechanisms - Securing Authentication

Module 4: Web Authorization

Understanding authorization - Need for Session Management – Attack against session - Session IDs and Cookies - Hijacking URLs - Protecting Authorization

Module 5: Web, Database and file Security Principles

Cross Site Scripting - Cross Site Request Forgery – Introduction to SQL - SQL Injection - Database Platform Attacks and Security - Database Encryption - Source code security – Forceful browsing - Directory Traversals

Module 6: Web application security development and deployment

Understanding Vulnerabilities in web application – Penetrate and patch methodology - Application Security approach: Training, Threat modeling, Secure coding, Code review, security testing, Incident response planning – Secure Development methodologies and maturity models

Text Book:

1. B. Sullivan, V. Liu, and M. Howard, “Web Application Security”, McGraw-Hill Education, 2012, ISBN: 978-0-07-177612-7.

Reference Books:

1. Mike Shema, “Web Application Security for Dummies”, John Wiley & Sons, Ltd, ISBN: 978-1-119-99487-9
2. Wade Alcorn, Christian Frichot, “The Browser Hacker’s Handbook”, John Wiley & Sons, Inc, ISBN-13: 978-1118662090,
3. Gene Spafford and Simson Garfinkel, “Web Security, Privacy & Commerce”, O'Reilly Media, Inc., ISBN-13: 978-0596000455, 2001
4. Andrew Hoffman, “Web Application Security”, O'Reilly Media, Inc., ISBN: 9781492053101, 2020
5. Dafydd Stuttard, Marcus Pinto, “The Web Application Hacker’s Handbook: Finding and Exploiting Security Flaws”, 2nd edition, ISBN-13: 978-81265334042011
6. Hanqing Wu, Liz Zhao, “Web Security: A White Hat Perspective”, Auerbach Publications 1st Edition, ISBN 9781466592612, 2015.
7. Steven Splaine, Testing Web Security: Assessing the Security of Web Sites and Applications 1st Edition, John Wiley & Sons, Inc, ISBN-13: 978-0471232810, 2002
8. Saumil Shah, Shreeraj Shah, Web Hacking: Attacks and Defense, Addison Wesley, ISBN-13: 978-0201761764, 2002

20CA3009	Advanced Digital Forensics	L	T	P	C
		3	0	0	3

Course Objectives:

1. To examine digital forensic techniques including acquiring evidence, examining volatile memory, hard drive assessment, and network-based evidence.
2. To explain the methods that can be deployed for examining malware in a sandbox environment.
3. To prepare a written report for use either internally or in a courtroom.

Course Outcomes:

By learning the course, the students will be able to

1. explain Linux file system artifacts, directory structures, and artifacts of system and user activity.
2. examine application forensics which includes files that require specific forensic techniques, web-based application forensics, e-mail forensics, and database forensics.
3. examine the various forms of malware and how to conduct malware analysis.
4. discover memory forensics techniques.
5. analyze the volatile data from host based systems and explore the fundamental concepts of digital imaging.
6. report the findings either internally or in a courtroom.

Module 1: Linux system artifacts

Linux file systems – boot process and services – Linux system organization – user accounts – Home directories – logs – Scheduling tasks.

Module 2: Application Forensics

File formats – Windows file copying – Web forensics: Basics of web application, SQL injection, Cross site scripting, cookie manipulation, forceful browsing, XML injection – Email forensics – Database forensics

Module 3: Malware Forensics and Analysis

Malware overview – Static analysis and Dynamic Analysis – Analyzing malware: Static analysis, Pestudio, Remnux, Dynamic Analysis – Process explorer, Cuckoo Sandbox

Module 4: Memory analysis

Introduction – Memory Acquisition: Preserving the digital environment – Software tools – memory dump formats – Converting memory dumps – volatile memory on disk – Windows objects and pool allocations – Linux memory acquisitions – File systems in memory

Module 5: Host based evidence acquisition and forensic imaging

Evidence volatility, Evidence acquisition, Evidence collection procedures: Memory acquisitions, Remote acquisitions, Virtual machines, Non volatile data – Overview of forensic imaging – Stage drive – Imaging

Module 6: Forensic Reporting

Case studies – Recent trends in Digital forensic tools and techniques - Documentation overview – Written reports: Forensic reports

Text Book:

Gerard Johansen, “Digital Forensics and Incident Response”, 2017, Packt Publishing, ISBN: 978-1-78728-868-3

Reference Books:

1. John Sammons, “The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics”, 2012 Elsevier, ISBN 978-1-59749-661-2
2. Chuck Easttom, “CCFPSP Certified Cyber Forensics Professional Certification ALL-IN-ONE (Exam Guide)”, McGraw-Hill Education, 2015, ISBN: 978-0-07-183611-1
3. Deje, Murugan, “Cyber Forensics”, Oxford University Press; First edition, 2018, ISBN-13: 978-0199489442
4. Bill Nelson Amelia Phillips Christopher Steuart, “Guide to Computer Forensics and Investigations: Processing Digital Evidence”, Fifth Edition, Cengage Learning, ISBN: 978-1-285-06003-3
5. Cory Altheide, Harlan Carvey, “Digital Forensics with Open Source Tools”, 2011, Elsevier, ISBN: 978-1-59749-586-8

6. John Vacca, “Computer Forensics: Computer Crime Scene Investigation”, Charles River Media; Second Edition, ISBN-13: 978-1-58450-389-7
7. Marjrie T. Britz, “Computer Forensics and Cyber Crime: An Introduction”, 3rd Edition, Prentice Hall, ISBN-13: 978-0-13-267771-4

20CA3010	Advanced Digital Forensic Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To examine digital forensic techniques including acquiring evidence, examining volatile memory, hard drive assessment, and network-based evidence.
2. To explain the methods that can be deployed for examining malware in a sandbox environment.
3. To prepare a written report for use either internally or in a courtroom.

Course Outcomes:

By learning the course, the students will be able to

1. explain Linux file system artifacts, directory structures, and artifacts of system and user activity.
2. examine application forensics which includes files that require specific forensic techniques, web-based application forensics, e-mail forensics, and database forensics.
3. examine the various forms of malware and how to conduct malware analysis.
4. discover memory forensics techniques.
5. analyze the volatile data from host based systems and explore the fundamental concepts of digital imaging.
6. report the findings either internally or in a courtroom.

Lab Experiments:

1. Mobile data acquisition and analysis using “OxyForensic tool”
2. Network forensics analysis using “Xplico”
3. Perform digital forensics incident response using “CAIN-8”
4. Perform digital forensics data analysis using “Autopsy”
5. Open source forensics tool analysis using “DEFT”
6. Mobile CRD Analysis
7. File Carving using Foremost
8. Data Carving using SANS
9. Editing and modifying of a raw disk or main memory (RAM) using hxd
10. Perform Securely Erasing Disk Drives.
11. Memory and file analysis Mandiant redline
12. Forensic analysis using PALADIN FORENSIC SUITE

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA3011	Business Continuity and Disaster Recovery Management	L	T	P	C
		3	0	0	3

Course Objectives:

1. To examine aspects of business continuity plans and disaster recovery plans.
2. To develop an understanding of concepts of risk management
3. To develop and execute plans to deal with contingency, incident response, disaster recovery and business continuity

Course Outcomes:

By learning the course, the students will be able to

1. design a disaster recovery plan, business continuity plan for sustained organizational operations.
2. identify and prioritize critical business functions; determine maximum tolerable downtime and other criteria and describe concepts of risk management.

3. describe Business Continuity Strategy and be able to discuss incident response options and contingency planning components.
4. explain backup storage strategy, recovery site strategies and provide Training to test, update, assess and maintain the plan.
5. illustrate incident response, detection; response; reporting; recovery; remediation and understand fault tolerance requirements.
6. discuss the Best practices for Business continuity and disaster recovery planning.

Module 1: Introduction

Components of Business – Terms and definitions – Phases of Business Continuity Planning – Types of disasters to consider in BCP/DR – Principles of BCMS – BCP vs BCMS – BCMS lifecycle – BCMS process life cycle model (Alexander) model

Module 2: Business Impact Analysis

Business Impact Analysis — Importance of risk management - Risk management methodology - Attack methods and Countermeasures - Business Impact Analysis and Risk Assessment – FISHBONE Diagram - Product – Process – Activities - Tasks

Module 3: Business Continuity Strategy

Methodology for developing Business Continuity Strategy - Business Continuity Strategy Development Framework - Strategies and Tactics to reduce Business continuity Risks - Selecting the right strategy - Incident, Emergency, Crisis Communication plan - Emergency response plan - Contingency planning

Module 4: Business Continuity Planning Testing and Maintenance

Business Continuity Plan and Disaster Recovery plan Maintenance process – BCP and DRP Change Management process - BCP Testing – BCP and DRP Training – BCP and DRP Audits - Requirements for conducting BCP audits

Module 5: Disaster Recovery

Business continuity and disaster recovery planning trends, standards and vendors - Business Continuity Vs Disaster Recovery - Data Processing Continuity Planning - Disaster Recovery site assessment and selection – Backup – Contemporary Issues and Case Studies: Recent Trends

Module 6: Best Practices

BCMS ISO 22301 methodology - Business impact analysis process based on International ISO 22317:2015 technical specification - Risk Management Frameworks – COBIT – OCTAVE - NIST SP 800-30 - ISO27005:2008 - ISO 22301/ISO22313/ISO 22317 - DR plan as per NIST standard 800-34.

Text Book:

James M. Stewart, Mike Chapple, Darril Gibson, “CISSP (ISC)2 Certified Information Systems Security Professional Official Study Guide”, Sybex, 7th edition, 2015, ISBN-13: 978-1119042716

Reference Books:

1. Thomas R. Peltier, “Information Security Fundamentals”, Auerbach Publications, 2nd edition, 2017, ISBN-13: 978-1138436893
2. Umesha Nayak, Umesh Rao, “The InfoSec Handbook: An Introduction to Information Security”, Apress, 1st edition, 2014, ISBN-13: 978-1430263821
3. Adam Gordon, “Official (ISC)2 Guide to the CISSP CBK ((ISC)”, Auerbach Publications; 4th edition, 2015, ISBN-13: 978-1482262759
4. Jason Andress, “The Basics of Information Security: Understanding the Fundamentals of InfoSec in Theory and Practice”, Syngress, 2nd edition, 2014, ISBN-13: 978-0128007440
5. Michael E. Whitman, Herbert J. Mattord, “Principles of Information Security”, 6th edition, Cengage Learning India Private Limited, 2018, ISBN-13: 978-9387994232
6. John Vacca, “Computer and Information Security”, Handbook, 3rd edition, Morgan Kaufman, 2017, ISBN: 9780128038437.
7. Mark Rhodes-Ousley, “Information Security: The Complete Reference”, McGraw Hill Education, Second edition, 2013, ISBN-13: 978-125909834

20CA3012	Database Security Management	L	T	P	C
		3	0	0	3

Course Objectives:

1. To describe Data Model concepts and Database architecture.
2. To explain how to defend and recover from threats.
3. To develop and implement data security model.

Course Outcomes:

By learning the course, the students will be able to

1. describe database concepts.
2. explain operational threats and vulnerable points of accessing and assess them.
3. propose plan to prevent data leakage and data breach.
4. protect personally identifiable information and other sensitive data from hackers.
5. devise the schedule for database backup.
6. develop security policy and perform database auditing.

Module 1: Data Modeling

Data modeling Concepts – Data modeling Components – Normalization forms – Logical Design to Physical design – Database performance design – Denormalization.

Module 2: Privacy information

Private information retrieval – FHE Based Private Information Retrieval – Private Data Warehouse Queries – Privacy- Preserving Location Based Queries - Case Study on Online Privacy.

Module 3: Data Leakage

Data Leakage – Taxonomy Data Leakage Prevention Solutions – Data Leakage / Misuse scenarios - Privacy, Data Anonymization, and Secure Data Publishing – Case Study on Data loss Data Breach: An Overview of Data Breaches-Qualifying and investigating a Breach – Determining the scope of a Breach – Communicating Data Breach - Preparing for Data Breach litigation.

Module 4: Database Security

Database Security Models - Granting and Revoking Authority – Authorization Roles and Groups – Views and Stored procedures - Encryption – SQL injection – External Security – Securing Database with Cryptography – Case study on database encryption.

Module 5: Database Backup and Recovery

Backup – Recovery – Alternatives to Backup and Recovery – Need for Planning – General Disaster Recovery Guidelines – Backing Up the Database for Disaster Recovery – Disaster Prevention.

Module 6: Database Auditing

Database Application Security Models - Database Auditing Models - Application Data Auditing – Auditing Database Activities – Case study on outcomes of Database auditing.

Text Book:

Craig S. Mullins, “Database Administration: The Complete Guide to DBA Practices and Procedures”, 2nd edition, Addison-Wesley Professional, 2013, ISBN-13: 978-0321822949.

Reference Books:

1. Hassan A Afyouni, “Database Security and Auditing Projecting Data Integrity and Accessibility”, Course Technology, 2006, ISBN 13-978-0-679-27559-0.
2. Kevvie Fowler, “Data Breach Preparation and Response: Breaches are Certain, Impact is Not”, 1st Edition, Todd Green, 2016, ISBN-978-0-12-803451-4.
3. Xun Yi, Russell Paulet, Elisa Bertino, “Private Information Retrieval”, 3rd Edition, 2013, ISBN: 9781627051538.
4. Alfred Basta, Melissa Zgola, “ Database Security”, Cengage Learning, 1st edition, 2011, ISBN-13: 978-1435453906
5. Ron Ben Natan, “Implementing Database Security and Auditing”, Digital Press, 2005, ISBN-13: 978-1555583347,

6. Gerard Blokdyk, “Database security: The Ultimate Step-By-Step Guide”, CreateSpace Independent Publishing Platform, 2017, ISBN-13: 978-1979896283.
7. Gerardus Blokdyk, “Database Security: A Complete Guide”, 5STARCooks, 2019, ISBN-13: 978-0655922476.
8. Nataraj Venkataramanan (Author), Ashwin Shriram”, Data Privacy: Principles and Practice”, 1st edition, 2016, Chapman and Hall/CRC
9. Lucy Thomson, “Data Breach and Encryption”, Handbook Paperback, 2012, ISBN-13: 978-1604429893.

20CA3013	Database Security Management Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To describe Data Model concepts and Database architecture.
2. To explain how to defend and recover from threats.
3. To develop and implement data security model.

Course Outcomes:

By learning the course, the students will be able to

1. describe database concepts.
2. explain operational threats and vulnerable points of accessing and assess them.
3. propose plan to prevent data leakage and data breach.
4. protect personally identifiable information and other sensitive data from hackers.
5. devise the schedule for database backup.
6. develop security policy and perform database auditing.

Lab Experiments:

1. Creating Database
2. Materialized view
3. Data Migration - External Tables, SQL* Loader, Data Pump Import and Data Pump Export
4. Managing Users – Users, Role, Privileges, Profiles
5. Managing Tablespace
6. Managing Schema Objects
7. Managing Tables
8. Managing Indexes
9. Managing Cluster
10. Managing Views, Sequences and Synonyms
11. Managing Redo logs
12. Backup and Recovery

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA3014	Information Security Governance, Risk and Compliance	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain information security governance to protect the information assets
2. To propose ideas to build an information security program
3. To discuss the various control frameworks and standards

Course Outcomes:

By learning the course, the students will be able to

1. explain Information Security Governance, Risk & Compliance
2. develop an information security strategy

3. determine and manage acceptable risk and select the appropriate, risk-based controls that align to the laws and frameworks
4. create a security-aware culture
5. discuss the existing and emerging laws and regulations impacting the organization
6. prepare for and leverage internal and external audits to enhance processes

Module 1: Governance, Risk & Compliance GRC

Definitions – Governance, Risk, Compliance - Corporate Governance, IT Governance and IS governance – Relationship - IT Governance frameworks – AS8015, ISO/IEC38500, COBIT - ISO/IEC38500 – principles (Evaluate Direct Monitor and Report) - COBIT5 for Information Security- Enterprise Security Architecture Frameworks – The open group, O-ESA -Information Security in ITIL - NIST Security publications - ISO standards for information security

Module 2: Information Security Governance

Information Security Governance - Importance of Information Security Governance - Outcomes of Information Security Governance - Strategic alignment - Performance Measurement - Information System Strategy - Strategic Planning - Steering Committee - Policies and Procedures

Module 3: Risk Management

Risk analysis, Risk assessment and Risk management- Gap analysis and Risk Assessment - When to perform Gap analysis /Risk Assessment - Benefits of performing a Risk Assessment - Conducting a IS risk assessment - Common pitfalls to avoid when doing a risk assessment - NIST - Risk management framework (RMF) - Risk management tools

Module 4: Security Controls and Security policies

Types of Security controls – Categories of Security controls – Implement policies and control functions – Promote awareness – Monitor and Evaluate – Central Management

Module 5: Compliance laws

Sarbanes Oxley Act – Payment card Industry Data Security Standard - Health Insurance Portability and Accountability Act - Federal Information Security Modernization Act (FISMA) - General Data Protection Regulation - Risk assessment based on NIST SP 800-30 - ISO 27000 series - OCTAVE - Compliance versus risk management

Module 6: Information Security Management Practices

Personnel Management - Financial Management – Quality Management - Information Security Management - Performance Optimization - Roles and Responsibilities - Auditing IT Governance Structure - Evaluation Criteria & Benchmark - Assessment Tools - Case Study Analysis

Text Book:

1. Todd Fitzgerald, “Information Security Governance Simplified: From the Boardroom to the Keyboard”, CRC Press; 1st edition, ISBN-13: 978-1439811634.

Reference Books:

1. Thomas R. Peltier, “Information Security Fundamentals”, Auerbach Publications; 2nd edition, 2017, ISBN-13: 978-1138436893
2. Robert R. Moeller, “COSO Enterprise Risk Management - Establishing Effective Governance, Risk, and Compliance Processes”, Second Edition, John Wiley & Sons, ISBN 978-0-470-91288-1
3. Fred Cohen, “Security Governance Checklists: Business Operations, Security Governance, Risk Management, and Enterprise Security Architecture”, Large Print Edition, Fred Cohen & Associates Publication, ISBN-13: 978-1878109378
4. James J, “IT Compliance and Controls: Best Practices for Implementation”, DeLuccia, Illustrated Edition, Wiley Publication, ISBN-13: 978-0470145012
5. Craig S. Wright, Brian Freedman, Dale Liu, “The IT Regulatory and Standards Compliance Handbook: How to Survive Information Systems Audit and Assessments”, 1st Edition, Syngress Publication, ISBN-13: 978-1597492669
6. Peter H. Gregory, “CISA Certified Information Systems Auditor All-in-One Exam Guide”, Third Edition, 2016, ISBN-13: 978-1259584169

20CA3015	Internet of Things Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To discuss in detail the IoT technology and its applications.
2. To transfer the expertise knowledge needed to design security policies for IoT.
3. To design IoT systems.

Course Outcomes:

By learning the course, the students will be able to

1. explain IoT system.
2. design IoT devices.
3. develop identity and access management system.
4. implement IoT privacy.
5. devise Cloud base IoT devices.
6. outline Fog computing.

Module 1: Introduction

IoT – IoT ecosystem – Common IoT attacks and countermeasures – Threat modelling an IoT system – Secure Development Life Cycle – Nonfunctional requirements - Challenges of secure IoT development

Module 2: Secure Design of IoT Devices

Challenges of secure IoT development – Secure design goals – Defining security policies – Configuring gateway and network security – Managing Keys and Certificates – Managing accounts – Monitoring – Managing compliance and incidents

Module 3: Cryptography and IAM

Cryptography role in securing the IoT – Cryptographic key management – Cryptography controls for IoT protocols – Identity life cycle – Authentication credentials – IoT IAM infrastructure – Authorization and access control

Module 4: IoT privacy and Compliance

Privacy challenges in IoT – guide to performing an IoT PIA – Privacy engineering recommendations – IoT compliance – Complex compliance environment

Module 5: Cloud Security for IoT

Role of cloud in IoT – Cloud based security for IoT – IoT incidence response – Detection and analysis – IoT forensics

Module 6: IoT Data Analytics

Data Analytics for IoT- Machine Learning – Big Data Analytical Tools and Technology – Edge/Fog computing – Fog computing concepts – use cases of Fog/Edge computing – Edge Analytics.

Text Book:

1. Brian Russell, Drew Van Duren, “Practical Internet of Things Security: Design a security for Internet connected ecosystem”, 2nd edition, Packt Publishing, 2018, ISBN-13: 978-1788625821

Reference Books:

1. Pethuru Raj Anupama C. Raman, “The Internet of Things Enabling Technologies, Platforms, and Use Cases”, Taylor & Francis Group, 2017, ISBN: -13: 978-1-4987-6128-4.
2. Sunil Cheruvu, Anil Kumar, Ned Smith, David M. Wheeler, “Demystifying Internet of Things Security”, Apress Media LLC, 2020, ISBN-13: 978-1-4842-2895-1.
3. Miguel de Sousa, “Internet of Things with Intel Galileo”, Packt Publishing, 2015, ISBN 978-1-78217-458-5.
4. Aditya Gupta, “The IoT Hacker’s Handbook”, Apress Media LLC, 2019, ISBN-13: 978-1-4842-4299-5.
5. Neil Wilkins, “Internet of Things: What You Need to Know About IoT, Big Data, Predictive Analytics, Artificial Intelligence, Machine Learning, Cybersecurity, Business Intelligence, Augmented Reality and Our Future”, Amazon.com Services LLC, ASIN: B07PG317XS, 2019

6. Amitha Kapoor, “Hands-On Artificial Intelligence for IoT: Expert machine learning and deep learning techniques for developing smarter IoT systems”, Packt Publishing, 1st edition 2019, ASIN: B07C5YMBZT,
7. Andrew Minter, “Analytics for the Internet of Things (IoT)”, Packt Publishing, 2017, ISBN-13: 978-1787120730,
8. Qusay F. Hassan, Atta ur Rehman Khan, Sajjad A. Madani, “Internet of Things Challenges, Advances, and Applications”, Chapman and Hall/CRC, 2018, ISBN 9780367111878.
9. Navveen Balani, Rajeev Hathi, “Enterprise IoT: A Definitive Handbook” 4th edition, CreateSpace Independent Publishing Platform, 2016, ISBN-13: 978-1535505642.

20CA3016	Artificial Intelligence Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the popular and successful artificial Intelligence approaches and models to detect potential attacks.
2. To identify the unusual and suspicious patterns and attacks, thereby developing strong network security defenses using AI.
3. To discuss AI techniques which can automatically scan unknown malware, based on certain features and behavior.

Course Outcomes:

By learning the course, the students will be able to

1. outline the fundamental concepts of artificial intelligence.
2. explain the different approaches of automated learning in the field of cyber security.
3. describe the current level of interconnection between different devices.
4. state the important role in terms of the protection of sensitive user related information.
5. identify the security attacks and data breaches.
6. discuss strategic defense mechanisms for malware, addressing cybercrime, and assessing vulnerabilities to yield proactive rather than reactive countermeasures.

Module 1: Introduction to AI

Artificial Intelligence – Approaches of AI - How AI works - AI tools used: phone, personal and business use, developers, healthcare – Advantages of Artificial Intelligence – AI Limitation – Real life examples of Artificial Intelligence – Challenges.

Module 2: AI in cyber Security

Applying AI in Cyber Security – Evolution in AI – AI Threat model of learning: Supervised Learning, Unsupervised learning, Reinforcement Learning, Learning Decision Trees – AI in the context of cyber security.

Module 3: Network anomaly detection

Network anomaly detection techniques – Network attacks – Anomaly detection strategies – Challenges – Botnet detection – Algorithms used in botnet detection.

Module 4: Securing user authentication

Authentication practices – Spotting fake logins – Choosing the right features – Preventing fake account creation – classifying suspicious user activity – Advantages and disadvantages of Supervised learning – User authentication with keystroke recognition – Biometric authentication with facial recognition.

Module 5: Security Attacks and Data Breaches

Dealing with credit card fraud – machine learning for fraud detection – Fraud detection and prevention systems – predictive analytics for credit card fraud detection – Case Studies on Security Attacks and Data Breaches.

Module 6: Domain ontologies for cyber Security

Intrusion Detection ontology – Malware classification and Malware behavior ontology – Cyber security threat intelligence ontology – ontology for Digital forensics – Ontology for describing cyber attacks and their impact.

Text Book:

1. Alessandro Parisi, “Hands-On Artificial Intelligence for Cybersecurity: Implement smart AI systems for preventing cyber-attacks and detecting threats and network anomalies”, Packt Publishing; 1st edition, 2019, ISBN-13: 978-1789804027

Reference Books:

1. Leslie F. Sikos, “AI in Cybersecurity (Intelligent Systems Reference Library)”, Springer; 1st edition, 2018, ISBN-13: 978-3319988412
2. Russell, S. and Norvig, P, “Artificial Intelligence - A Modern Approach”, 3rd edition, Prentice Hall, 2015, ISBN-13: 978-9332543515
3. Poole, D. and Mackworth, A, “Artificial Intelligence: Foundations of Computational Agents”, Cambridge University Press, 2017, Second Edition, ISBN-13: 978-1107195394.
4. Elaine Rich, Kevin Knight, Shivashankar B. Nair, Artificial Intelligence, Third Edition, McGraw-Hill, 2009, ISBN -13: 973-0-07-008770-5. ISBN-10:0-07-008770-9.
5. Kwangjo Kim, Muhamad Erza Aminanto, Harry Chandra Tanuwidjaja, “Network Intrusion Detection using Deep Learning: A Feature Learning Approach (SpringerBriefs on Cyber Security Systems and Networks)”, Springer; 1st edition, 2018 edition, ASIN: B07HNTPGGN
6. Soma Halder, Sinan Ozdemir, “Hands-On Machine Learning for Cybersecurity: Safeguard your system by making your machines intelligent using the Python ecosystem”, Packt Publishing, 2018, ISBN-13: 978-1788992282

20CA3017	Economic Offences	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the concepts of economic offences, types and forms of economic offences
2. To describe the economic offences in digital space
3. To apply best practices to prevent and detect economic offences

Course Outcomes:

By learning the course, the students will be able to

1. explain the concepts of economic offences.
2. outline the types and forms of economic offences.
3. state the modus operandi of committing economic offences.
4. describe the economic offences in the digital space.
5. outline the laws relating to economic offence in India.
6. apply best practices to prevent and detect economic offences and discuss the role of an information security professional.

Module 1: Economic Offences

Introduction – Concepts and Definitions – Emergence of Economic Offences in the world - Emergence of Economic Offences in India.

Module 2: Types and Forms of Economic Offences

Corruption – Smuggling – Food Adulteration – import / Export Crimes – Tax Crimes – Customs Evasion – Trafficking – Business Frauds – House Tenancy Frauds – Insurance Frauds – Banking Frauds – Money Laundering.

Module 3: Types and Forms of Economic Offences II

Illicit trafficking of contraband goods – Excise Duty evasion – Foreign Fund Manipulation – Cultural Object Theft – Idol Theft – Land Grabbing and Real Estate Frauds – Organ Trading – Bankruptcy Frauds

– Employment Racketeering – Illegal Foreign Trade – False Travel Documents – Arms and Explosives Trafficking – IPR Violations – Stock Market Manipulations.

Module 4: Economic Offences and Digital Space

Application of Digital technologies in economics and business – use and abuse of digital space in relation to economic offence.

Module 5: Laws relating to Economic Offences in India

IPC provisions – Prevention of Corruption Act – Income Tax Act – Customs Act – Antiquity and Art Treasures Act – Anti Money Laundering Laws – IPR Laws – Banking Regulations Act – Trafficking Prevention Act – NDPS Act and other related laws.

Module 6: The role of information security professional and cyber forensic expert

The role of information security professional and cyber forensic expert in the prevention and detection of economic offences – case studies – Best practices.

Text Books:

1. Subramaniam, “Economic Offences: A Compendium of Crimes in Prose and Verse”, Oxford University Press, 2013, ISBN-13: 978-0198090328
2. B.K. Sharma & Vijay Nagpal, “Economic & Social Offence”, Allahabad Law Agency, 2017, ISBN-13: 978-8189530457

Reference Books:

1. Prof. Nuzhat Parveen Khan, “Law Relating to Socio-Economic Offences”, Central Law Publications, 2018, ASIN: B07BS15MYH
2. J.P.S. Singh, “Socio-Economic Offences”, Central Law Publications, 2017, ISBN-13: 978-9380231747

20CA3018	Ethical Hacking	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain ethical hacking methodology
2. To use techniques, skills and modern tools necessary to gather the information and to identify the vulnerabilities
3. To identify the exploits in various operating systems and Wireless environment.

Course Outcomes:

By learning the course, the students will be able to

1. determine the security threats and vulnerabilities in computer networks using ethical hacking techniques
2. identify various attacks in various domains of cyber space
3. use the tools that can be used to perform information gathering
4. explain the exploits in various operating systems and Wireless environment
5. identify the vulnerabilities associated with various network applications and database system
6. comprehend report writing procedure.

Module 1: Introduction to Ethical hacking

Information Security Overview, Essential Terminologies, Elements of Information Security, Information Security Threats and Attack Vectors, Information Security Threat Categories, Ethical Hacking Concepts and Scope, information security controls.

Module 2: Hacking Methodologies

Reconnaissance, scanning, gaining access, maintaining access, clearing tracks. Types of attacks: Denial of service, sniffers, session hijacking, Eavesdropping attack, drive by attack, password attacks.

Module 3: Ethical Hacking Web Server and Web Application

Introduction to Web Application – Web Application Attacks-Attack methodology- Attack tools-counter measures-patch management-web server security tools-SQL injection.

Module 4: Ethical hacking Wireless and Mobile Applications

Ethical hacking Wireless: Wireless concepts- wireless Encryption- Wireless Threats- hacking methodologies-hacking tools- Bluetooth hacking- countermeasures- wireless security tools. Mobile Applications: Mobile platform attack vectors- hacking android OS- hacking IOS-Hacking windows phone OS- mobile device management-mobile security guidelines and tools – Case Studies on Ethical hacking and Mobile Applications

Module 5: Evading IDS, Firewalls, and Honeypots: IDS, firewall and honeypot concepts

IDS, firewall and Honeypot solutions-evading IDS-Evading Firewalls- IDS, Firewall Evading Tools- Detecting Honeypots- IDS, Firewall Evasion counter measures

Module 6: Report writing

Introduction to Report Writing & Mitigation, requirements for low level reporting & high-level reporting of Penetration testing results, Demonstration of vulnerabilities and Mitigation of issues identified including tracking.

Text Books:

1. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, “Gray Hat Hacking: The Ethical Hackers Handbook”, 3rd Edition, McGraw Hill Education, 2017.
2. Sean-Philip Oriyano, “CEH v9: Certified Ethical Hacker Version 9 Study Guide”, Sybex, 2016.

Reference Books:

1. Anthony Reynolds, “Hacking for Beginners: Ultimate 7 Hour Hacking Course for Beginners. Learn Wireless Hacking, Basic Security, Penetration Testing”, 2017, CreateSpace Independent Publishing Platform.
2. Swaroop Yermalkar, “An Ethical Guide To WI-FI Hacking and Security”, First edition, 2014
3. Michael T. Simpson, Kent Backman, James Corley, “Hands-On Ethical Hacking and Network Defense”, 1st edition, 2016, Cengage India.
4. Michael T. Simpson, Kent Backman, James Corley, “Hands - On Ethical Hacking and Network Defense”, Delmar Cengage Learning, 2012, ISBN-13: 978-113393561
5. Stuart McClure, Joel Scambray and Goerge Kurtz, “Hacking Exposed Network Security Secrets & Solutions”, Tata Mcgrawhill Publishers, 2010.
6. Bensmith, Brian Komer, “Microsoft Windows Security Resource Kit”, Prentice Hall of India, 2010.
7. Allen Harper, Shon Harris, “Gray Hat Hacking: The Ethical Hackers Handbook”, Third Edition, McGraw Hill Education, 2011, IBSN-13: 978-0071742559.

20CA3019	Ethical Hacking Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To explain ethical hacking methodology.
2. To use techniques, skills and modern tools necessary to gather the information and to identify the vulnerabilities.
3. To identify the exploits in various operating systems and Wireless environment.

Course Outcomes:

By learning the course, the students will be able to

1. determine the security threats and vulnerabilities in computer networks using ethical hacking techniques.
2. identify various attacks in various domains of cyber space.
3. use the tools that can be used to perform information gathering.
4. explain the exploits in various operating systems and wireless environment.
5. identify the vulnerabilities associated with various network applications and database system.
6. comprehend report writing procedure.

Lab Experiments:

1. Active Information Gathering

2. Passive Information Gathering
3. Enumerating the network resources using Advanced Ip Scanner
4. Perform Network Enumeration Using Super Scan
5. Packet crafting using Hping3
6. Port scanning using Nmap
7. Packet analysis using Wireshark
8. installation and configuration of kali linux and victim machines
9. Exploiting windows machine using Metasploit
10. Exploiting windows machine and establishing the VNC session
11. Hacking a website using SQLmap
12. Social engineering attack using SET toolkit

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA3020	Python for Cyber Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the essentials of Python libraries.
2. To apply penetration testing and hacking skills to students.
3. To empower students with skills to prototype their own tool or modify existing capabilities to make them perform as they need.

Course Outcomes:

By learning the course, the students will be able to

1. use Python in data analysis using NumPy, IPython and Pandas.
2. gain knowledge on Python's role in data preparation, data visualization and statistical computations.
3. explain the Web Application Security, which includes Cross-Site Scripting Attacks, Cross-Site Request Forgery, SQL Injection Attacks.
4. describe crypto primitives and their applications.
5. outline the process behind web pentesting.
6. discuss the role ethical hacking plays in providing secure and robust networks.

Module 1: Python Libraries

IPython, NumPy Basics, Pandas.

Module 2: Data Analysis

Data Loading, Storage, and File Formats, Combining and Merging Data sets, Reshaping and Pivoting, Data Transformation, String Manipulation, Plotting and Visualization, Data Aggregation and Group Operations.

Module 3: Penetration Testing

Scope pentesting, Approaches to pentesting, Common testing platforms with Python, Network sockets, Server sockets methods, Client socket methods, General socket methods, Scanning Pentesting, Sniffing and Penetration testing, Wireless Pentesting, Client-side and DDoS attacks, Pentesting of SQLI and XSS.

Module 4: Cryptography

Cryptography introduction, Caesar cipher and ROT13, base64 encoding, XOR, MD5 and SHA hashes, Windows password hashes, Linux password hashes, Cracking windows hashes, cracking Linux hashes, Strong encryption with AES, ECB and CBC modes, Strong encryption with RSA, Cracking RSA.

Module 5: Web Penetration Testing

Introduction, Interacting with Web Application, Web Crawling, Resources discovery, Password testing, Detecting and exploiting SQL injection vulnerabilities, Intercepting HTTP requests.

Module 6: Hacking

Basics of Hacking, Cracking of Password, Spoofing Attacks, Hacking into a Network Connection, Hiding and Finding your IP Address, Mobile Hacking, Hacking Tools.

Text Books:

1. Christian Martorella, "Learning Python Web Penetration Testing: Automate web penetration testing activities using Python", Packt Publishing, 2018, ISBN-13: 978-1789533972.
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, Inc., 2012, ISBN: 9781449323615.

Reference Books:

1. Mohit Raj, "Python Penetration Testing Essentials: Techniques for ethical hacking with Python", Packt Publishing; 2nd edition, 2018, ASIN: B07DGLPGZN.
2. Samuel Bowne, "Hands-On Cryptography with Python: Leverage the power of Python to encrypt and decrypt data", Packt Publishing, 1st edition, 2018, ASIN: B07F73GW7Y.
3. Evan Lane, "Hacking with Python: Beginner's Guide to Ethical Hacking, Basic Security, Penetration Testing, and Python Hacking", 2017, ASIN: B06XK3Z9N4.
4. Sheetal Taneja, Naveen Kumar, "Python Programming: A Modular Approach, With Database, Mobile, and Web Applications, Pearson India", 1st edition, 2017, ISBN-13: 978-9352861293.
5. R. Nageswara Rao, "Core Python Programming", Dreamtech Press, 2018, ASIN: B07BFSR3LL.
6. Jose Manuel Ortega, "Mastering Python for Networking and Security: Leverage Python scripts and libraries to overcome networking and security issues", 2018, Packt Publishing, ISBN-13: 978-1788992510.
7. Miles Price, "Hacking with Python: The Complete Beginner's Guide to Learning Ethical Hacking with Python along with Practical Examples", Createspace Independent Pub, 2017, ISBN-13: 978-1547130504.
8. Justin Seitz, "Black Hat Python: Python Programming for Hackers and Pentesters", No Starch Press, 1st edition, 2014, ASIN: B00QL616DW.

20CA3021	Python for Cyber Security Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To explain the essentials of Python libraries.
2. To apply penetration testing and hacking skills to students.
3. To empower students with skills to prototype their own tool or modify existing capabilities to make them perform as they need.

Course Outcomes:

By learning the course, the students will be able to

1. use Python in data analysis using NumPy, IPython and Pandas.
2. gain knowledge on Python's role in data preparation, data visualization and statistical computations.
3. explain the Web Application Security, which includes Cross-Site Scripting Attacks, Cross-Site Request Forgery, SQL Injection Attacks.
4. describe crypto primitives and their applications.
5. outline the process behind web pentesting.
6. discuss the role ethical hacking plays in providing secure and robust networks.

Lab Experiments:

1. Hashing
2. Cracking Password and Hashes
3. Building Brute-Force Tool
4. Implementing Cryptography Algorithms
5. Hacking wi-fi password
6. HTTP Hacking
7. Face recognition
8. Network Scanner

9. Network Monitoring
10. Packet sniffing
11. Penetrating Testing
12. Control Device

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

20CA3022	Security in the Cloud	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the broad perceptive of cloud architecture and model.
2. To outline the concept of Virtualization
3. To identify the lead players in cloud.

Course Outcomes:

By learning the course, the students will be able to

1. compare deployment models versus service models of cloud computing.
2. apply suitable virtualization concept.
3. design and Compute the Storage Clouds.
4. use Programming model.
5. debate the security risks associated with the cloud.
6. discuss the governance and the legal issues in the cloud.

Module 1: Cloud Architecture and model

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture - Cloud Models: Characteristics – Cloud Services – Cloud delivery models (IaaS, PaaS, SaaS) – Types of Cloud: Private Public and hybrid clouds, Public vs Private Cloud – Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

Module 2: Virtualization

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

Module 3: Cloud Infrastructure

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

Module 4: Programming model

Parallel and Distributed Programming Paradigms – MapReduce, Twister and Iterative Map Reduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim.

Module 5: Risk Management and Cloud Security

Risk: Risk Assessment, Company concerns, Risk Mitigation methodology for Cloud computing – Cloud Security vulnerabilities and mitigating controls - Cloud Trust Protocol. Cloud Controls Matrix - Complete Certificate of Cloud Security Knowledge (CCSK) – Autonomic Security – Case studies on Data Privacy and Security Issues.

Module 6: Governance and Legal Issues in the Cloud

Governance in Cloud: Industry Standards Organizations and Groups associated with Cloud Computing, Need for IT governance in cloud computing, Cloud Governance Solution: Access Controls, Financial Controls, Key Management and Encryption, Logging and Auditing, API integration. Legal Issues: Data Privacy and Security Issues, Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations.

Text Book:

1. Ronald L Krutz and Russel Dean Vines, “Cloud Security: A Comprehensive Guide to Secure Cloud Computing”, 1st edition, Wiley, ISBN-13: 978-8126528097.

Reference Books:

1. John W Rittinghouse and James F Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, ISBN-13: 978-1439806807.
2. Ben Halpert, “Auditing Cloud Computing – A Security and Privacy Guide”, John Wiley and Sons, ISBN-13: 978-0470874745.
3. Rajkumar Buyya, James Broberg and Andrzej Goscinski, “Cloud Computing: Principles and Paradigms”, John Wiley, ISBN-13: 978-8126541256.
4. Danielle Ruest and Nelson Ruest, “Virtualization: A Beginners Guide”, Tata McGraw Hill, New Delhi, ISBN-13: 978-0071614016.
5. Tim Mather, Subra Kumaraswamy and Shahed Latif, “Cloud Security and Privacy”, O’Reilly Publishers, ISBN-13: 978-8184048155.
6. Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing, A Practical Approach”, 2017, McGraw-Hill Osborne Media, ISBN-13: 978-0070683518.
7. Bill Nelson Amelia Phillips Christopher Steuart, “Guide to Computer Forensics and Investigations: Processing Digital Evidence”, Fifth Edition, Cengage Learning, ISBN: 978-1-285-06003-3.

20CA3023	Security in the Cloud Lab	L	T	P	C
		0	0	2	2

Course Objectives:

1. To explain the broad perceptive of cloud architecture and model
2. To outline the concept of Virtualization
3. To identify the lead players in cloud.

Course Outcomes:

By learning the course, the students will be able to

1. compare deployment models versus service models of cloud computing.
2. apply suitable virtualization concept.
3. design and Compute the Storage Clouds
4. use Programming model
5. debate the security risks associated with the cloud
6. discuss the governance and the legal issues in the cloud

Lab Experiments:

1. Monitoring and Managing Virtual Machines in VMware Environment
2. Creating and Managing hosts and Clusters in VMWare Environment
3. Creating and Managing Snapshots, templates, and Clones of a VM
4. Configuring and Managing DRS clusters – manual mode
5. Configuring and Managing DRS clusters – partially automated mode
7. Configuring and Managing DRS clusters – fully automated mode
8. Creating and Managing resource pools
9. Deploy and securely manage a web server in cloud using AWS
10. Configuration and management of object access in AWS S3
11. Object Versioning in AWS S3
12. AWS identity and Access management
13. AWS dynamoDB – Cloud DB

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester

20CA3024	Social Media Crimes	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain Social Media, Social Networks and Crime.
2. To discuss the types of Media, Social Media and the services offered by various social networking sites.
3. To debate various types of social media crimes and the response of the criminal Justice System.

Course Outcomes:

By learning the course, the students will be able to

1. explain about media, social media and social networks.
2. describe different types of social media and their vulnerabilities.
3. analyze the various services of social media, usage and their promotions.
4. discuss Social Media and Crimes against women and Children.
5. tell the other forms of social media such as online frauds, financial frauds, Digital cloning frauds, identity theft data privacy and legal measures to prevent social media crimes.
6. outline the response of the Criminal Justice System towards the social networking sites.

Module 1: Introduction to Social Media

Definitions – Social Media, Social Network, Social Networking Sites, Digital Identify , Instant Messaging, Types of Media, History of Social Media – Genesis of Internet, WWW, Emergence of Social Networking Sites, Web 2.0 – Current Social Media and Social Networking Usage in various countries – Trends in Social Media – Effects on the Society - Social Activism – Social Medias dark side – Civic engagement in social world – Internet Vigilantism and Related Concepts – Digital Privacy and Privacy Issues.

Module 2: Types of Social media

Various types of social media, types of social networking sites, - Profile based SNS – Content Based SNS – White label SNS – Multi user virtual environment – Mobile based SNS – Community based SNS – Instant Messaging Applications – Mobile based applications, their types and their vulnerabilities - Micro Blogging – People Search – Other forms of SNS – List of Social Networking Sites, Applications and their history

Module 3: Social Media Services

Types of services of social media – Usage of social media – Friending, Trending, Chatting, Wall Posts, Tweets, Selfies, Forwards, Community networking, Gaming, Memes, Talent displays, Use of social networking sites for small businesses – Use of social networking sites for large scale businesses – Use of Social Media in Politics – Social media as other advertisement platforms – Different types of Promotions and Social Media

Module 4: Social Media and Crimes against women and Children

Types of Social Media Crimes against women and Children, causes, consequences and countermeasures – Pornography – Child Pornography – Non Consensual Pornography – Revenge Porn - Indecent Representation of Women – Insult to Modesty of Women - Online Violence – Cyber/virtual Rape - Online Harassment – Cyber Bullying – Cyber Stalking – Chat room based crimes – Emotional Targets – Toxic contents – Causing Disrespect - Online Predators – Abuse of Children online – Patterns of women and child sexual victimization – Trends and Analysis

Module 5: Other forms of social media crimes

Online Frauds – Frauds targeting children, women, youngsters, senior citizens – Business related frauds – Hacking – Cyber Defamation – Cyber Terrorism – Financial Frauds – Fake News – Fake Memes – Online challenges, selfie, facebook, whats app victimization – Digital Cloning Frauds – Morphing – Identity Theft – Data Theft – Human Flesh Search Engine – Intellectual Property Related Crimes in Social Media.

Module 6: The Criminal Justice System and Social Networking

Response of the Police – Helplines and Other online applications, other initiatives - Related laws and case laws – Community Policing in Social Media – Moral Policing – Online Policing – Filtering – Use of Social Media in Cyber Crime Investigation and General Crime Investigation.

Text Books:

1. Joshua Brunty, Katherine Helenek, "Social Media Investigation for Law Enforcement", 1st Edition, 2012, Anderson Publisher, ISBN: 9781455731626.
2. Catherine D. Marcum, George E. Higgins, "Social Networking as a Criminal Enterprise", Routledge, 1st edition, 2016, ISBN-13: 978-1138141902.
3. Thaddeus A. Hoffmeister, "Social Media in the Courtroom: A New Era for Criminal Justice", Praeger, 2014, ASIN: B00NVJUWJG

Reference Books:

1. Venessa Garcia, Samantha G. Arkerson "Crime, Media, and Reality: Examining Mixed Messages About Crime and Justice in Popular Media", Rowman & Littlefield Publishers, 2017
2. Michael Salter, "Crime, Justice and Social Media (New Directions in Critical Criminology)", Routledge, 2016
3. Rebecca M. Hayes, Kate Luther, Crime: Social Media, Crime, and the Criminal Legal System (Palgrave Studies in Crime, Media and Culture)", Palgrave Macmillan, 1st edition, 2018, ASIN: B07GTH57P3
4. Daniel Trottier, "Christian Fuchs Social Media, Politics and the State: Protests, Revolutions, Riots, Crime and Policing in the Age of Facebook, Twitter and YouTube (Routledge Research in Information Technology and Society)", Routledge; 1st edition, 2015, ISBN-13: 978-1138798243
5. Mohammad A. Tayebi, Uwe Glässer, David B. Skillicorn, "Open Source Intelligence and Cyber Crime: Social Media Analytics (Lecture Notes in Social Networks)", Springer, 1st edition, 2020, ISBN-13: 978-3030412500

20CA3025	Digital Security	L	T	P	C
		3	0	0	3

Course Objectives:

1. To explain the requirements for ensuring privacy and security in the e-platform
2. To identify and assess different types of security breaches and possible solutions for e-based system
3. To describe remedies for various existing security breaches in e-based systems

Course Outcomes:

By learning the course, the students will be able to

1. recommend suitable controls and procedures for ensuring privacy and security
2. explain current e-commerce security threats faced by the organization and how to combat the threats
3. apply best practices and solutions required to manage the security of the healthcare data
4. demonstrate the ability to select and design security solutions to the E-Learning module
5. generate knowledge about various operations associated with the life cycle of Blockchain and Cryptocurrency
6. outline key issues with the development of smart cities

Module 1: Digital Privacy

Privacy in Cyberspace - Concepts -Privacy Principles and Policies -Authentication and Privacy - Data Mining -Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies.

Module 2: Ecommerce Security

Evolution of Commerce -Payment Modes and Methods - Distributed Computing Environment - Cloud Security- Mobile Commerce M Vs. E- Commerce- Web Commerce Security Requirements -Risk Driven Security- Scalable Security - Architectural Framework - Cryptographic Access Control- System Hardening Authentication - Authorization - Non-Repudiation - Privacy Layered Security Architecture.

Module 3: Healthcare Security

Introduction - Electronic Storage of Medical Records- Security Threats - Health Information Exchange - impact of IT on Healthcare Costs - Remote Home Healthcare Services - Significance and Challenges -

Approaches - Securing E-Healthcare - Information Breaches of Privacy and Confidentiality in E-Healthcare - Legal Protection Challenge.

Module 4: E-Learning Security

Introduction Security Attacks in E-Learning Security - E-Learning Scenarios - Mobile Learning - Massive Open Online Courses (MOOC) - Bring your own device and remote access – Security in learning system – Security threats in Elearning – Cyber security issues in elearning systems – Privacy concerns – Implementing security management model – Elearning security case study.

Module 5: Digital Currencies Security

Introduction to cryptocurrency - Rules and structure of Bitcoin – Crypto currency as an asset – Bitcoin protocols - Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin - Block Chain ecosystem - Blockchain Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain – Altcoins – Security.

Module 6: Smart Cities Security

Need for Smart Cities, City-Specific Challenges, Potentials of Smart Cities, City Transformation Strategy, Key Trends in IT toward Smart Cities, Smart City Infrastructure and Platform Solutions in the national and international level, Framework for Smart City Applications – Smart cities – Threats and Countermeasures.

Text Books:

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, 2016, ISBN-13: 978-0691171692.
2. M. S. Obaidat and N. A. Boudriga, “Security of E-Systems and Computer Networks”. Cambridge: Cambridge University Press, 2007, ISBN No.: 978-3-66-244787-1.

Reference Books:

1. H. Nahari and R. L. Krutz, “Web Commerce Security: Design and Development”. Indianapolis: Wiley, John Sons, 2011, ISBN No: 978-0-470-62446-3
2. C. A. Shoniregun, K. Dube, and F. Mtenzi, “Electronic Healthcare Information Security”, New York: Seacaucs, New Jersey, U.S.A.: Springer-Verlag New York, 2010. ISBN No: 978-0-387-84817-4
3. M. Jorge, S. Caballe, and F. Xhafa, “Intelligent Data Analysis for e-Learning: Enhancing Security and Trustworthiness in Online Learning Systems”. United States: Morgan Kaufmann Publishers In, 2016, ISBN No: 978-0-12-804535-0
4. K. Stanoevska-Slabeva, “Towards the e-Society: e-Commerce, e-Business, and e-Government”. Kluwer Academic Publishers, 2001, ISBN: 978-0-306-47009-7
5. Pethuru Raj Anupama C. Raman, “Intelligent Cities - Enabling Tools and Technology”, CRC Press Taylor & Francis Group, 2015, ISBN: 978-1-4822-9998-4
6. Dustdar, Schahram, Nastić, Stefan, Šćekić, Ognjen, “Smart Cities - The Internet of Things, People and Systems”, Springer, 2017, ISBN 978-3-319-60030-7

REVISED COURSE OBJECTIVES / COURSE OUTCOMES FOR APPROVED COURSES

17CA2045 OPERATING SYSTEM AND ITS SECURITY

Credits: 3:0:0

Course Objectives:

1. To provide students adequate knowledge about working principles of operating system.
2. To explain students the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts them.
3. To teach students the security policies of operating systems.

Course Outcomes:

Students will be able to

1. infer the role played by the various components of operating system.
2. describe, contrast and compare differing structures for operating systems.
3. summarize how operating system manages and schedules I/O devices.
4. summarize the process management policies and scheduling of processes by CPU
5. identify use and evaluate the storage management policies with respect to different storage management.
6. devise security mechanism to protect operating system from external threats.

17CA2047 FORMS OF CYBER CRIMES AND FRAUDS

Credits: 3:0:0

Course Objectives:

1. To educate students the various forms of cybercrimes and frauds.
2. To teach students the technological and social engineering methods used to undertake cybercrimes.
3. To empower students with the skills to critically evaluate the impact of cybercrime on information professions.

Course Outcomes:

Students will be able to

1. summarize the different forms of cybercrimes and their operation pattern.
2. practice secure digital transactions.
3. take preventive measures against external and internal cyber-attacks.
4. gain knowledge about financial theft and its impact.
5. implement preventive measures to protect their devices from cyber-thieves and hackers.
6. summarize fraud detection techniques

17CA2048 COMPUTER FORENSICS

Credits: 3:0:0

Course Objectives:

1. To explain computer forensics and examine how it's being used
2. To Perform digital forensics analysis upon various operating system
3. To gain insight into evidence creation and interpretation

Course Outcomes:

Students will be able to

1. provides an overview of computer forensics types and techniques and their electronic evidence and capture
2. learn what happens and what files are altered during computer startup and how file systems deal with deleted and slack space
3. explain how to effectively find, capture, and prepare evidence for investigation
4. illustrates how to apply recovery techniques to investigations from the evidence collected across many platforms and scenarios found in corporate settings
5. summarizes requirements for workstations and software
6. discuss how to interact with council, testify in court, and report on findings

17CA2049 FUNDAMENTALS OF INFORMATION SECURITY

Credits: 3:0:0

Course Objectives:

1. To summarize the elements of confidentiality, integrity, and availability (CIA Triad) and the mechanisms that support them
2. To examine how to assess and manage security risks
3. To acquire knowledge on the various security Domains

Course Outcomes:

Students will be able to

1. State and apply the concepts of confidentiality, integrity and availability
2. Develop and implement documented security policy, security mechanisms and security assurance
3. Determining and diagramming potential attacks
4. Classifying information based on its value to the organization and ensure appropriate retention.
5. Summarize and apply risk management concepts
6. Discuss the various security domains that can be supported in all type of organizations worldwide

17CA2050 SECURITY OF WEB APPLICATIONS

Credits: 3:0:0

Course Objectives:

1. To teach students the concepts and techniques of web applications.
2. To teach students the authentication and authorization aspects of web applications in depth.
3. To sow in students the skills required to design a web application, which is robust to known and unknown, attacks.

Course Outcomes:

Students will be able to

1. get an overview of web application architecture.
2. use vulnerability scanners.
3. apply practical methods, measures and resources in providing protection to web applications from hackers.
4. summarize the underlying security principles of the web.
5. demonstrate in-depth summarizing of authentication, access control, and session management
6. detect and prevent input validation flaws, cross-site scripting (XSS), buffer overflow attacks and SQL injection.

17CA2051 MALWARE ANALYSIS AND SECURITY

Credits: 3:0:0

Course Objectives:

1. To summarize the overall process and methodology of analyzing malware
2. To gain insight into the malware analysis
3. To provide awareness to secure the eco system

Course Outcomes:

Students will be able to

1. describe malware and differentiate malware and a virus as far as the modes of operation are considered
2. identify, define the different types of computer viruses and summarize the working principle of virus and its design
3. explain Computer viruses and the computer infection programs
4. design Shell bash virus under Linux
5. analyze the different types of virus and worms.
6. discuss the risks associated and provide awareness

17CA2053 FUNDAMENTALS OF GENERAL FORENSIC SCIENCE

Credits: 3:0:0

Course Objectives:

1. To summarize the history of forensic science and the roles of different types of professionals involved in evaluating a crime scene and the collected evidence
2. To summarize the methodology of collecting & interpreting data, avoiding contamination, and preservation of chain of custody

3. To present evidence in a professional (courtroom) setting

Course Outcomes:

Students will be able to

1. explain the history of the forensic sciences
2. outline the roles of different types of professionals involved in evaluating a crime scene and collecting the evidence
3. state the aspects of the justice system followed.
4. learn the methodology of collecting & interpreting data, avoiding contamination, and preservation of chain of custody
5. define the importance pertaining to forensic examination
6. justify and present the evidence in a professional (courtroom) setting

17CA2054 DATABASE SECURITY FUNDAMENTALS

Credits: 3:0:0

Course Objectives:

1. To introduce to students the basic concepts and major techniques in database management system.
2. To explain the students the need for various database connectivity technologies.
3. To cultivate database auditing skills, in students.

Course Outcomes:

Students will be able to

1. summarize DBMS Architecture and Data Models.
2. gain knowledge about the Database Interface Languages.
3. identify and use right database connection.
4. summarize data warehouse and data mining concepts.
5. demonstrate an summarizeing of the various database application security models and database auditing models.
6. conduct database auditing.

17CA2055 OSI LAYERS AND SECURITY PROTOCOLS

Credits: 3:0:0

Course Objectives:

1. To acquire a foundational summarizeing of computer communications technologies
2. To be familiar with the OSI Reference Model and in particular have a good knowledge of Layers 1-4 and the various protocols.
3. To describe the working principles of various security protocols

Course Outcomes:

Students will be able to

1. enumerate the layers of the OSI model and explain the functions of each layer
2. identify the different types of network topologies and protocols and explain their hierarchical relationship in the context of a conceptual model, such as the OSI framework
3. demonstrate the working of various protocols in internetworks
4. discuss the relationship between the transport and network layers
5. learn the overview of the network layer and the services it can provide
6. explore important data link-layer concepts and technologies

17CA2056 SECURITY ASSESSMENT OF INFORMATION SYSTEMS THROUGH ETHICAL HACKING

Credits: 3:0:0

Course Objectives:

1. To acquire knowledge on ethical hacking methodology

2. Use techniques, skills and modern tools necessary to gather the information and to identify the vulnerabilities
3. To Identify the exploits in various operating systems and Wireless environment

Course Outcomes:

Students will be able to

1. Determine the security threats and vulnerabilities in computer networks using ethical hacking techniques
2. Identify and analyze various attacks in various domains of cyber space
3. Explore the tools that can be used to perform information gathering
4. Use techniques, skills and modern tools necessary to gather the information and to identify the vulnerabilities
5. Learn about exploits in various operating systems and Wireless environment
6. Identify the vulnerabilities associated with various network applications and database system

17CA2058 CYBER CRIME AND CYBER LAW

Credits: 3:0:0

Course Objectives:

1. To acquire knowledge on the legal and other supplementary provisions relating to cyber crimes and technology related crimes.
2. To gain insight into the important aspects like fundamentals of Cyber Law, crime Investigation and the legal issues
3. To summarize the laws relating to cyber laws with an overall perspective.

Course Outcomes:

Students will be able to

1. Learn techno-legal regulations and the basics of computer and Internet
2. Outline the overall regulatory framework of cyberspace in India
3. Analyze the legal constraints in the enforceability of IT Act and related legislations
4. Explain various forms of cyber crimes and evaluate various laws related to cyber crimes
5. Use the cyber forensic investigation methodology and also relate to other contemporary issues.
6. Describe the legal frame work of right to Privacy, Data Security and Data Protection.

17CA2059 BIOMETRIC SECURITY

Credits: 3:0:0

Course Objectives:

1. To acquire knowledge in the field of biometrics
2. To explore the various modules constituting a bio-metric system
3. To learn the challenges and limitations associated with bio-metrics

Course Outcomes:

Students will be able to

1. Summarize the basic principles of bio-metric systems.
2. Recognize the various modules constituting a bio-metric system.
3. Summarize different types of bio-metric traits
4. Analyze basic biometric system applications.
5. Identify the sociological and acceptance issues associated with the design and implementation of biometric system
6. Infer the challenges and limitations associated with bio-metrics.

17CA2061 VIGILANCE AND SECURITY MANAGEMENT

Credits: 3:0:0

Course Objectives:

1. To develop the knowledge and skills required to effectively lead and facilitate investigations.
2. To train and develop the security professionals to handle the issues related to vigilance and investigation.
3. To provide basic conceptual summarizing of disaster management theory, policy and practice.

Course Outcomes:

Students will be able to

1. Summarize the fundamentals of investigation and its types.
2. Plan an investigation strategy.
3. Acquire solid grounding in all key aspects of vigilance
4. Summarize the common physical security measures, threats, risk reduction and good practices.
5. State security and safety practices
6. Use various methods and techniques for appropriate and timely preparation and mitigation of disasters

17CA2062 INFORMATION SECURITY MANAGEMENT SYSTEM STANDARDS

Credits: 3:0:0

Course Objectives:

1. To create the information security management structure based on the CIA triad
2. To develop and implement documented security policy, standards, procedures, guidelines and legal framework
3. To gain insight into the foundational security operations

Course Outcomes:

Students will be able to

1. Apply concepts of confidentiality, integrity and availability and create the information security management structure
2. Determine and manage acceptable risk and select the appropriate, risk-based controls that align to the laws and frameworks
3. Develop and implement documented security policy, standards, procedures, guidelines and legal framework
4. Apply foundational security operations and participate in addressing personnel safety concerns
5. Design and establish secure communication channels and mitigate network attacks
6. Assess the effectiveness of software security and enforce security controls

17CA2063 MOBILE COMPUTING

Credits: 3:0:0

Course Objectives:

1. To summarize the mobile security working methods and their technical features
2. To be familiar with mobile application security techniques.
3. To gain insight into the security issues in real time mobile communication

Course Outcomes:

Students will be able to

1. Summarize the fundamentals of mobile devices
2. Describe the mobile devices working methods and their technical features
3. Learn the multiple access techniques like frequency division multiple access, time division multiple access, code division multiple access, space division multiple access
4. Explore the Global System for Mobile Communications
5. Familiar with mobile application security models

6. Discuss the security issues in real time mobile communication

17CA2065 ADVANCED COMPUTER FORENSICS

Credits: 3:0:0

Course Objectives:

1. To present the students with a comprehensive summarizing of Computer forensic principles
2. To enlighten the importance of forensic principles and procedures, evidence controls, and the documentation of forensic analysis
3. To develop an summarizing of the different applications and methods for conducting forensic acquisition and analysis

Course Outcomes:

Students will be able to

1. Discuss computer forensics fundamentals, types of computer forensics technology
2. Summarize the different types of computer forensics system and discuss data recovery
3. Explain the operating systems, examines e-mail crimes
4. Choose and apply current computer forensics tools
5. Determine what data to collect and analyze and refining investigation plan
6. Infer forensic evidences and investigate the contents

17CA2067 CYBER SECURITY GOVERNANCE

Credits: 3:0:0

Course Objectives:

1. To know about the basics of cyber security policy
2. To provide effective cyber security governance to protect the information assets
3. To gain insight into various control frameworks and standards

Course Outcomes:

Students will be able to

1. Summarize the basics of cyber security governance
2. Develop an Information Security strategy
3. Learn the need for resilience management
4. Summarize the existing and emerging security strategy
5. Select a governing control or standards framework
6. Discuss the various cyber management issues

17CA2068 CLOUD SECURITY

Credits: 3:0:0

Course Objectives:

1. To introduce the basic concepts of Cloud Computing
2. To acquire knowledge on new technologies in Cloud Computing
3. To gain insight into the cloud computing risk issues and challenges

Course Outcomes:

Students will be able to

1. Articulate the differences between deployment models versus service models of cloud computing.
2. Illustrate the architecture and categorize the services using Cloud computing
3. Identify the known threats, risks, vulnerabilities and privacy issues associated with Cloud based IT services.
4. Summarize the concepts and guiding principles for designing and implementing appropriate safeguards and countermeasures for Cloud based IT services

5. Learn the industry security standards, regulatory mandates, audit policies and compliance requirements for Cloud based infrastructures.
6. Discuss the cloud computing life cycle issues

17CA2069 SECURITY THREAT MANAGEMENT

Credits: 3:0:0

Course Objectives:

1. To introduce students to information security, network security and security management.
2. To give the students the exposure to common vulnerabilities and teach them how to assess, ethically scan and test these.
3. To provide intricate knowledge and skills needed to implement and operate a security assessment and authorization process for an organization.

Course Outcomes:

Students will be able to

1. Summarize the implications of common vulnerabilities, and recommend ways to rectify or mitigate them.
2. Summarize the common vulnerabilities in systems, networks and applications.
3. Summarize the risk assessment
4. Get an overview of Security Risk Assessment (SRA) and Security Risk Management (SRM) approaches to security management
5. operate in complex and unpredictable contexts to select identification and authentication technologies appropriate for an organization
6. reformulate and use practical, conceptual and technological summarizing to create security roles, procedures and management structures appropriate for an organization

18CA2014 FORENSIC DIGITAL IMAGE PROCESSING

Credits: 3:0:0

Course Objectives:

1. To summarize and analyze image processing and the basics of colour image Processing
2. To acquire knowledge on the various techniques employed for the enhancement of images
3. To gain insight into the image compression and the image compression techniques

Course Outcomes:

Students will be able to

1. Describe the need for image transforms and explain the different types of image transforms and their properties.
2. Summarize and analyze image processing problems
3. Learn different techniques employed for the enhancement of images.
4. Explain 1-D convolution, the 2-D DFT, and have the ability to design systems using these concepts
5. Discuss the different causes for image degradation and overview of image restoration techniques.
6. Outline the need for image compression and the image compression techniques.

18CA2015 INCIDENT MANAGEMENT

Credits: 3:0:0

Course Objectives:

1. To identify common issues that have caused them problems in managing critical incidents, especially in the crisis phase.
2. To establish a control-oriented response to the crisis phase.
3. To gain insight into the purpose and function of the Emergency Operation Center (EOC).

Course Outcomes:

Students will be able to

1. Recall the most common characteristics of critical incident response
2. List and explain the stages in the emergency management life cycle.
3. Describe each of the Seven Critical Tasks
4. Apply the Incident Command System to both planned events and unplanned critical incidents.
5. Recognize acute and delayed stress symptoms in responders and identify stress-mitigating techniques for use before, during, and after an incident.
6. Give a brief description of the role of each of the functional titles and describe how the EOC communicates with other levels of the organization during a crisis

18CA2016 PRESERVING & RECOVERING DIGITAL EVIDENCE

Credits: 3:0:0

Course Objectives:

1. To teach student how to conduct successful digital forensic examinations in Windows, Linux
2. To explain students the method of capturing, recording and analysis of network events in order to discover evidential information about the source of security attacks.
3. To educate students how to conduct investigations to correctly gather, analyze and present digital evidence to both business and legal audiences.

Course Outcomes:

Students will be able to

1. Acquire skills, practitioners need to conduct a forensic investigation in operating systems
2. Summarize forensic approach done by the computer forensic experts in the perspective of recovery.
3. perform network forensic examinations.
4. master the key technologies about digital investigation Investigate
5. monitoring and analysis of computer network traffic for the purposes of information gathering, legal evidence, or intrusion detection.
6. Handle the digital crime scene

18CA2017 NETWORK SECURITY APPLICATIONS

Credits: 3:0:0

Course Objectives:

1. To gain insight into specific technical areas of computer security such as authentication, access control intrusion detection, and firewalls
2. To explain the basic operation of cryptography and encryption techniques
3. To Present an overview on the user authentication.

Course Outcomes:

Students will be able to

1. Give examples of the types of threats and attacks that apply to different categories of computer and network assets.
2. Discuss the basic operation of cryptography and encryption techniques
3. Provide an overview of the key components Secure Sockets, Security standards
4. Summarize the functionality of S/MIME and the security threats it addresses.
5. Explain the role of firewalls, Intrusion detection, Virtual Private Networks as part of a computer and network security strategy
6. Summarize some of the key security issues for user authentication.

18CA2019 EMAIL FORENSICS

Credits: 3:0:0

Course Objectives:

1. To explore how E-mail forensic analysis use e-mail message as evidence to bring criminals to justice.
2. To explain the working email server.
3. To give an overview of how content filtering deals email threats.

Course Outcomes:

Students will be able to

1. Summarize the impact of various faces of content abuses.
2. gain knowledge about various scams used by cybercriminals to deceive victims through the internet.
3. Brief overview of content-based e-mail spam filtering techniques.
4. Give the reasons for the necessity to run own mail server.
5. Get in-depth knowledge about content filtering.
6. Learn about Bayesian classification technique in spam filtering.

18CA2020 DOCUMENT EXAMINATION AND FINGER PRINT ANALYSIS

Credits: 3:0:0

Course Objectives:

1. To summarize the basic principles and methodologies used in forensic document examination
2. To acquire the state-of-the-art techniques and new trends
3. To gain insight into Forensic Document Standards

Course Outcomes:

Students will be able to

1. Determine whether a document is genuine, an examiner may attempt to confirm who created the document, determine the timeframe in which it was created
2. Identify the materials used in its preparation or uncover modifications to the original text
3. Establish the individuality of handwriting and the methodology to articulate Forensic document examination
4. Learn Instruments used for Forensic Document Examination
5. Cite some case studies
6. Provide training and awareness to the document examiner to document and present the evidence in the courtroom

18CA2022 INFORMATION ETHICS

Credits: 3:0:0

Course Objectives:

1. To introduce ethics in Information and Computer Sciences.
2. To major ethical theories and frameworks in the field of information ethics.
3. To facilitate a solid summarizing of legal policies on privacy and data protection.

Course Outcomes:

Students will be able to

1. Summarize the ethics and ethical issues within the context of Information and Computer Sciences.
2. Identify key problems in information ethics and propose solutions to these problems.
3. Learn the information ethics and Ten Commandments of computer ethics.
4. Apply know data privacy laws and regulations and how to apply them.
5. identify security mechanisms to manage access controls in Big Data system.
6. summarizing privacy laws and data protection will be able to safeguard their personal information of an organization.

18CA2023 SECURITY INVESTIGATION AND REPORT WRITING**Credits: 3:0:0****Course Objectives:**

1. To prepare well written investigation report
2. To Choose the appropriate mechanisms for writing the report
3. To Identify purposes of report writing

Course Outcomes:

Students will be able to

1. Outline the concepts, rules, and processes with the goal of providing practical tools to ensure successful investigative processes and investigative practices
2. Summarize how different types of reports influence the structure and style of the report
3. Explain the generic function and structure of reports
4. Prepare the reports on the basis of importance
5. Choose the appropriate mechanisms for writing the report
6. Write and critique the report containing the essentials and the requirements of report writing.

18CA2025 TRUST MANAGEMENT IN E-COMMERCE**Credits: 3:0:0****Course Objectives:**

1. To detail what is meant by the term ‘e-commerce’ used in typical commercial system
2. To provide protection and assurance upon which trust is built
3. To discuss management of trust related to IT security in the e-commerce environment

Course Outcomes:

Students will be able to

1. Demonstrate an summarizing of the foundations and importance of E-commerce
2. Assess electronic payment systems
3. Identify key security threats in ecommerce environment
4. Develop an in-depth summarizing of the importance of inter-organizational trust in e-commerce
5. Learn what Trusted Platform Modules (TPMs) are and what capabilities they can provide both at an in-depth technical level and in an enterprise context
6. Determine whether a system is trustworthy and the people behind the technology

17CA3001CYBER CRIMINOLOGY AND CRIMINAL JUSTICE ADMINISTRATION**Credits: 3:0:0****Course Objectives:**

1. To Summarize the concept of crimes, various forms of crimes and cyber crimes
2. To summarize Crime from Sociological, Psychological and Criminological Perspectives
3. To summarize the role of Criminal Justice Administration and Cyber Crimes

Course Outcomes:

Students will be able to

1. Summarize the concepts of crime and cyber crimes
2. Describe the principles of crime, cause and extent of cyber crimes
3. Learn various forms of contemporary crimes
4. Analyze the mode of operation to commit the crime and the psychological theories related to cyber criminals
5. Explain theoretical perspectives of cyber crimes
6. Summarize the role of Criminal Justice Administration and Cyber Crimes

17CA3002 CYBER CRIMES AND FRAUDS

Credits: 3:0:0

Course Objectives:

1. To give detailed outline of categories of cybercrimes.
2. To educate students the policy and regulatory issues pertaining to cyberspace and cybercrimes.
3. To provide vivid knowledge about cyber frauds and evolution of cyber fraud techniques.

Course Outcomes:

Students will be able to

1. Distinguish between various cyber-attacks and their targets.
2. Summarize cybersecurity control frameworks.
3. Get knowledge about types of financial frauds.
4. Successfully provide quality legal support.
5. Detect attack methodology and combat hackers from intrusion or other suspicious attempts at connection to gain unauthorized access to a computer and its resources.
6. Summarize evolution of cyber fraud techniques.

17CA3003 FUNDAMENTALS OF NETWORK SECURITY

Credits: 3:0:0

Course Objectives:

1. To generate a comprehensive summarizing of networks models.
2. To describe the essential introductory aspects of Routing
3. To acquire knowledge in configuring network level technical security controls

Course Outcomes:

Students will be able to

1. Describe the network models and their relationship to each other
2. Identify the different types of network topologies and describe the physical characteristics of cables
3. Explain how Ethernet makes use of the physical and data link layers and the difference between an Ethernet hub and an Ethernet switch
4. Demonstrate routing protocols used for different networks
5. Identify the various TCP/IP protocols used for the networking application
6. Demonstrate expertise in configuring network level technical security controls

17CA3005 INFORMATION SECURITY

Credits: 3:0:0

Course Objectives:

1. To create the information security management structure based on the CIA triad
2. To develop and implement documented security policy, standards, procedures, guidelines and legal framework
3. To ensure the physical and environmental security of information, information systems, and information-processing and storage facilities.

Course Outcomes:

Students will be able to

1. Apply concepts of confidentiality, integrity and availability and create the information security management structure
2. Determine and manage acceptable risk and select the appropriate, risk-based controls that align to the laws and frameworks
3. Develop and implement documented security policy, standards, procedures, guidelines and legal framework
4. Apply foundational technical security operations and participate in addressing personnel safety concerns

5. Assess the effectiveness of software security and enforce security controls
6. Develop policies designed to ensure the physical and environmental security of information, information systems, and information-processing and storage facilities.

17CA3006 DIGITAL FORENSICS

Credits: 3:0:0

Course Objectives:

1. To provide the fundamental knowledge of digital forensics and investigations
2. To Perform digital forensics analysis upon various operating system
3. To gain insight into evidence creation and interpretation

Course Outcomes:

Students will be able to

1. Define and discuss the concepts of digital forensics
2. Perform digital forensics analysis upon Windows, MAC and LINUX, Mobile Phone operating systems
3. Utilize various forensic tools to collect digital evidence
4. Utilize a systematic approach to computer investigations and summarize the implications of anti-forensics to the digital forensics investigator
5. Explain guidelines for investigation reporting.
6. Analyze and carve image files both logical and physical

17CA3008 INFORMATION TECHNOLOGY (IT) ACT

Credits: 3:0:0

Course Objectives:

1. To entrusts students the summarizeing of knowing what are the important laws related to cybercrimes.
2. To give students a comprehensive knowledge of the cyber laws.
3. To explore the skills and concepts needed to effectively manage E-Commerce and E-Governance.

Course Outcomes:

Students will be able to

1. Summarize the cyber law and the need for cyber forensics.
2. Strengthen their cyber law.
3. Derive a strong foundation in aspects of cyber-attacks.
4. Get a deeper insight into legal framework IT Act 2000.
5. Get an insight of Cyber jurisprudence in Indian framework.
6. Gain a familiarity with the basic concepts, terminology and technology of e-commerce and e-governance.

17CA3009 ADVANCED DIGITAL FORENSICS

Credits: 3:0:0

Course Objectives:

1. To demonstrate an awareness of current methods of reducing the effectiveness of anti-forensics.
2. Perform digital forensics analysis upon Windows and LINUX operating systems
3. To utilize various forensic tools to collect digital evidence.

Course Outcomes:

Students will be able to

1. Demonstrate an awareness of current methods of reducing the effectiveness of anti-forensics
2. Use of the Sleuth Kit and the fundamentals of media analysis, disk and partition structures, and file system concepts
3. Review core digital forensics topics such as hashing and the creation of forensic images

4. Analysis of FAT and NTFS file systems, including internal structures of the NTFS Master File Table, extraction and analysis of Registry hives, event logs, and other Windows-specific artifact
5. Discuss analysis of the most common Linux file systems and analysis of artifacts found on Linux servers and desktops
6. Utilize various forensic tools to collect digital evidence and present the evidence in the courtroom as per the industry best standards

17CA3011 INFORMATION SECURITY MANAGEMENT

Credits: 3:0:0

Course Objectives:

1. To implement security administration
2. To summarize access controls basics
3. To participate in the implementation of change management

Course Outcomes:

Students will be able to

1. Discuss the vital role of Information Security Governance has to play in organizations
2. Summarize that effective change management hinges on implementing the controls to enforce segregation of duties and ensure adequate management supervision.
3. Identify, analyze methodologies and best practices in patch management focusing on security patches.
4. Explore the access control mechanisms for user authorization
5. Discuss access control techniques
6. Decide on the method of access control administration

17CA3012 DATABASE SECURITY

Credits: 3:0:0

Course Objectives:

1. To give students in depth information about database system architecture and system implementation techniques.
2. To elaborate on data storage and indexing options, and perform query optimization.
3. To provide an overview of basic security mechanisms, Security models, and security issues in database.

Course Outcomes:

Students will be able to

1. Summarize database concepts and structures and query language.
2. Apply various Normalization techniques.
3. Summarize query processing and techniques involved in query optimization.
4. Transaction Processing & Locking using concept of Concurrency control.
5. Practice various access control theories and techniques including mandatory access control, discretionary access control, role-based access control.
6. Conduct database auditing for security and reliability.

17CA3014 GOVERNANCE, RISK & COMPLIANCE

Credits: 3:0:0

Course Objectives:

1. Provide effective information security governance to protect the information assets
2. Provides guidance to build an information security program
3. Provides discussion of the various control frameworks and standards

Course Outcomes:

Students will be able to

1. Lay strong foundation of Information Security Governance, Risk & Compliance
2. Develop an information security strategy
3. Determine and manage acceptable risk and select the appropriate, risk-based controls that align to the laws and frameworks
4. Create a security-aware culture
5. Summarize the existing and emerging laws and regulations impacting the organization
6. Prepare for and leverage internal and external audits to enhance processes

17CA3015 BUSINESS CONTINUITY PLANNING/ DISASTER RECOVERY PLANNING

Credits: 3:0:0

Course Objectives:

1. To examine aspects of business continuity plans and disaster recovery plans.
2. To summarize the concepts of risk management
3. To develop and execute plans to deal with contingency, incident response, disaster recovery and business continuity

Course Outcomes:

Students will be able to

1. Design a disaster recovery plan, business continuity plan for sustained organizational operations
2. Identify and prioritize critical business functions; determine maximum tolerable downtime and other criteria and describe concepts of risk management
3. Implement Business Continuity Strategy and be able to discuss incident response options and contingency planning components
4. Implement a backup storage strategy, recovery site strategies and provide Training to test, update, assess and maintain the plan
5. Manage incident response, detection; response; reporting; recovery; remediation and summarize fault tolerance requirements
6. Best practices for Business continuity and disaster recovery planning

17CA3016 INTELLECTUAL PROPERTY RIGHTS (IPR)

Credits: 3:0:0

Course Objectives:

1. To educate student the operation and features of IP law in industry or regulatory context.
2. To provide practical development of the skills required for a patent prosecutor.
3. To give an overview of Copyright and Industrial Design

Course Outcomes:

Students will be able to

1. Apply intellectual property law principles to real problems.
2. Analyze the social impact of intellectual property law and policy.
3. Summarize the policies behind patent law.
4. Acquire knowledge of the practical operation of trade mark law.
5. Learn copyright and recent amendments.
6. Learn industrial designs.

17CA3017 INCIDENT RESPONSE AND COMPUTER FORENSICS

Credits: 3:0:0

Course Objectives:

1. To provide students the knowledge required to undertake incident response activities.
2. To explain how forensic duplication data can be used as legal evidence.
3. To introduce the basic technical concepts behind the various stages of a hacking attack, as well as some common tools used by hackers and security professionals.

Course Outcomes:

Students will be able to

1. Get in-depth knowledge of incident response.
2. Design an incident response process that will work with each type of incident you may encounter
3. Acquire in-depth knowledge in Data Acquisition of physical storage devices and data handling.
4. Summarizing of the tradeoffs and differences between various forensic duplication tools.
5. Deal with the ethical issues associated with computer security and to show how ethics functions as a control.
6. Investigate hacker tools.

17CA3018 SECURITY IN THE CLOUD**Credits: 3:0:0****Course Objectives:**

1. To introduce the broad perceptive of cloud architecture and model
2. To summarize the concept of Virtualization
3. To be familiar with the lead players in cloud.

Course Outcomes:

Students will be able to

1. Articulate the differences between deployment models versus service models of cloud computing.
2. Identify the architecture, infrastructure and delivery models of cloud computing
3. Apply suitable virtualization concept.
4. Design and Compute the Storage Clouds
5. Explore Programming model
6. Manage the security risks associated with the cloud

17CA3020 INTRUSION DETECTION AND PREVENTION SYSTEM**Credits: 3:0:0****Course Objectives:**

1. To summarize basic Intrusion Detection System (IDS) and Intrusion Prevention System (IPS)
2. To be familiar with the detection approaches
3. To be familiar with the data collection, evaluation criteria

Course Outcomes:

Students will be able to

1. Summarize the process of monitoring the events occurring in a computer system or network and analyzing them for signs of possible incidents
2. Compare and contrast Intrusion Detection and Intrusion Prevention System
3. Explain architecture and implementation of IDS & it how can be accomplished
4. Examine system or network activity to find possible intrusions or attacks and trigger security alerts for the malicious activities
5. Learn how to collect data from various sources
6. State the Legal and evidentiary issues

17CA3021 E-MAIL SECURITY**Credits: 3:0:0****Course Objectives:**

1. To summarize the working concept and the security issues of Email, Mobiles and wireless
2. To summarize the various security models deployed
3. Learn the procedures for handling email, mobile and android forensics

Course Outcomes:

Students will be able to

1. Summarize the working principles of email and the security issues

2. Learn security services to combat the email attacks
3. Explore email forensics
4. Describe the functionalities of Mobile Phone
5. Discuss the challenges faced by the mobile devices and the security models
6. Explain the procedures for handling mobile forensics and android forensics

17CA3022 SOCIAL MEDIA CRIMES

Credits: 3:0:0

Course Objectives:

1. To summarize history of social networking, criminal Justice System
2. To gain insight into how the emergence of social networking has affected criminality online, and how it has impacted the criminal justice system
3. To summarize the criminality via texting, identity theft, and hacking

Course Outcomes:

Students will be able to

1. Examine the history of social networking and the process of developing an online identity
2. Summarize the affordances and limitations of each medium, and practice at assessing the best ways to use each medium
3. Discuss adolescents as offenders and victims in cyberbullying and digital piracy
4. Explores how new avenues for social networking criminality have affected our criminal justice system.
5. Learn to use new social media, to assess social, and political impact, and to tune or relinquish use of the medium for their own purposes
6. Discuss the importance of social media in business by analyzing its advantages.

17CA3023 DIGITAL FRAUDS

Credits: 3:0:0

Course Objectives:

1. To conceptualize the Nature of Fraud
2. To identify financial statement fraud exposures
3. To detect and prevent fraud in e-commerce

Course Outcomes:

Students will be able to

1. Classify frauds into various types.
2. Establish a management system for detecting and responding to fraud
3. Summarize the nature of bank frauds committed and the procedure of commission of bank frauds
4. Design and evaluate controls to prevent, detect and respond appropriately to corporate fraud and misconduct
5. Identify controls that prevent and/or detect fraudulent behavior.
6. Detect e-business fraud and take appropriate measures to prevent fraud in e-commerce

18CA3001 VULNERABILITY ASSESSMENT AND PENETRATION TESTING

Credits: 3:0:0

Course Objectives:

1. To acquire knowledge on ethical hacking methodology
2. Use techniques, skills and modern tools necessary to gather the information and to identify the vulnerabilities
3. To Identify the exploits in various operating systems and Wireless environment

Course Outcomes:

Students will be able to

1. Demonstrate the ability to attack and defend a network.
2. Analyze social engineering methods
3. Identify open ports on a target system and determine the possible attack vectors
4. Identify the components of the web infrastructure and use the tools and techniques to scan web servers
5. Summarize windows and linux hardening methods
6. Explain the application threats and discuss the countermeasures

18CA3003 ACCESS CONTROL AND IDENTITY MANAGEMENT SYSTEM

Credits: 3:0:0

Course Objectives:

1. Summarize the elements of System Security, Identity Management models and be familiar with the third-party approach
2. To explain the process of administering access controls
3. State Access control administration methods

Course Outcomes:

Students will be able to

1. Define the basic concepts that collectively form the foundation for computing security and emphasize the major aspects relating to identification and access control
2. Describe how to implement Authentication mechanisms
3. Identify and operate internetwork trust architectures
4. Implement the different types of access controls
5. Describe the process of administering access controls
6. Develop and apply security system access controls

18CA3005 WEB APPLICATION SECURITY

Credits: 3:0:0

Course Objectives:

1. To summarize fundamental techniques in developing secure web based applications
2. To identify the vulnerabilities of web based applications and to protect those applications from attacks
3. To summarize security-related issues in Web-based systems and applications.

Course Outcomes:

Students will be able to

1. Identify the most critical risks faced by the organization and provide awareness about application security
2. Classify and prioritize threats using some popular methods
3. Discuss various attacks against authentication systems and to mitigate the threats against the attacks
4. Explain the terminology, methodology and dangers involved in web application authorization
5. Develop custom authorization mechanism
6. Learn how to securely manage session state and summarize the reasons used behind session and session state

**DEPT. OF INFORMATION
TECHNOLOGY**

LIST OF NEW COURSES

Course Code	Name of the Course	Credits
18CA2001	Big Data Analytics	3:0:0
18CA2002	Internet of Things	3:0:0
18CA2003	Software Metrics and Quality Management	3:0:0
18CA2004	Data Mining	3:0:0
18CA2005	Data Mining Lab	0:0:2
18CA2006	Programming in JavaEE	3:0:0
18CA2007	Programming in JavaEE Lab	0:0:2
18CA2008	Mobile Application development in Android	3:0:0
18CA2009	Mobile Application Development in Android Lab	0:0:2
18CA2010	Management Information System	3:0:0
18CA2011	Software Project Management	3:0:0
18CA2012	Data Analytics using Python	3:0:0
18CA2013	Data Analytics using Python Lab	0:0:2
18CA2014	Forensic Digital Image processing	3:0:0
18CA2015	Incident Management	3:0:0
18CA2016	Preserving and Recovering Digital evidence	3:0:0
18CA2017	Network Security Applications	3:0:0
18CA2018	Network Security Applications Lab	0:0:2
18CA2019	E – mail Forensics	3:0:0
18CA2020	Document Examination and Fingerprint analysis	3:0:0
18CA2021	Document Examination and Fingerprint analysis Lab	0:0:2
18CA2022	Information Ethics	3:0:0
18CA2023	Security Investigation and Report Writing	3:0:0
18CA2024	Security Investigation and Report Writing Lab	0:0:2
18CA2025	Trust management in E-commerce	3:0:0
18CA2026	Big Data Analytics Lab	0:0:2
18CA3001	Vulnerability assessment and Penetration testing	3:0:0
18CA3002	Vulnerability assessment and Penetration testing Lab	0:0:2
18CA3003	Access Control and Identity Management	3:0:0
18CA3004	Access Control and Identity Management Lab	0:0:2
18CA3005	Web Application Security	3:0:0
18CA3006	Web Application Security Lab	0:0:2

18CA2001 BIG DATA ANALYTICS

Credits: 3:0:0

Course Objective:

- To gain experience about Big Data
- To help students to understand about Hadoop
- To understand various features of Hive

Course Outcome:

Students will be able to

- Understand the fundamental of Big Data
- Understand the concepts of Hadoop
- Develop solutions to problems using Big Data
- Gain knowledge about MongoDB
- Apply Big Data to solve real world problems

- Illustrate the role of mapreduce programming in various scenarios

Unit I -Introduction: Types of Digital Data-Classification of Digital Data- Introduction to Big data- Characteristics of Data- Evolution of Big data- Definition of Big data- Challenges with big data- What is big data- Why big data- data warehouse environment – hadoop environment.

Unit II -Big data Analytics and The Big Data Technology Landscape: What is Big data Analytics- Classification of Analytics- Top Challenges facing big data- Why is big data analytics important – Data Science- Terminologies used in big data environment - BASE- NoSQL- Hadoop.

Unit III -Hadoop: Introducing Hadoop- Why Hadoop- Why not RDBMS- RDBMS versus Hadoop- Distributed Computing Challenges- History of Hadoop – Hadoop Overview – Use case of Hadoop- Hadoop Distributors – HDFS- Processing Data with Hadoop- Mapping Resources and Applications with Hadoop YARN – Interaction with Hadoop Ecosystem.

Unit IV - MongoDB and Mapreduce Programming: What is MongoDB – Why MongoDB –Terms used in RDBMS and MongoDB – Data Types in MongoDB – MongoDB Query Language. Mapreduce Introduction –Mapper – Reducer – Combiner –Partitioner – Searching – Sorting – Compression.

Unit V - Introduction to Hive and Machine Language: What is Hive- Hive Architecture – Hive Data Types- Hive File Format – Hive Query Language – RC File Implementation – SerDe- User Defined Function – Introduction to Machine Learning – Machine Learning Algorithms.

Text Book:

1. Seema Acharya, Subhashini Chellappan, “Big data and Analytics”, First Edition, Wiley, 2016, ISBN: 978-8126554782.

Reference Books:

1. Anil Maheshwari, “Big Data Made Accessible”, McGrawHill Education Publication, 2017, ISBN: 978-9352604548.
2. Nathan Marz, James Warren, “Big data: Principles and Best Practices of Scalable Realtime Data Systems”, Manning Publications, 2015, ISBN: 978-1617290343.
3. Sandeep Karanth, “Mastering Hadoop”, First Edition, Packt Publishing, 2014, ISBN: 978-1783983643.

18CA2002 INTERNET OF THINGS

Credits: 3:0:0

Course Objective:

- To understand the fundamental principles of Internet of Things
- To understand about wireless sensor networks
- To develop IoT based applications

Course Outcome:

Students will be able to

- Understand the fundamental concepts of Internet of Things
- Understand how to interconnect software and hardware
- Analyze protocols in wireless sensor networks
- Design IoT applications in various domains
- Evaluate performance of IoT applications
- Develop sensor based applications through embedded platform

Unit I - Introduction to IoT: Defining IoT, Characteristics of IoT, Physical Design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs. IoT& M2M:Machine to Machine, Difference between IoT and M2M, Software define Network.

Unit II - Network & Communication aspects: Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & Dissemination.

Unit III - Challenges in IoT: Design challenges, Development challenges, Security challenges, Other challenges.

Unit IV - Domain specific applications of IoT: Home automation, Industry applications, Surveillance applications, Other IoT applications.

Unit V - Developing IoTs: Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with Python.

Text Book:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-On Approach", First Edition, 2014, ISBN: 978-0996025515.

Reference Books:

1. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", First Edition, Wiley-Blackwell, 2010, ISBN: 978-0470997659
2. Claire Rowland, Elizabeth Goodman, "Designing Connected Products: UX for the Consumer Internet of Things", O'Reilly Publications, First Edition, 2015, ISBN: 978-1449372569.
3. Adrian Mcewen, Hakin Cassimally, "Designing the Internet of Things", Wiley, 2014, ISBN: 978-1118430620.
4. Cuno Pfister, "Getting Started with the Internet of Thing: Connecting Sensors and Microcontrollers to the Cloud", O'Reilly, First Edition, 2011, ISBN: 978-1449393571.
5. Gaston C Hillar, "Internet of Things with Python", Packt Publishing Limited, 2016, ISBN: 978-1785881381.
6. Jan Holler, VlasiosTsiatis, Catherine Mulligan, "From Machine to Machine to the Internet of Things: Introduction to a New Age of Intelligence", Academic Press, 2014, ISBN: 978-0124076846.

18CA2003 SOFTWARE METRICS AND QUALITY MANAGEMENT

Credits: 3:0:0

Course Objective:

Enable the student to

- understand how to choose appropriate quality goals and to select, plan, and execute quality assurance activities throughout the development phase
- study the software quality engineering metrics and models
- learn the design methods for various software applications

Course Outcome:

The student will be able to

- Select the best quality assurance plan during software development
- Classify software metrics and models in software development
- Apply the traditional project management skills and manage resource requirements
- Identify the suitable life cycle models for the software applications.
- Formulate the design methods based on the projects
- Select proper planning methods and execute projects

Unit I -Software Development Process Models: The waterfall Development model - The Prototyping Approach - The spiral Model - The iterative Development Process Model - The object - oriented Development Process - The clean room Methodology - The Defect Prevention Process - Process Maturity Framework and Quality Standards

Unit II -Software Quality Metrics Overview: Product Quality Metrics - In-Process Quality Metrics - Metrics for Software Maintenance. Applying the Seven Ishikawa's Seven Basic tools - Checklist - Pareto Diagram - Histogram - Run charts - Scatter Diagram - Control chart - Cause-and-Effect Diagram - Relations Diagram

Unit III - Exponential Distribution and Reliability Growth Models: Reliability Models - The Rayleigh Model - Basic assumptions - Reliability and Predictive Validity - The Exponential Model - Reliability Growth Models - Test Compression Factor - Estimating the distribution of total defects over time.

Unit IV - In-Process Metrics and Reports: Orthogonal defeat classification - In-Process Metrics for Software Testing - Quality management - Halstead's Software Science - Structure Metrics - Oriented

Concepts and Constructs - Design and Complexity Metrics - Productivity Metrics - Quality and Quality Management Metrics

Unit V - Conducting In-Process Quality Assessments: Preparation Phase -Evaluation Phase - Summarization Phase - Recommendations and Risk Mitigation - Audit and Assessment - Software Process Maturity Assessment and Software Project Assessment - Do's and Don'ts of Software Process Improvement.

Text Book:

1. Stephen H. Kan, “Metrics and Models in Software Quality Engineering”, Second Edition, Addison-Wesley Professional, 2003. ISBN: 0201729156.

Reference Books:

1. John W. Horch, “Practical Guide to Software Quality Management”, Second Edition, Artech House Computer Library, 2013. ISBN: 0813170324.
2. John C. Munson, “Software Engineering Measurement”, Auerbach Publications, 2003. ISBN: 0849315034.
3. Norman.E. Fenton and James Bieman ,“Software Metrics: A Rigorous and Practical Approach”, Third Edition, Taylor & Francis, 2014. ISBN 1439838224, 9781439838228.
4. Gerald M. Weinberg, “Quality Software Management: Anticipating Change”, Dorset House Publishing Company, 1997.
5. B A Kitchenham, “Software Metrics: Measurement for Software Process Improvement”, Blackwell Pub, 1996. ISBN: 1855548208.

18CA2004 DATA MINING

Credits: 3:0:0

Course Objective:

- To understand Data mining, Kinds of data that can be mined
- To understand the Data objects and Attribute types
- To understand Data mining trends

Course Outcome:

Students will be able to:

- Describe Data mining, Kinds of data, patterns that can be mined
- Apply attribute types and statistical distribution of data
- Determine the different steps followed in Data mining and pre-processing for Data mining
- Select and Apply proper data mining algorithms to build applications
- Describe the designing of Data Warehousing
- Understand and apply the most current data mining trends and applications

Unit I - Introduction: Why data mining – Data mining – Kinds of data that can be mined – Database data, data warehouses, Transactional data – Kinds of patterns that can be mined – Technologies used – major issues in data mining

Unit II - Data objects and Attribute types: Attribute – Nominal attributes –Binary attributes – Ordinal attributes – Numeric attributes – Discrete versus continuous attributes – Statistical distribution of data - data visualization – measuring data similarity and dissimilarity

Unit III - Data pre processing: Overview – Data cleaning – missing values, Noisy data, Data cleaning as a process – Data Integration – entity identification problem, redundancy and correlation analysis – Data reduction – Data transformation and data discretization

Unit IV - Data Warehousing: What is Data warehouse – Difference between operational database systems and data warehouses – Data warehouse modeling – Data warehouse design and usage – data warehouse implementation.

Unit V - Data mining trends: Mining complex data types – Data mining methodologies - Statistical data mining, Data mining foundation, Visual and Audio data mining - Data mining applications – data mining trends.

Text Books:

1. Jiawei Han, Micheline Kamber, Jian Pei, “Data Mining: Concepts and Techniques”, Third Edition (The Morgan Kaufmann Series in Data Management Systems) 3rd Edition, 2012, ISBN 978-0-12-381479-1
2. Margaret H. Dunham, “Data Mining Introductory and Advanced Topics”, Pearson Education, ISBN: 978-81-7758-785-2.

Reference Book:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to Data Mining”, Pearson Education; First edition, 2016, ISBN: 978-0321321367.

18CA2005 DATA MINING LAB

Credit: 0:0:2

Co –requisite: Data Mining

Course Objectives:

Enable the student to

- Implement classical models and algorithms in data mining
- To learn main process of data mining such as data preparation, classification, clustering, association analysis, and pattern evaluation
- Gain hands-on experience in data mining tools

Course Outcomes:

The student will be able to

- Evaluate the different models of data preprocessing techniques.
- Apply various algorithms used in information analysis of Data Mining Techniques to solve practical problems.
- Test the algorithm with different data sets and analyze the result.
- Apply state-of-art approaches and techniques in data mining and visualization.
- Develop a model for the given dataset using the machine learning algorithms.
- Predict the future occurrence based on the historical data.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

18CA2006 PROGRAMMING IN JAVAEE

Credits 3:0:0

Course Objective:

- To use J2EE to build scalable n-tiered web application
- To learn Servlets, JSP and JSF
- To learn about data access using EJB

Course Outcome:

Upon successful completion of this course, the student will be able to

- Describe the multi-tier enterprise architecture
- Demonstrate the major components of Java EE for enterprise application development
- Describe how servlets and Java Server Pages (JSP) fit into a Java-based web application architecture
- Implement Servlets and Java Server Page (JSP) s in web application
- Develop user Interface components for enterprise application with JSF
- Design EJB to fit into various enterprise applications

Unit I -Java EE 7 Overview: Enterprise Architecture - Java EE 7 Platform – servers for Java EE Applications- Java EE Related Technologies- Web Applications- Web Architecture Models - MVC Architecture.

Unit II - Servlets: Features of Java Servlet –Servlet API – Servlet Life Cycle –Creating a Simple Servlet – HttpServletRequest and HttpServletResponse – Handling Sessions in servlets-Session Tracking Mechanisms.

Unit III - Java Server Pages: Introduction – Architecture of JSP Page – Life Cycle of JSP page –JSP Basic Tags and Implicit Objects –Directive Tags – Action Tags –Working with JSP Fragments – working with Tag Files.

Unit IV- JavaServer Faces: Introduction – Features of JSF – JSF Architecture –JSF Elements – JSF Request Processing Life Cycle – JSF standard UI Components – JSF Input Validation.

Unit V- EJB: EJB 3 Fundamentals – Features of EJB 3 – Classifying EJBs - Session Beans – Implementing Session Beans – Introducing MDB –Life Cycle of MDB –Implementing Entities –Entity and Session beans – Life Cycle of Entity.

Text Book:

1. Kogent Learning Solutions Inc,” Java Server Programming Java EE 7 (J2EE 1.7), Black Book”, Dreamtech Press, 2014, ISBN: 978-9351194170

Reference Books:

1. Bryan Basham, Kathy Sierra, Bert Bates, “Head First Servlets and JSP”, O’Reilly Media, 2008, ISBN: 9780596516680.
2. Phil Hanna, “JSP 2.0: The Complete Reference”, Osborne/McGraw-Hill, Second Edition, December 2002, ISBN: 978-0072224375.
3. Kathy Sierra, Bert Bates, “Head First EJB”, O’Reilly Media, 2005, ISBN: 978-0596005719.
4. William Crawford, “Java Enterprise in a Nutshell”, O’Reilly Media Inc., 2005, ISBN: 9780596101428.

18CA2007 PROGRAMMING IN JAVAEE LAB

Credits: 0:0:2

Co-requisite: Programming in JavaEE

Course Objective:

- To enable the students implementing the concepts of Servlets and JSP by developing online applications.
- To enable students to understand the use of enterprise java beans
- To apply java technology in developing real time enterprise applications

Course Outcome:

Students will be able to

- Create interactive user interfaces using client tier technologies
- Implement the concepts of Servlets in interactive online applications
- Develop online applications using JSP technologies
- Model the business logic using Enterprise Java Bean technologies
- Develop user interfaces using Java enterprise technologies
- Know about the web based real time application.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

18CA2008 MOBILE APPLICATION DEVELOPMENT IN ANDROID

Credits: 3:0:0

Course Objective:

- To understand the platform, tools, technology and process for developing mobile applications using Google Android.
- To demonstrate the operation of the application, application lifecycle, configuration files, intents and activities.
- To secure, tune, package, deploy and manage Android applications.

Course Outcome:

The student will be able to

- Identify the significant programming components, involving the sensors and hardware features of mobile device.

- Discuss various mobile devices, including their capabilities and limitations.
- Demonstrate mobile applications with appropriate, layouts and user interfaces.
- Experiment applications with network connectivity, messaging and persistent storage.
- Design and develop android applications for real time problems.
- Explain how to deploy and publish mobile application.

Unit I- Getting Started with Android Programming: Features of Android - Architecture of Android –Eclipse - Android SDK - Android Development Tools (ADT) - Creating Android Virtual Devices (AVDs) - Creating Your First Android Application - Anatomy of an Android Application – Understanding Activities – Linking Activities using Intents – Calling Built-In Applications using Intents.

Unit II- Getting to Know the Android Interfaces: Understanding the Components of a Screen - Adapting to Display Orientation - Managing Changes to Screen Orientation - Listening for UI notifications - Basic Views - Picker Views - List Views - Using image Views to Display Pictures - Using Menus with Views.

Unit III- Data Persistence: Saving and Loading User Preferences - Persisting Data to Files - Creating and Using Databases – Sharing Data in Android - Using a Content Provider - Creating User Defined Content Providers.

Unit IV -Messaging and Networking: SMS Messaging - Sending e-Mail –Networking – Displaying Maps – Getting Location Data.

Unit V-Developing Android Services: Creating your own Services – Communicating between a Service and an Activity – Binding Activities to Services – Preparing for Publishing – Deploying APK files.

Text Book:

1. Wei-Meng Lee, Beginning Android Application Development, First edition, Wiley Publishing, 2011, ISBN: 9781118017111.

Reference Books:

1. ZigurdMednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura, “Programming Android”, Second Edition, O'Reilly Media , 2012, ISBN 978-1449316648.
2. Donn Felker, “Android Application Development for Dummies”, 2010, ISBN 9780470770184.
3. Wallace Jackson, “Android Apps for Absolute Beginners”, Apress, 2011, ISBN 978-1430234463.
4. Reto Meier, “Professional Android 4 Application Development”, Third edition, Wrox, 2012, ISBN 9781118102275.
5. Bill Stonehem, Google Android Firebase: Learning the Basics, First edition, Greenlights Publishing, 2016, ISBN 9781365223075.

18CA2009 MOBILE APPLICATION DEVELOPMENT IN ANDROID LAB

Credits: 0:0:2

Co requisite: Mobile Application Development in Android

Course Objective:

Enable the student to

- Learn the platform, tools and technology and process for developing mobile applications using Google Android.
- Explore the Android application architecture, including the roles of the task stack, activities, and services
- Get exposure about multimedia, database and connectivity in the Android operating system.

Course Outcome:

The student will be able to

- List the necessary GUI components for a real time application.
- Identify advanced UI widgets for scrolling, tabbing, and layout control
- Illustrate menus via the Android action bar and handle menu selections.
- Infer tools to create applications for a mobile platform.

- Construct simple graphics with data persistence for mobile devices.
- Evaluate different types of networking options for mobile devices.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

18CA2010 MANAGEMENT INFORMATION SYSTEM

Credit 3:0:0

Course Objective:

- To understand about the usage of MIS in organizations.
- To explore managerial issues relating to information systems.
- To gain experience about the various options in Management Information Systems.

Course Outcome:

Students will be able to

- Learn the functions and issues at each stage of system development.
- Demonstrate business knowledge.
- Identify the need of MIS in real-life situation.
- Use both business and software skills in real-world business applications.
- Apply the learning of MIS in context of an organization.
- Assess the requirement and stage in which the organization is placed.

Unit I - Information System in global business today, The role of Information Systems in Business today, Perspectives on Information Systems, Contemporary approaches to information systems, Global E-business and Collaboration, Business Process and Information system, Types of information systems

Unit II - Systems for collaboration and teamwork, Information Systems function in Business, Organizations and Information Systems, How information Systems impact organizations and business firms, Using Information systems to achieve competitive advantage, Business value chain.

Unit III - Ethical and social issues related to systems, Ethics in information society, IT infrastructure and components, Contemporary hardware and software platform trends, management issues, Organizing data in a traditional file environment, database approach to data management, using database to improve business performance and decision, managing data resources

Unit IV - Telecommunication and networking in today's business world, communication networks, global internet, wireless revolution, System vulnerability and abuse, Business value of security and control, Establishing a framework for security and control, technologies and tools for protecting information resources.

Unit V - E-Commerce and the Internet, E-commerce: Business and Technology, mobile digital platform and e-commerce, Building an e-commerce website, decision making and information systems, Business intelligence in the enterprise, business intelligence constituencies.

Text Book:

1. Kenneth C Laudon, "Management Information Systems – Managing the Digital Firm", Twelfth Edition, Prentice Hall of India, 2011, ISBN: 0132142856.

Reference Books:

1. James, A. O'Brien, George Marakas, "Introduction to Information Systems", 13th Edition Tata McGraw Hill, 2009, ISBN: 9780070167087.
2. Paige Baltzan; Amy Phillips, "Business-Driven Information Systems", McGraw Hill Education, 2015, ISBN: 9780073402987.
3. Davis Olson, "Information Systems Project Management", Business Expert Press, 2015, ISBN: 1631571222.
4. Jawadekar, W. S, "Management Information Systems", Tata McGraw Hill, 2004, ISBN: 9780074631973.

18CA2011 SOFTWARE PROJECT MANAGEMENT

Credits: 3:0:0

Course Objectives:

- To discuss about the professional way of managing software projects
- To plan and execute software projects by means of activity planning, managing risk and allocating resources
- Discussion about software project team management

Outcomes:

The students will understand

- The overview of project planning
- Effort estimation and risk management in software projects
- How to manage people and organize team
- Learn about planning and execution of the project
- How to manage a software project in a business environment
- Learn about project monitoring and control

Unit I - Introduction to Software Project Management, Step Wise: An Overview of Project Planning, Project Evaluation: Introduction

Unit II - Selection of an Appropriate Project Approach, Software Effort Estimation.

Unit III - Activity Planning, Risk Management.

Unit IV - Resource Allocation, Monitoring and Control, Managing Contracts.

Unit V - Managing People and Organizing Teams, Software Quality, Small Projects

Text Book

1. Bob Hughes, Mike Cotterell, "Software and Project Management", McGraw-Hill Publishing Company Limited, Fifth Edition, 2009, ISBN: 9780077122799.

Reference Books

1. Walker Royce, "Software Project Management", Addison-Wesley, 2004 ISBN: 0-20-1309580.
2. Murali K. Chemuturi, Thomas M. Cagley Jr., "Mastering Software Project Management: Best Practices, Tools and Techniques", J. Ross Publishing, 2010, ISBN: 9781604270341S.A. Kelkar, "Software Project Management: A Concise Study", Prentice Hall of India, Third Edition, 2013, ISBN: 978-8120347021
3. Mohapatra S, "Software Project Management", Cengage Learning, 2011, ISBN: 978-8131514849
4. Azath M, ChannamallikarjunaMattihalli, "Software Project Management", LAP Lambert Academic Publishing, 2012, ISBN: 978-3848494422
5. Ashfaq Ahmed, "Software Project Management: A Process-Driven Approach", Auerbach Publications, 2012, ISBN: 978-1439846551
6. Rajiv Chopra, "Software Project Management", S K Kataria & Sons, 2011, ISBN: 978-9380027364.

18CA2012 DATA ANALYTICS USING PYTHON

Course Objective:

- To understand, evaluate, and visualize data
- To learn basic steps of data analysis and how to use Python and its packages
- To learn about the packages used in python for data analytics

Course Outcome:

The students will

- Have an Understanding how to program in python
- Know how to create and manipulate arrays using numpy
- Know how to use pandas to create and analyze data sets
- Learn about MongoDB
- Have an understanding of scikit-learn
- Know how to use matplotlib and seaborn libraries to create data visualization

Unit I: Introducing Data Analysis and Libraries: NumPy arrays and Vectorized Computation: NumPy Arrays, Array functions, Data processing using arrays

Unit II: Data analysis with Pandas: An overview of the pandas package, The pandas data structure, The essential basic functionality, Indexing and selecting data, Working with missing data, Advanced uses of pandas for data analysis

Unit III: Data Visualization: The Matplotlib API primer, Exploring plot types, Legends and annotations, Plotting functions with pandas

Unit IV: Interacting with Database: Interacting with data in text format, Interacting with data in binary format, Interacting with data in MongoDB, Interacting with data in Redis.

Unit V: Data Analysis: Data munging, Data aggregation, Grouping data, Machine learning models with scikit-learn, Statistical concepts for predictive modelling

Text Book

1. Phuong Vo. T. H, Martin Czygan, Ashish Kumar, Kirthi Raman, “Python : Data Analytics and Visualization” , Packt Publishing Ltd, 2017, ISBN: 978-1-78829-009-8.

Reference Books:

1. Magnus Vilhelm Persson, Luiz Felipe Martins, “Mastering Python Data Analysis”, Packt Publishing Ltd, 2016, ISBN: 978-1-78355-329-7.
2. Kirthi Raman, “Mastering Python Data Visualization”, Packt publishing Ltd, 2015, ISBN: 978-1-78398-832-7.
3. Frank Millstein, “Data Analytics with Python: Data Analytics in Python using Pandas”, 2018, ISBN: 978-1986054492.
4. Arshdeep bahga, “Big Data Analytics- A Hands-On Approach”, 2018, ISBN: 978-0-9960255-7-7.
5. Singh /Ali Sams Teach Yourself- Big Data Analytics with Microsoft HDInsight, 2016.

18CA2013 DATA ANALYTICS USING PYTHON LAB

Credits: 0:0:2

Co requisite: Data Analytics using Python

Course Objective:

Enable the student to

- Learn the basic steps of data analysis and to use python packages.
- Explore about data analysis using numpy, pandas
- Prediction about the data using scikit-learn

Course Outcome:

The student will be able to

- Learn about how to program in python
- Process and analyze the data
- Data manipulation and cleaning Techniques
- Create data visualization using matplotlib and the seaborn modules with python
- Learn about machine learning algorithms
- Learn about MongoDB

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

18CA2014 FORENSIC DIGITAL IMAGE PROCESSING

Credits: 3:0:0

Course Objective:

- To be familiar with forensic digital enhancement, integrity of digital images
- To understand the basics of Image calibration
- To gain insight into advanced processing techniques

Course Outcome:

Students will be able to:

- Understand the forensic digital enhancement
- Understand the integrity of digital images
- Understand the Image calibration
- Learn Multiple image Techniques
- Explain Advanced processing techniques
- Understand Format based forensics

Unit I - Introduction: History of forensic digital enhancement – Transition from film to digital imaging – Digital edge – Scientific working group of Imaging technology – Organization of Scientific area committees

Unit II - Establishing integrity of digital images: Presumption of integrity – Image integrity – Storage of digital data – Image authentication – file formats – Methods of tracking processing steps – Raw file formats and Image processing - Image calibration

Unit III - Multiple image Techniques: Image subtraction – Channel subtraction – Filtration subtraction – Erasure of evidence – Focus stacking – High dynamic range – Colour model and colour channels – Channel blending In adobe photoshop

Unit IV- Advanced processing techniques: Reducing random noise – Filters – outlining edges – multiple images – Periodic noise removal – 3-D imaging – wavelet transform.

Unit V - Format based forensics: Fourier – JPEG – JPEG Header – Double JPEG – JPEG host – Problem set – Resampling - cloning – Geometric based forensics.

Text Books

1. HusrevTahaSencar, Nasir Memon, Digital Image Forensics: There is More to a Picture than Meets the Eye, Springer; 2013 edition, ISBN 978-1489992321
2. Brian Dalrymple, Jill Smith, Forensic Digital Image Processing: Optimization of Impression Evidence, CRC Press; 1 edition 2018, ISBN 9781498743433

Reference Books

1. John C. Russ, Forensic Uses of Digital Imaging, CRC Press; 2 edition, 2016, ISBN 9781498733076
2. Marcus Borengasser, Forensic Image Processing, McGraw-Hill Education, 2016, ISBN-13: 978-0071599337

18CA2015 INCIDENT MANAGEMENT

Credits: 3:0:0

Course Objective:

- To be familiar with Nature of Critical Incidents
- To understand the Incident Command system
- To gain insight into the Emergency Operation Center

Course Outcome:

Students will be able to:

- Understand the types of Incidents, common characteristics
- State Recovery and mitigation stages
- Understand the seven critical tasks
- Understand the incident command system operating requirement, common terminology
- Learn sources of stress, stress types
- Understand the emergency operation center

Unit I - Nature of Critical Incidents: Objectives – Types of Incidents –Common characteristics – Stages, Phases, and Strategies – prevention and preparedness stages, Response stage, Crisis phase, Scene management phase, Executive management phase, Recovery and mitigation stages

Unit II - Seven Critical tasks: Establish control and communications – Identify the hot zone – Establish the Inner perimeter – Establish the outer perimeter – Establish the command post – Establish

a staging area – Emergency medical services, Fire Service, Media, Utility companies – seven critical tasks

Unit III - Incident Command system: History and Development – ICS Operating requirement – ICS Component – Common terminology, modular organization – management by objectives – Integrated communications – Unified command structure – Incident location and facilities - Dispatch and deployment

Unit IV- Critical Incident Stress: Sources of stress – Stress types – Acute stress, Delayed stress – Strategies – During an incident, after an incident

Unit V - Emergency Operation Center: Introduction to emergency operation center – Location, structure, processes of EOC, basic EOC functional roles – Emergency Manager, Deputy Emergency Manager, Command staff – Functional process of the emergency Operation center – Communication and interaction in the EOC – EOC communication, Internal and External

Text Books

1. Vincent Faggiano, John McNall, Thomas T. Gillespie, “Critical Incident Management: A Complete Response Guide”, CRC Press; 2 edition, 2011, ISBN 9781439874547.
2. Leighton Johnson, “Computer Incident Response and Forensics Team Management: Conducting a Successful Incident Response”, Syngress, 2013, ISBN-13: 978-1597499965.

Reference Books

1. Kevin Mandia, Matthew Pepe, Jason Luttgens, “Incident Response & Computer Forensics”, McGraw-Hill Education; 3 edition, 2014, ISBN-13: 978-0071798686
2. Gerard Johansen, “Digital Forensics and Incident Response”, Paperback – Import, Packt Publishing Limited, 2017, ISBN-13: 978-1787288683
3. Chuck Easttom, “CCFP Certified Cyber Forensics Professional All-in-One Exam Guide”, McGraw-Hill Education; Har/Cdr edition, 2014, ISBN-13: 978-0071839761
4. Vincenzo G. Calabro', “Incident Response & Digital Forensics”, Lulu.com, 2014, ISBN-13: 978-1326099411.

18CA2016 PRESERVING & RECOVERING DIGITAL EVIDENCE

Credits: 3:0:0

Course Objective:

- To acquire knowledge in the field of digital investigators
- To understand Investigating computer intrusions
- To handle the digital crime scene

Course Outcome:

Students will be able to:

- Apply forensicscience to computers
- Understand forensic examination process
- ExplainNetworks basics for digital investigators
- StateDigital evidence and computer crime
- Investigate computer intrusions
- Handle the digital crime scene

Unit I - Computer basics for digital investigators: applying forensic science to computers – forensic examination of windows systems – forensic examination of unix systems – forensic examination of macintosh systems - forensic examination of handheld devices.

Unit II - Networks: Networks basics for digital investigators –applying forensic science to networks – digital evidence on physical and data link layers - digital evidence on network and transport layers - digital evidence on the internet.

Unit III - Digital Investigation: Digital evidence and computer crime –history and terminals of computer crime investigation –technology and law - the investigate process – investigate reconstruction – modus operandi, motive and technology –digital evidence in the court room.

Unit IV - Investigating Computer Crime: Investigating computer intrusions – investigating cyber stalking – digital evidence as alibi.

Unit V- Guidelines: Handling the digital crime scene – digital evidence examination guidelines.

Text Books

1. Eoghan Casey, “Digital Evidence and Computer Crime Forensic science, Computers and Internet”, Elsevier Academic Press –Second Edition, 2011, ISBN: 9780123742681.
2. Shira A scheindlin, “A Electronic Discovery and Digital Evidence in a Nut Shell West”, Academic Press; 2nd Revised edition, 2016, ISBN-13: 978-1634597487

Reference Books

1. Marcella, “Cyber Forensics: A Field Manual For Collecting, Examining & Preserving Evidence Of Computer Crimes”, Auerbach Publications, 2 edition, 2007, ISBN-13: 978-0849383281
2. John Sammons, “The Basics of Digital Forensics: The Primer for Getting Started in Digital Forensics Paperback ”, Syngress; 2 edition, 2014, ISBN-13: 978-1597496612
3. Casey, Eoghan. “Digital Evidence and Computer Crime: Forensic Science, Computers, and the Internet Hardcover”, Academic Press; 3 edition, 2011, ISBN-13: 978-0123742681

18CA2017 NETWORK SECURITY APPLICATIONS

Credits: 3:0:0

Course Objective:

- To acquire knowledge in the field of Networks, Security Concepts, Kinds of security breaches
- To understand Access Control Models
- To understand Network Security Applications, Authentication Mechanisms

Course Outcome:

Students will be able to:

- Understand Characteristics of Networks, Security Concepts, identify vulnerabilities
- Explain Access Control Model and Encryption techniques
- Understand Sniffing, Spoofing
- Study Security protocols
- Learn Firewalls design principles
- Explain the Authentication Mechanisms

Unit I - Introduction-Characteristics of Networks, Security Concepts, Kinds of security breaches – Threats and Risks, Points of vulnerability, Attacks – Passive and Active, Security Services - Control measures – Effectiveness of controls, Model for Internetwork Security, Internet Standards

Unit II- Access Control Models, Chinese Wall, Clark-Wilson, Bell LaPadula, Non Interference and Role Base Model Cryptography, Encryption techniques – Characteristics of good encryption systems

Unit III - Secure sockets –IPSec-Internet Key Exchanging(IKE) – IKE phases –encoding – Internet security – Threats to privacy – Packet sniffing – Spoofing - Web security requirements – Real Time communication security – Security standards–Kerberos.X.509 Authentication Service.

Unit IV - Security protocols – Transport layer protocols – SSL –Electronic mail security – PEM and S/MIME security protocol– Pretty Good Privacy – Web Security - Firewalls design principles – Trusted systems – Electronic payment protocols- Intrusion detection.

Unit V - Network Security Applications, Authentication Mechanisms: Passwords, Cryptographic authentication protocol, SmartCard, Biometrics, Digital Signatures and seals, Kerberos,X.509 LDAP Directory.

Text Books

1. William Stallings, "Network Security Essentials", Pearson Education, 3rd edition, 2011, ISBN-13: 978-8131758977
2. Easttom II, Computer Security Fundamentals, 2e Paperback, Pearson Education India;2 edition, 2014, ISBN-13: 978-9332539433

Reference Books

1. William Stallings, “Cryptography and Network Security: Principles and Standards”, Prentice Hall India, Pearson Education; Seventh edition, 2017, ISBN-13: 978-9332585225

2. Charles P. Pleege, "Security in Computing", Pearson Education, 4th Edition, 2011, SBN 978-0-13-408504-3
3. Mark Ciampa, "Security+ Guide to network Security Fundamentals", Fourth Edition, Cengage Learning, 2011, ISBN-13: 978-1111640170.
4. AtulKahate,"Cryptography and Network Security", McGraw Hill Education; Third edition , 2017 , ISBN-13: 978-1259029882

18CA2018 NETWORK SECURITY APPLICATIONS LAB

Credits: 0:0:2

Co-requisite: Network Security Applications

Course Objective:

- To acquire knowledge in the field of Networks, Security Concepts, Kinds of security breaches.
- To understand Access Control Models.
- To understand Network Security Applications, Authentication Mechanisms.

Course Outcome:

Students will be able to:

- Understand Characteristics of Networks, Security Concepts, identify vulnerabilities
- Study the features of encryption systems
- Explore Sniffing, Spoofing
- Study Security protocols
- Firewalls design principles
- Learn Authentication Mechanisms

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

18CA2019 EMAIL FORENSICS

Credits: 3:0:0

Course Objective:

- To acquire knowledge in the field of Scams, Spams and other abuses
- To understand Principles of Filtering
- To understand advanced Content filtering

Course Outcome:

Students will be able to:

- Understand the threat, Content filtering
- Understand the Spams, Scams
- State Basic filtering
- Learn to set up a mail server
- Learn advanced Content filtering
- Learn Bayesian Filtering

Unit I - The rise of email: The threat – Email pollution – email blindness – Email subject obfuscation – little history – Content filtering – Collaborative filtering – Reputation analysis – Sender authentication – Network properties – Challenge response – Sending message from A to B – The protocols – Headers and Content

Unit II - Scams, Spams and other abuses: Spam – Scams – Banking scams, upfront pieces, Tax and other refunds – Phishing and Identity theft, Botnets, trojans - Bulk mailing – Investigative forensics – Identifying marks, matching entry with logs, Traversing the received mail

Unit III - Principles of Filtering: Basic filtering – Binary classification and filter performance – Measurement in practice – Binary classification and multiple mail categories – Blacklist and Whitelists – External whitelists, External Blacklists, Personal hatelists

Unit IV - Setting up a mail server: Proxies – Client checks – Sender checks – Recipient checks – Data checks – Content Header checks - Content body checks – Enabling other checking systems – Demands on the server – Logs in Mailboxes – Outgoing mail – Contaminated machines, Sender verification

Unit V- Advanced Content filtering: Simple text patterns – Advanced text patterns – Role of honeypots – Dealing with backscatter – Dealing with image spam – Dealing with embedded links – Bayesian Filtering – email trials

Text Books

1. Les Hatton, “Email Forensics: Eliminating Spam, Scams and Phishing”, Paperback, Blue Spear Publishing, 2011, ISBN-13: 978-1908422002
2. John Sammons, “The basics of Digital Forensics”, Second Edition, Syngress Publication, 2012, ISBN-13: 978-0128016350

Reference Books

1. Chris Davis, Aaron Philipp, David Cowen, “Hacking Exposed Computer Forensics”, McGraw-Hill Education; 2 edition, 2009, ISBN-13: 978-007162678-1.
2. Greg Gogolin, “Digital Forensics Explained”, Auerbach Publications; 1 edition, 2013, ISBN-13: 978-1439874950.
3. David Cowen, “Computer Forensics InfoSec Pro Guide”, McGraw-Hill Education; 1 edition, 2013, ISBN-13: 978-007172467.

18CA2020 DOCUMENT EXAMINATION AND FINGER PRINT ANALYSIS

Credits: 3:0:0

Course Objective:

- To understand History of Forensic Document Examination
- To understand Instruments used for Forensic Document Examination
- To understand Forensic Document Examiners Standards

Course Outcome:

Students will be able to:

- Understand the History of Forensic Document Examination
- Explain Handwriting Individuality & Methodology
- State the Elements of Writing in Forensic Document Examination
- Learn Instruments used for Forensic Document Examination
- State Case Examples
- Understand Standards for Forensic Document Examiners

Unit I - The History of Forensic Document Examination: Pioneers of Forensic Document Examination - Questioned Document Organization - Forensic Laboratories Established with Questioned Document Sections - Forensic Document Examination Defined - Training of Forensic Document Examiners – Certification

Unit II - Handwriting Individuality & Basic Methodology: Individuality in Handwriting – Research - Methodology in Forensic Document Examination - ACE Method - Elements of Writing in Forensic Document Examination - Other Ways to Articulate FDE Methodology - Natural Variation in Handwriting

Unit III - Instrumentation: Stereo Microscope – Magnifiers - Light Panels – MiScope - Video Spectral Comparators - Hyperspectral Imaging - Electrostatic Detection Devices - Photography and Imaging - Specialized Grids

Unit IV - Case Examples: Introduction - John Waters Will Case - Medical Records Case - Original Contract Case - Irene V. Vander Zee Will Case - Cases with Low Resolution Images of Checks - Typewriter Defect Case - Check Alterations - Alteration to a Letter - Simulated Signature Case.

Unit V - Standards for Forensic Document Examiners: Standardization in Questioned Document Literature - ASTM International Standards – SWGDOC - American Board of Forensic Document Examiners (ABFDE) Certification

Text Books

1. Jane Lewis, “Forensic Document Examination”, 1st Edition, Academic Press, 2014, ISBN-13: 978-0124166936

2. Koppenhaver, Katherine M, "Forensic Document Examination", Humana Press, 2007, ISBN 978-1-59745-301-1

Reference Books

1. Michael J. Allen, "Foundations of Forensic Document Analysis: Theory and Practice (Essential Forensic Science), Wiley-Blackwell; 1 edition, 2015, ISBN-13: 978-1118729939
2. Michael Wakshull, "Line by Line: Forensic Document Examination -- A Strategy for Legal Professionals", Paperback – Import, 2013, Q9 Consulting, Incorporated, ISBN-13: 978-0985729400
3. Michael P. Caligiuri, "The Neuroscience of Handwriting: Applications for Forensic Document Examination (International Forensic Science and Investigation) Hardcover – Import", CRC Press; 1 edition, 2012, ISBN-13: 978-1439871409
4. Reed C Hayes, "Training Course in Questioned Handwriting & Document Examination Paperback – 2014", Reed Hayes Handwriting Examiner, ISBN-13: 978-0578136325

18CA2021 DOCUMENT EXAMINATION AND FINGER PRINT ANALYSIS LAB

Credits: 0:0:2

Co-requisite: Document Examination And Finger Print Analysis

Course Objective:

- To understand History of Forensic Document Examination
- To understand Instruments used for Forensic Document Examination
- To understand Forensic Document Examiners Standards

Course Outcome:

Students will be able to:

- Learn Forensic Document Examination
- Learn Handwriting Individuality & Methodology
- Learn Methodology in Forensic Document Examination
- Learn Instruments used for Forensic Document Examination such as Stereo Microscope – Magnifiers - Light Panels – MiScope
- Learn Instruments used for Forensic Document Examination such as Video Spectral Comparators - Hyperspectral Imaging
- Learn Instruments used for Forensic Document Examination such as Electrostatic Detection Devices - Photography and Imaging - Specialized Grids

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

18CA2022 INFORMATION ETHICS

Credits: 3:0:0

Course Objective:

- To understand need of Information ethics
- To understand information ethics Frameworks
- To understand areas requiring policy level attention

Course Outcome:

Students will be able to:

- Understand the need of Information ethics
- Explain Information ethics in real world scenarios
- Learn information ethics Frameworks
- State areas requiring policy level attention
- Define Big data and data mining
- Understand Issues and concerns

Unit I - Information ethics: Introduction - need of information ethics- Ethical theory vs. ethical practices - Social contract theory and utilitarianism - Introduction to moral reasoning – values in information context

Unit II - Information ethics in real world scenarios: Due care, due diligence - Applying rationale for freedom of speech to information context - Information power and social stratification - Ethical and legality – thin lines at the border - Enforcement vs voluntary compliance of security baselines and policies

Unit III - Frameworks for information ethics: Taxonomy of computer ethics - First principle of information ethics –Ethics and the Internet - Steven Levy’s Hacker ethics - Ten commandments of Computer Ethics Institute - Fallacies in computer ethics

Unit IV - Areas requiring policy level attention: Network infrastructure - Surveillance on access and use of information - Wealth and division of labor in networked society - Introduction to intellectual property rights – patents, trade / service marks and copyrights - Big data and data mining

Unit V - Issues and concerns: On-line privacy – concerns about loss of privacy on-line - Digital Gambling – ethical implications - Videogames addiction - Cyber bullying - Right to Privacy - Privacy in the Facebook era

Text Books

1. Floridi, L., “The ethics of information. Oxford: Oxford University Press, 2013, ISBN: 9780198748052, 0198748051
2. Floridi, L. “The Philosophy of Information. Oxford: Oxford University Press, 2011, ISBN-13: 978-0199232390

Reference Books

1. The Open University, “Introducing ethics in Information and Computer Sciences Kindle Edition, The Open University; 1.0 edition, 2016, ISBN: 978-147301773,
2. Bawden, D. & Robinson, L., “Introduction to information science. London: Facet, 2012, ISBN-13: 978-1555708610
3. Bawden, D. & Robinson, L., “Library and Information Science. In International Encyclopedia of Communication Theory and Philosophy, K.B. Jensen and R.T. Craig(eds.), New York NY: Wiley, 2016, ISBN: 978-3-658-14681-8_2
4. Thomas Koenig, Michael Rustad, “Global Information Technologies: Ethics and the Law (Higher Education Coursebook), West Academic Publishing; 1 edition, 2017, ISBN-13: 978-1683285731

18CA2023 SECURITY INVESTIGATION AND REPORT WRITING

Credits: 3:0:0

Course Objective:

- To understand Security Investigation, Elements of investigation, Guidelines
- Learn report writing
- To understand the Importance of report writing

Course Outcome:

Students will be able to:

- Understand the Security Investigation, Elements of investigation, Guidelines
- Explain report writing
- Present a Case study analysis Reports
- State the types of reports
- State the mechanism of writing a report
- Learn the Importance of report writing

Unit I - Security Investigation: What is Security Investigation – Elements of investigation – Tools of the investigation – Three fold aim of investigation – Qualities of an effective investigation – Characteristics of a successful investigator – Systematic approach to investigation – Methods and sources to be used – Studies of the document or records – Guidelines in an investigation

Unit II- Report writing: What is a report writing – Reports and essays – Key differences – Types of report: Information only reports – research reports – Case study analysis reports – Writing a good report: Purpose of the report – Scope of the report – Features of a well written report – Format of the report – Section of the report – Examples of report writing

Unit III - Types of reports: Classification of report: Formal – Informal – Statutory – non statutory – Routine – Special – Informative – Interpretative – Advantage – Steps for report writing - Format

Unit IV - Mechanism of writing a report: Size and Physical design – Layout – Treatment of quotations – footnotes: page number, For cross references – Documentation style – Abbreviations – Use of statistics, Charts, graphs – Final draft –Bibliography – Preparation of index

Unit V- Importance of report writing: Introduction – Mistakes in report writing – Importance of report writing – Types of reports – Report do last forever – Importance of report writing – Tips for writing fraud examination reports – Planning the report – avoiding common reporting mistakes – Tips to keep in mind when writing an expert report – Additional consideration for written reports

Text Books

1. Michael Karson, Lavita Nadkarni, “Principles of Forensic Report Writing (Forensic Practice in Psychology)”, American Psychological Association; 1 edition, 2013, ISBN-13: 978-1433813061
2. Bruce W. Pixley, “Report Writing Handbook for the Computer Forensic Examiner: Law Enforcement Edition”, Createspace Independent Pub; 1 edition, 2014, ISBN-13: 978-1492208433

Reference Books

1. Suzanne Widup, “Computer Forensics and Digital Investigation with EnCase Forensic”, McGraw-Hill Education, 2013, ISBN-13: 9780071807913
2. Jonathan Reuvid, “Managing Cyber security Risk: Cases Studies and Solutions, Legend Press”, 2 edition, 2016, ISBN-13: 978-1787198913
3. Prakash Prasad, “A Brief Introduction on Cyber Crime Cases under Information Technology Act: Details & Analysis | Handbook | Cyber Law Cases Indian Context, CreateSpace”, Independent Publishing Platform; First edition, 2017, ISBN-13: 978-1548094331
4. Randy K. Otto, Richard DeMier, Marcus Boccaccini, “Forensic Reports and Testimony: A Guide to Effective Communication for Psychologists and Psychiatrists”, John Wiley & Sons, 2014, ISBN-13: 978-1118136720

18CA2024 SECURITY INVESTIGATION AND REPORT WRITING LAB

Credits: 0:0:2

Co-requisite: Security Investigation And Report Writing

Course Objective:

- To understand different types of case Studies
- Learn to write a Report
- Research a Case Study, Identify Strengths and Weaknesses of Case Studies

Course Outcome:

Students will be able to:

- Understand the Security Investigation, Elements of investigation, Guidelines
- Explain report writing
- Present a Case study analysis Reports
- State the types of reports
- State the mechanism of writing a report
- Learn the Importance of report writing

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

18CA2025 TRUST MANAGEMENT IN E-COMMERCE

Credits: 3:0:0

Course Objective:

- To understand Network and E-Commerce
- To acquire knowledge on E-Commerce Security Environment
- To understand Trust models and the E-Commerce domain

Course Outcome:

Students will be able to:

- Understand the Network and E-Commerce
- Understand the Ecommerce Payment systems
- State E-Commerce Security Environment
- Learn Inter-organizational trust
- State the trust mechanisms in a trusted platform
- To gain knowledge on Trust models and the E-Commerce domain

Unit I - Introduction to E-Commerce – Network and E-Commerce – Types of E-Commerce – Ecommerce Business Models: B2C, B2B, C2C, P2P and M-commerce business models – Ecommerce Payment systems: Types of payment system – Credit card E-Commerce transactions– B2C E-Commerce Digital payment systems – B2B payment system

Unit II

Security and Encryption: E-Commerce Security Environment – Security threats in E-Commerce environment – Policies, Procedures and laws

Unit III

Inter-organizational trust in E-Commerce: Need – Trading partner trust – Perceived benefits and risks of E-Commerce – Technology trust mechanism in E-Commerce – Perspectives of organizational, economic and political theories of inter-organizational trust – Conceptual model of inter-organizational trust in E-Commerce participation

Unit IV: Introduction to trusted computing platform: Overview – Usage Scenarios – Key components of trusted platform – Trust mechanisms in a trusted platform

Unit V- Trusted platforms for organizations and individuals – Trust models and the E-Commerce domain.

Text Books:

1. David Whiteley, “E-Commerce: Strategy, Technologies And Applications (Information Systems Series)”, McGraw-Hill Higher Education, 2017, ISBN-13: 978-0070445321
2. Laudon, “E-Commerce”, Pearson Education India; 10 edition, 2016, ISBN-13: 978-0133938951

Reference Books

1. Kenneth C. Laudon and Carol Guercio Trave, “E-Commerce Business Technology Society”, Pearson Education, 2009, ISBN: 9780321200563
2. Bharat Bhasker, “Electronic Commerce: Framework, Technologies and Applications”, Tata McGraw – Hill, 4th edition, 2013, ISBN-13: 978-9351341673
3. Kenneth C. Laudon and Carol Guercio Traver, “E-Commerce – Business, Technology, Society”, Pearson; 13th edition, 2017, ISBN-13: 978-9353063153
4. G. Schneider, “Electronic Commerce”, Cengage Learning, 11th edition, 2014, ISBN-13: 978-1285742298

18CA2026 BIG DATA ANALYTICS LAB

Credits: 0:0:2

Co requisite: Big Data Analytics

Course Objective:

Enable the student to

- Learn the Hadoop environment
- Explore about MongoDB and Mapreduce Programming

- Hands on experience on machine learning

Course Outcome:

The student will be able to

- Learn about the concept of Hadoop
- Apply big data to solve real world problem
- Learn about MongoDB
- Explore in Mapreduce Programming
- Explore about the NoSQL
- Learn about machine learning

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

18CA3001 VULNERABILITY ASSESSMENT AND PENETRATION TESTING

Credits: 3:0:0

Course Objective:

- To understand Ethical Hacking terminology
- To understand the foot printing, Scanning and Enumeration, Social Engineering
- To understand System Hacking

Course Outcome:

Students will be able to:

- Identify different types of hacking technologies
- Understand foot printing
- Learn Different types of DNS records
- Understand Social Engineering
- Understand Scanning and Enumeration
- Learn System Hacking

Unit I - Introduction to Ethical hacking: Certified Ethical Hackers – Network and Computer Attacks – Ethical Hacking Plan – Ethical Hacking Methodology. Foot printing Tools – Conducting Competitive Intelligence - DNS Zone Transfers – Introduction to Social Engineering – Performing Social Engineering Attacks – Social Engineering Countermeasures.

Unit II - Introduction to Port Scanning – Types of Port Scan – Port Scanning Tools - Conducting Ping Sweeps - Shell Scripting. Enumeration: Introduction - Enumerating Windows, Symbian, Java OS, Android and NetWare Operating Systems.

Unit III - Ethical Hacking Web Servers: Web Application – Web Application Vulnerabilities – Tools for Web Attackers and Security Testers. Ethical Hacking Wireless Network: Wireless Technology – Wireless Network Standards – Authentication – Wardriving – Wireless Ethical Hacking – Protecting Networks with Security Devices.

Unit IV - Windows: Vulnerabilities – Choosing Tools – Information Gathering – RPC – Null Sessions – Share Permissions – Hardcore Vulnerability Exploitation. Linux: Vulnerabilities – Information Gathering – Unconnected Services - .rhosts and hosts.equiv Files – NFS – File Permissions – Buffer Overflow

Unit V - Ethical Hacking Applications: Messaging Systems – Web Applications – Mobile Applications - Databases - Reporting Results

Text Books:

1. Matt Walker, “CEH Certified Ethical Hacker All-in-One Exam Guide”, Second Edition Paperback – 1, McGraw Hill Education, 2014, ISBN-13: 978-0071836487
2. Srikanth Ramesh, “How to Hack: Hacking Secrets Exposed: A Beginner's Guide”, Kindle Edition, GoHacking eBook Services, 2015, ISBN:0128021497

Reference Books:

1. Michael Gregg, “Certified Ethical Hacker (CEH) Version 9 Cert Guide (Certification Guide)”, Pearson IT Certification; 2 edition , 2017

2. Stuart McClure, Joel Scambray, George Kurtz, "Hacking Exposed" 7th Edition, McGraw Hill, 1 August 2012
3. Dexter Jackson, "Hacking: Ultimate Beginner's Guide to Computer Hacking in 2016; 18Hacking for Beginners", Hacking University, Hacking MadeEasy, Hacking Exposed, Hacking Basics", Create Space Independent Publishing Platform (30 August 2016)
4. Jeremy Faircloth, "Penetration Tester's Open Source Toolkit", Syngress; 4 edition (20 September 2016)

18CA3002 VULNERABILITY ASSESSMENT AND PENETRATION TESTING LAB

Credits: 0:0:2

Co-requisite: Vulnerability Assessment and Penetration Testing

Course Objective:

- To understand Ethical Hacking terminology
- To understand the foot printing, Scanning and Enumeration, Social Engineering
- To understand System Hacking

Course Outcome:

Students will be able to:

- Learn to identify known weaknesses
- Understand basic penetration test
- Scanning the network or application
- Identify security flaws
- Exploiting the security flaws
- Learn password cracking techniques

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

18CA3003 ACCESS CONTROL AND IDENTITY MANAGEMENT SYSTEM

Credits: 3:0:0

Course Objective:

- Understand the elements of System Security, Identity Management models
- Be familiar with the third party approach
- Learn the mobile Access control models, Techniques and technologies
- State Access control administration, methods

Course Outcome:

Students will be able to:

- Explain the elements of System Security, Identity Management models
- Familiar with the third party approach to identity trust
- Gain knowledge on Access control models,
- Understand Access control Techniques and technologies
- Familiar with the Access control administration, methods
- Learn Access control practices and identify threats to access control

Unit I - Introduction: Elements of System Security – Identification, Authentication, Authorization and Accountability - Identity Management models: local –Network - federal – global web identity - XNS approach for global Web identity - Centralized enterprise level - Identity Management

Unit II - Third party approach to identity trust: Kerberos -Explicit third party authentication paradigm – PKI approach to trust establishment – Attribute certificates – Generalized web of trust models

Unit III - Access control models, Techniques and technologies: Discretionary access control - Mandatory access control - Role based access control- Rule based access control– Constrained user interfaces – Access control matrix – Content Dependent access control - Context Dependent access control

Unit IV- Access control administration, methods: Centralized access control administration – Decentralized access control administration – Access control layers – Administrative controls – Physical controls – Technical controls

Unit V - Access control practices: Unauthorised disclosure of information – Intrusion detection systems – Intrusion prevention system – Keystroke monitoring – Threats to access control: dictionary attacks, Brute force attacks, Spoofing at Logon, Phishing and Pharming

Text Books:

1. Messaoud Benantar, “Access Control Systems, Security, Identity Management and TrustModels”, Springer Publications, 2010, 978-1-4419-3473-4
2. Shon Harris, Jonathan Ham, CISSP Practice Exams”, McGraw-Hill Education; 4 edition, 2016, 978-1259585968

Reference Books:

1. Harold F Tipton, Micki Krause , “Information Security Management handbook”, 6th Edition, , Auerbach Publications, 2012, ISBN: 978-1138199750
2. ErtemOsmanoglu, “Identity and Access Management: Business Performance Through Connected Intelligence”,Syngress, 2013, ISBN: 978-0124081406
3. Ed Tittel, Mike Chapple, James Michael Stewart “Certified Information Systems Security Professional Study Guide”, 6th Edition, Sybex Publication, 2012, 978-0-470-94498-1

18CA3004 ACCESS CONTROL AND IDENTITY MANAGEMENT SYSTEM LAB

Credits: 0:0:2

Co-requisite: Access Control and Identity Management System

Course Objective:

- Understand the elements of System Security,Identity Management models
- Be familiar with the third party approach
- Learn the mobile Access control models, Techniques and technologies
- State Access control administration, methods

Course Outcome:

Students will be able to:

- Explain the elements of System Security,Identity Management models
- Familiar with the third party approach to identity trust
- Gain knowledge on Access control models,
- Understand Access control Techniques and technologies
- Familiar with the Access control administration, methods
- Learn Access control practices and identify threats to access control

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

18CA3005 WEB APPLICATION SECURITY

Credits: 3:0:0

Course Objective:

- To understand Security Fundamentals
- To understand the Web application security principles
- To understand Session Management

Course Outcome:

Students will be able to:

- LearnOWASP top ten list
- Understand Security Fundamentals
- Learn Web application security principles - authentication
- Learn Web application security principles – Authorization
- Learn about validation credentials

- Understand Session Management Fundamentals

Unit I - Introduction: OWASP top ten list – Injection, Cross site scripting, Broken authentication and session management, Insecure direct object, cross site request forgery, security misconfiguration, insecure cryptographic storage, failure to restrict URL access, insufficient transport layer protection, Unvalidated redirects and forwards

Unit II - Security Fundamentals: Input validation – Blacklist validation, Whitelist validation, validation practices, Defence in depth approach – Attack surface reduction – Classifying and prioritize threats – STRIDE, IIMF, CIA, Common weakness enumeration, DREAD, Common vulnerability scoring system

Unit III- Web application security principles: Web application authentication – password based authentication systems, Built in HTTP authentication, Single sign on authentication, custom authentication systems, Validating credentials – Securing password based authentication

Unit IV- Web application security principles – Authorization: Authorization – Session management – Authorization fundamentals – Authorization goals – Authorization check process – Types of permissions – Authorization layers - Controls y layers – We authorization best practices – Attack against authorization

Unit V - Session Management Fundamentals: What's Session? –Session state – Session Management – Attack against sessions – SSL and HTTPs – Securing web application session management – Session management best practices

Text Books:

1. Bryan Sullivan, Vincent Liu, "Web Application Security, A Beginner's Guide Paperback – 2012", McGraw-Hill Education, ISBN: 978-0071776165
2. Neil Dawwani, Christoph Kern and Anita Kesavan, "Foundations of Security", Apress, 2007, ISBN: 978-1590597842.

Reference Books:

1. Joel Scambray, Mike Shema, Caleb Sima, "Hacking Exposed Web Application", 2nd Edition. 2010, ISBN: 978-0072262995
2. Mike Shema, "Hack Notes Web Security Pocket", 2010, McGraw Hill Professional, ISBN: 0672227842.
3. Steven Splaine, "Testing Web Security: Assessing the Security of Web Sites and Applications", 2011, ISBN: 978-0471232810

18CA3006 WEB APPLICATION SECURITY LAB

Credits: 0:0:2

Co-requisite: Web Application Security

Course Objective:

- To understand Security Fundamentals
- To understand the Web application security principles
- To understand Session Management

Course Outcome:

Students will be able to:

- Learn OWASP top ten list
- Understand XSS (Cross-Site-Scripting) and SQL injection
- Learn HTTP vs HTTPS
- Learn Session security, cookies, session hijacking
- Learn OSRF/CSRF (On-Site and Cross-Site Request Forgery)
- Learn Authentication and authorization errors, "remember me" features

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

INFORMATION TECHNOLOGY

LIST OF COURSES

Course Code	Name of the Course	Credit
17CA3021	E-mail Security	3:0:0
17CA3022	Social Media Crimes	3:0:0
17CA3023	Digital Frauds	3:0:0
17CR2008	Field Visit to Criminal Justice Institutions	0:0:2
17CR2009	Criminology Practical Lab I	0:0:2
17CR2010	Basics of Indian Constitutions & Offenders Rights	4:0:0
17CR2011	Forensic Science in Crime Investigation	4:0:0
17CR2012	Police Administration	4:0:0
17CR2013	Research Methodology and Statistics in Criminology and Police Administration	4:0:0
17CR2014	Penology and Correctional Administration	4:0:0
17CR2015	Criminology Practical Lab II	0:0:2
17CR2016	Indian Penal Code and Indian Evidence Act	3:0:0
17CR2017	Victimology	4:0:0
17CR2018	Forensic Analysis	4:0:0
17CR2019	Privileged Class Deviance	3:0:0
17CR2020	Criminology Practical Lab - III	0:0:2
17CR2021	Private Detective and Investigation	4:0:0
17CR2022	Fire and Industrial Safety	4:0:0
17CR2023	Human Rights and Criminal Justice Administration	4:0:0
17CR2024	Criminology Practical Lab IV	0:0:2
17CR2025	White Collar Crime and Organized Crime	4:0:0
17CR2026	Prevention of Crime and Delinquency	4:0:0
17CR2027	Media and Crime	4:0:0
17CR2028	Environmental Crimes	4:0:0
17CR2029	Document Examination	4:0:0
17CR2030	Cyber Crimes	4:0:0
17CR2031	Abnormal Psychology	4:0:0
17CR2032	Digital Frauds	4:0:0
17CR2033	Crimes Against Women and Children	4:0:0
17CR2034	Special Laws	4:0:0
17CR2035	NGO Management	4:0:0
17CR2036	Cyber Crimes Practical Lab	0:0:2

17CA3021 E-MAIL SECURITY

Credits: 3:0:0

Course Objective:

- To understand Email, Mobiles and wireless
- To understand the Security framework for mobile systems and E-mail Security
- To gain knowledge on Mobile Phone, Android, Email forensics

Course Outcome:

Students will be able to:

- Understand Email, Mobiles and wireless devices
- Learn E-mail Security

- State Security framework for mobile systems
- Understand Mobile Phone forensics
- Learn Android forensics
- Learn Email Forensics

Unit I

Lecture hours: 45

Introduction: How email works - The role of Mail User Agent, Mail Delivery Agent, Mail Transfer Agent, and DNS servers - An overview of various protocols (SMTP, POP, IMAP) involved in a typical email infrastructure - A brief introduction to security issues relevant to emails as well as the typical email infrastructure – Introduction on Mobiles and wireless devices –Types of Mobiles and wireless devices and their functionalities - Proliferation of Mobile and Wireless Devices

Unit II

E-mail Security: Security Services for E-mail-attacks possible through E-mail – establishing keys-privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME.

Unit III

Security framework for mobile systems: CIA triad in mobile phones-Voice, SMS and Identification data interception in GSM: Introduction, practical setup and tools, implementation- Software and Hardware Mobile phone tricks: Netmonitor, GSM network service codes, mobile phone codes, catalog tricks and AT command set- SMS

security issues

Unit IV

Mobile Phone forensics: Crime and mobile phones, evidences, forensic procedures, files present in SIM card, device data, external memory dump, evidences in memory card, operators systems- Android forensics: Procedures for handling an android device, imaging android USB mass storage devices, logical and physical techniques

Unit V

Email Forensics - Understanding message headers - Forging message headers and identifying forged headers - General approaches to tracking the email sender - General approaches to inspect attachments - Spam and steganography

Text Books:

1. Iosif I. Androulidakis, “Mobile phone security and forensics: A practical approach”, Springer publications, 2012, ISBN: 978-3-319-29742-2.
2. Andrew Hoog, “Android Forensics: Investigation, Analysis and Mobile Security for Google Android”, Elsevier publications, 2011, ISBN: 978-1-59749-651-3.
3. IT Governance Publishing, “E-Mail Security: A Pocket Guide”, It Governance Publishing (November 30, 2010), ISBN: 978-1849280976.

Reference Books

1. Charles J. Love, “5 EMAIL SECURITY SOLUTIONS THAT EVERYONE WHO USES EMAIL SHOULD BE USING: Email security recommendations by someone who has been in the industry for over 17 years”, Amazon Digital Services LLC, September 28, 2017
2. Jim Doherty, “Wireless and Mobile Device Security (Jones & Barlett Learning Information Systems Security & Assurance) ”, Jones & Bartlett Learning; 1 edition (January 6, 2015), ISBN: 9781284059276.
3. Neil Bergman, Mike Stanfield, Jason Rouse, Joel Scambray, Sarath Geethakumar, Swapnil Deshmukh, Scott Matsumoto, John Steven, “Hacking Exposed Mobile: Security Secrets & Solutions”, McGraw-Hill Education; 1 edition (July 30, 2013), ISBN: 978-0-07-181702-8.

17CA3022 SOCIAL MEDIA CRIMES

Credits: 3:0:0

Course Objective:

- To understand Social Networks and crime
- To be familiar with the types of social working criminality
- To understand the criminal Justice System and Social Networking

Course Outcome:

Students will be able to:

- Understand Social Networks and crime
- State the types of social working criminality
- Present a Case Study
- Learn criminal Justice System and Social Networking
- Explain Criminal defendants
- Understand Personal use and ethics

Unit: Understanding the social Network

History of Social Networking – Creating identity on social Network sites – Social Networks and crime: applying criminological theories

Unit II: Types of Social Working Criminality

Texting and Social Networks - Identity Theft and Social Networks - Wall Posts and Tweets and Blogs - Understanding Digital Piracy Using Social Networks: An Integrated Theory Approach - Patterns of Sexual Victimization of Children and Women in the Multipurpose Social Networking Sites - Case Study: Advancing Research on Hackers through Social Network Data

Unit III: The Criminal Justice System and Social Networking

Further Examining Officer Perceptions and Support for Online Community Policing - Prosecution and Social Media - Corrections and Social Networking Websites – Countermeasures

Unit IV: Increasing use of social Networking sites – Trends – Effect on the society – Use of social media by political parties during elections

Unit V: Social Media is Big Business

Economic dimensions of social networking sites – Digital Identities – Privacy and anonymity – Social Activism – Social Medias dark side – Civic engagement in social world

Text Books:

1. Catherine D. Marcum, George E. Higgins, “Social Networking as a Criminal Enterprise (Kindle Edition)”, CRC Press; 1 edition (28 April 2014), ISBN: 9781466589797
2. Thaddeus A. Hoffmeister, “Social Media in the Courtroom: A New Era for Criminal Justice”, Hardcover import, Praeger (August 11, 2014), ISBN: 9781440830051.

Reference Books

1. Venessa Garcia, Samantha G. Arkerson “Crime, Media, and Reality: Examining Mixed Messages About Crime and Justice in Popular Media Kindle Edition”, Rowman & Littlefield Publishers (8 December 2017), ISBN: 978-1442260818.
2. Michael Salter, “Crime, Justice and Social Media (New Directions in Critical Criminology)”, Kindle Edition, Routledge (4 October 2016), ISBN: 9781138919679.

17CA3023 DIGITAL FRAUDS

Credits: 3:0:0

Course Objectives:

- To understand Banking & Financial Concepts
- To understand Corporate Fraud
- To understand Trends in e-commerce & digital fraud

Course Outcome:

Students will be able to:

- Learn types of fraud, Detection, Opportunities & Countermeasures
- Understand Banking Concepts & Fraud
- Understand Corporate Fraud
- Understand Financial Concepts & Fraud
- Gain knowledge on Audit Report on the Financial Statements
- Explain Trends in e-commerce & digital fraud

Lecture hours: 45

Unit I: Introduction

Fraud introduction and overview - “Standard” fraud types - recent fraud types - The next generation of fraud – Fraud Detection – Fraud opportunities - Countermeasures

Unit II: Banking Fraud

Banking Concepts - Core Banking Solution - Security mechanisms to secure network and devices – Internet Banking - Mobile banking - Cyber Security Attacks On Banks – Fraud Detection – Fraud opportunities

Unit III: Corporate Fraud

Nature of Fraud - Elements of crimes of theft and fraud – Role of ethics in fighting fraud – Controlling fraud – fraud risk management – Investigating fraud – Computer fraud and countermeasures

Unit IV: Financial Fraud

The Origin of Financial Fraud - Treadway to Sarbanes-Oxley - The Sarbanes-Oxley Act - The Audit Committee - Detection and Its Aftermath - Investigating Financial Fraud - Finding the False Numbers - Getting a New Audit Report on the Financial Statements - The Securities and Exchange Commission - The Future of Financial Reporting

Unit V: Trends in e-commerce & digital fraud

Introduction-Methods of payment fraud - Decoding the methods of online or e-commerce fraud - The financial impact of online or e-commerce fraud - e-commerce fraud prevention capabilities - Use of technology

Text Books:

1. Richard E. Cascarino, Corporate Fraud and Internal Control Workbook: A Framework for Prevention, Wiley, Dec 2012, ISBN: 9781118317105.
2. Michael R. Young, Financial Fraud Prevention and Detection: Governance and Effective Practices, Wiley, Oct 2013, ISBN: 978-1118761632.

Reference Books

1. Zabihollah Rezaee, Richard Riley, ”Financial Statement Fraud: Prevention and Detection”, Wiley, 2nd edition, 2009, ISBN: 9780470455708
2. Richard H Girgenti and Timothy P, ”Managing the risk of fraud and misconduct the challenges of a Global, Regulated and Digital Environment”, Hedley , first edition, Mc Graw Hill Education Publication, 2011, ISBN: 9780071621298
3. Cecil W Jackson, “Detecting Accounting Fraud: Analysis and Ethics”, 1st edition, Pearson Education, 2014, ISBN:9780133078602
4. Stephen Pedault,”Anatomy of a fraud investigation,1st edition, John Wiley & sons Publication,2010, ISBN:978047056047
5. Jan Wilson, “Telecom and Network Security :Toll Fraud and Telabuse update”, 2nd edition, telecommunication reports International publications, 2010, ISBN:978938866091

17CR2008 FIELD VISIT TO CRIMINAL JUSTICE INSTITUTIONS

Credit 0:0:2

Course Objectives

- To give hands on practical and field exposure to Criminal Justice Institutions such as Police, Prison, judiciary, NGO's.
- To understand the different functions in the Criminal Justice Agencies.
- To enable the students to understand the overall agencies involved in the Criminal justice system process.

Course Outcomes

By the end of the course, students should be able to:

- Students must be aware of the different kind of functions that are carried out in the agencies pertaining to Criminal Justice System.
- Aware of the different roles and responsibilities of the uniformed service personnel such as police, prison, Judiciary and NGO's organizations.
- Students will be equipped with the capacity to design state-of- the-art approaches to deal with the social injustices and social harms.
- It helps the students to articulate ethical implications of decision making in a professional capacity.
- Students will demonstrate a professional demeanor in behavior and communication.
- Apply theoretical knowledge to practical problems.

Visits to

1. Police Department
Police station with the jurisdiction of Coimbatore city, understanding of Law and Order, Crime, Traffic, Cyber Crime Cell divisions
2. Central Prison Coimbatore
Prison administration, inmate's category, facilities and register
3. Coimbatore District Magistrate court (understand the court proceedings)
4. NGO's (Non- Governmental Organization)
Working areas on Environmental issues and children)
5. Juvenile Justice Board (understand the juvenile justice system)

Assessment:

1. Attendance is mandate for all the Institutions visit.
2. Students must understand the different agencies functions and note the observations.
3. Students must submit the report of the institutions visit individually to the concern faculty for finalizing.
4. Each visit to the institutions carry 20 marks.
5. Students must consolidate all the institutions visit report and submit as a project work at the end of the semester.
6. Oral Viva-Voce shall be conducted to assess the individual work and marks will be awarded.

17CR2009 CRIMINOLOGY PRACTICAL LAB I

Credit: 0:0:2

Course Objectives

- To learn crime trend analysis using the Indian government agencies data such as NCRB and SCRB.
- To learn basic psychological tests and interpret the data and its outcome
To learn the techniques used on the evidence collected from the crime scene and its preservation methods.
- To learn the techniques that are used to handle the delinquents who are in conflict with law.

Course Outcome:

Students should be able

- To demonstrate different methods of analysis crime over a period of time and its data interpretations.
- To apply psychological test conducted during the Juvenile delinquent's assessment.
- Aware of the different NGO's strategies
- Students will understand qualitative and quantitative research methods to collect and analyze data.
- Students will articulate the link between research, theory and practice.
- Apply theoretical knowledge to the practical problems.

List of Experiments:

1. Calculating Crime Rate and comparing geographically, spatially and economically (Analysis based on the Government based data NCRB, SCRB – Population, total number of crimes, crime rate, applying for metropolitan cities of Tamil Nadu, major and minor cities India, Crime Trend analysis of crime rates in the last five years and projection)
2. Anger – Aggression scale measurement or Attitude Measurement (Either sentence completion test)
3. Thematic Appreciation Test (TAT)
4. MMPI / 16 Personality PF – measurement, scoring, report submission
5. Understanding and evaluating the profile, duties and functions of Human Rights Organizations (Any one) – Evaluation, implementation of UN documents and judgements.
6. Analysis of media reports (paper cuttings) of investigation of criminal cases.
7. Evidence collection and preserving physical evidences
8. Analysis of school truancy and delinquent behavior – Management process by schools
9. Intelligence tests for delinquency – Bhatia's or Ravens
10. Environment Protection strategies by NGO's

17CR2010 BASICS OF INDIAN CONSTITUTIONS & OFFENDERS RIGHTS

Credit 4:0:0

Course Objectives

- To introduce the students to the over view of salient features of the Constitution of India.
- To make the students understand various Constitutional Remedies
- To make students understand the provisions for offender's rights in the Constitution of India.

Course Outcomes

By the end of the course, students should be able to:

- The students will know the fundamentals of Constitution of India
- The students will know the Constitutional Remedies and various provisions relating to offender's rights
- Students will be able to understand the functioning of the Courts and appointments of judges based on the Constitution of India.
- Students will be able to describe the salient features of Constitution of India.
- Students will learn the provisions provided by the Constitution of India particularly for the protection of the weaker sections (i.e., children, women and elderly) of the society.
- Students will have the basic understanding of the Fundamental Rights, Fundamental Duties and Directive Principles of State policy.

Unit I: Introduction – Constitution - meaning of the term - Indian Constitution – Preamble - Fundamental Rights

Unit II: Fundamental Duties – Directive Principles of State Policy

Unit III: Rights to Constitutional Remedies – Writ, Meaning of Writs, Various types of writs.

Unit IV: Provisions in Constitution – Courts, functions and powers – Judges, appointment of judges, powers and functions.

Unit V: Constitutional Provisions for Offenders Rights - Right to legal aid – Right for Speedy Trial – Double Jeopardy

References

1. Durga Das, B. (2013). *An introduction to the Constitution of India* (21st edition). New Delhi: Lexis Nexis.
2. Bakshi, P. M. (2002). *The Constitution of India*. New Delhi: Universal Law Publishing
3. Jain, M. P. (2003). *Indian Constitutional Law* (Volumes 1 & 2). New Delhi: Wadhwa and Company Nagpur
4. Pandey, J. N. (2003). *Constitutional Law of India*. Allahabad: Central Law Agency.

17CR2011 FORENSIC SCIENCE IN CRIME INVESTIGATION

Credit 4:0:0

Course Objectives

- To have a basic understanding about Forensic Science
- To understand its application in Crime Investigation
- To understand the role of biological evidence in crime investigation

Course Outcomes

By the end of the course, students should be able to:

- Able to apply the basic principles of forensic science to crime investigation.
- Learn the minimum techniques for crime investigation through forensic biology, forensic ballistics, forensic chemistry and forensic toxicology.
- Students will be able to demonstrate knowledge and understanding of some of the links between forensic Science and the Indian legal system.
- Students will be able understand the basics on drawing together information from different sources and make logical deductions as a result.
- Students will understand how forensic scientists operate and use scientific evidence in a legal context.
- Learn to apply biological evidence in crime investigation.

Unit I: Introduction to Forensic Science History and development of Forensic Science – Definitions – Scope and need – Basic principles – Locard's principle – Branches of Forensic science – Organizational setup of Forensic Science Laboratories

Unit II: Forensic Biology Biological evidence: Importance, nature, location, typology – Role of Forensic Biologists– Human blood groups: collection of samples, species identification – Antigen and antibody: Definitions and reactions – Blood grouping from blood, semen, saliva and other body fluid stains – Techniques for blood grouping

Unit III: Forensic Ballistics and Forensic Physics Firearms: History and background, classification, characteristics, firing mechanisms, typology – Ammunition: Typology, cartridge components matching of crime, test bullets and cartridge cases, identification of bullets, pellets and wads – Automated method of cartridge case and bullet comparison – Determination of range and time of fire – Visual, chemical and instrumental methods – Gun Shot Residues (GSR)

Unit IV: Forensic Chemistry Introduction – Typology – Analysis and techniques – Trace evidence – Chemistry of fire.

Unit V: Forensic Toxicology: Poisons: Classification, signs and symptoms, antidotes and collection of samples – Explosives: Classification, characteristics, process and effects – Types of hazards

References

1. Bureau of Police Research & Development. (2000). *Working procedures manual ballistics*. New Delhi: BPR&D.
2. Dr. B. R. Sharma. (2016). *Forensic science in criminal investigation and trials*. New Delhi: Universal Law Publishing.
3. Heard, B. J. (1997). *Handbook of firearms and ballistics: Examining and interpreting forensic evidence*. Chichester, England: Wiley.
4. Van Kirk, D. J. (2001). *Vehicular accident investigation and reconstruction*. Boca Raton, Florida: CRC Press.
5. Lee, H., & Palmbach, T. (2001). *Henry Lee's crime scene handbook*. San Diego, California: Academic.
6. Modi, J. P., & Modi, N. (1969). *Modi's a textbook of medical jurisprudence and toxicology* (17th (50th year) ed.). Bombay: N. M. Tripathi.

17CR2012 POLICE ADMINISTRATION

Credit 4:0:0

Course Objectives

- Introduce the students to the basics of policing in India.
- Give a general overview of structure and functions of Police and related establishments.
- Brief about the Tamilnadu Special Investigation team and its functioning.

Course Outcomes

By the end of the course, students should be able to:

- Understand the concepts of police administration and policing
- Know the structure and functions of Indian police and related establishments
- Learn the basic duties of police.
- Understand the process of recruitment, selection and training in law enforcement.
- Understand the structure, operation and powers of special units of the Tamil Nadu Police.
- Apply theoretical knowledge to practical issues in the police department.

Unit-I: Basics of Police Administration - History of Indian Police – Policing in Ancient, Medieval and Modern India- Police Act of 1861- National Police Commission recommendations (NPC), 1979.

Unit-II: Structure of Indian Police Structure of State Police – District Police – City Police. Central Police Organizations - CBI, CISF, CRPF, RPF etc. Police research and Crime Statistics Organizations – BPR&D, NCRB, Village police, Railway and Armed Police.

Unit-III: Processes of Recruitment and training of Constables, Sub-inspectors, Deputy Superintendents of Police – Police Training Colleges – Police Academies – National and State level.

Unit-IV: State Police organizations Tamil Nadu Special Investigation team, Special Branch, Q Branch, Crime Branch, Anti-Dacoity cell, Video Piracy Cell, Narcotic Intelligence Bureau, Idol wing and Economic Offences wing

Unit-V: Police Duties and Powers - Arrest, search, locking up and remand of suspected and accused persons. Conducting various types of raids – Prohibition, gambling, Narcotics and PITA – Procedure to be followed and precautions to be taken while suspected hide outs of Criminals/ Terrorists.

References

1. Arvind, V., & Subramanian, K. S. (2013). *Understanding the police in India*. New Delhi: Lexis Nexis Publishers.
2. Diaz, S.M. (1976). *New Dimensions to the police role and functions in India*. Published Hyderabad: National Police Academy.
3. Mathur, K. M. (1994). *Indian police, role and challenges*. New Delhi. Gyan Publishing House.

4. Nehad, A. (1992). *Police and policing in India*. New Delhi. Common Wealth Publishers.
5. Parmar, M. S. (1992). *Problems of police administration*. New Delhi: Reliance Publishing House.
6. Sethi, R. B. (1983). *The police acts*, Allahabad: Law Book Co.
7. Vanamamalai, N. T. (1980). *Law and justice in the U.S*. New Delhi: Sterling Publishers Pvt. Ltd.

17CR2013 RESEARCH METHODOLOGY AND STATISTICS IN CRIMINOLOGY AND POLICE ADMINISTRATION

Credit 4:0:0

Course Objectives

- The objectives of the course are to give orientation to the students on the systematic research in the field of Criminology and Police Administration
- To develop the analytical skills through basic statistical techniques.
- To teach interpretation of data and report writing

Course Outcomes

End of this course, the student will be able to

- Understand the importance of research in the field of Criminology and Police Administration.
- Know the basics of research methodology and statistics and their applications in the field of Criminology and Police Administration
- Students will understand qualitative and quantitative research methods to collect and analyze data as well as describe the general strengths and weaknesses of each.
- Students will be able to describe and explain the nature and purpose of the social scientific research initiatives.
- Students will be able to critically assess contemporary ethical issues in conducting research on human subjects.
- Learn to interpret statistical data and develop a report out of it.

Unit I - Foundation in Research Methodology: Importance of Research in Criminology and Police Administration – Significance of Research - Research Process - Defining the Research Problem - Types of Research Designs – Independent and dependent variables - review of literature – Hypothesis and Research Questions.

Unit II – Sampling: Census and Sample Survey - Steps in Sampling Design - Characteristics of a Good Sample Design - Different Types of Sampling - Probability Sampling-Non-Probability Sampling - Sample Size and its Determination – Validity.

Unit III - Data Collection: Collection of Primary Data - Observation Method - Interview Method - Collection of Data through Questionnaires - Collection of Data through Schedules - Collection of Secondary Data, - Validity-Reliability of the tool - Levels of Measurement - Scaling-Thurstone Scaling- Likert Scaling-Guttman Scaling.

Unit IV - Statistics and Analysis of Data and Testing of Hypotheses: Basic Statistics – Measures of Central Tendency - Mean – Median – Mode – Measures of Deviation - Standard Deviation – Correlation – Regression - ANOVA

Unit V - Interpretation and Report Writing: Application of Research Methods and Statistics in the field of Criminology and Police Administration - Meaning of Interpretation - Precaution in Interpretation - Significance of Report Writing - Different Steps in Writing Report - Layout of the Research Report - Types of Reports.

Reference Books

1. Loseke, D. R. (2012). *Methodological thinking: Basic principles of social research design*. Sage Publications.
2. Gadd, D., Karstedt, S., & Messner, S. F. (2012). *The Sage handbook of criminological research methods*. Sage Publications.

3. James, V. (2007). *The complete reference methodology of research in criminology, law, justice and correction* (Vol. 1). Indian Publishers & Distributors.
4. Kothari, C. R. (2018). *Research methodology: Methods and techniques (4th Edition)*. New Age International Publishers.

17CR2014 PENOLOGY AND CORRECTIONAL ADMINISTRATION

Credit 4:0:0

Course Objectives

- To give a conceptual and practical understanding of punishments and corrections.
- Teach the theories and concepts of why punishments
- Create awareness on the role played by correctional institutions in India.

Course Outcomes

By the end of the course, students should be able to:

- Understand the concepts and theories of punishments
- To know the historical development of punishments
- To understand the establishment, functioning and the role of correctional institutions in India in rehabilitation, reformation and resocialization.
- Help the students to develop a basic understanding of the discipline of penology, the concept of punishment and its overall significance in the field of criminology.
- Help the students to understand the legal and structural framework of the Indian penal system from a comparative perspective.
- Help the students to understand the prison management, prison administration and types of prisons in India.

Unit-I: Nature of Punishment – definition, nature and scope. Types of Punishment. Corporal and Capital Punishment – 3 R's – Rehabilitation, Reformation and Resocialization. – Just Desserts.

Unit-II: Theories of Punishment: Retributive theory, Preventive theory, deterrence theory, Reformation theory.

Unit-III: Prison systems Historical development of Prison system in India. Prison Manual. Prison Act.

Unit-IV: Correctional Institutions Adult Institutions: Central, District and Sub Jails. Juvenile Institutions: Observation Homes, Special Homes. Women Institutions: Vigilance Home, Protective home. Open Prisons.

Unit-V: Community based Corrections - Probation: Concept and Scope, Historical development of probation - Probation in India – Probation of offenders Act. Probation procedures: Pre-sentence Investigation report, Revocation of probation etc. Parole: Meaning and Scope. Parole - provisions and rules - After Care services – Borstal Schools – Role of NGO's in Aftercare.

References

1. Siddique, A (1993). *Criminology, problems and perspectives*, III Edn. Lucknow: Eastern Book Company.
2. Chockalingam, K. (1993). *Issues in probation in India*. Chennai: Madras University Publications.
3. Christopher J. Emmins, (1985). *A practical approach to sentencing*. London: Financial Training Publications Ltd.
4. Devasia, V. D & Leelamma D. (1992). *Criminology, victimology and corrections*. New Delhi: Ashish Publishing House.
5. Goswami, B. K. (1980). *Critical study of criminology and penology*. Allahabad: Allahabad Agency.
6. Ghosh, S. (1992). *Open prisons and the inmates*. New Delhi. Mittal Publications.
7. Paranjpe, N. V. (2002). *Criminology and penology*. Allahabad: Central Law Publications.

17CR2015 – CRIMINOLOGY PRACTICAL LAB II

Credit 0: 0: 2

Course Objectives

- To enable the students have a hands-on experience on the lab experiments pertaining to the forensic science to understand forensic methodology
- To learn the key forensic methods and concepts
- To identify various types of forensic evidences.

Course Outcomes

- Gain knowledge and insight on basic forensic methodology
- Able to identify the suitable forensic method for investigation
- Able to interpret the data of the crime scene using Locard's principle
- Gain ability to collect evidences from crime scene.
- Able to detect fraudulent documentation practices in banking sector, Real Estate etc..
- Create a concise and clear report of the crime scene using forensic methods

List of Experiments:

1. Understanding and applying Locard's Principles
2. Collection and preservation of samples of physical evidences
3. Fluid stains collection, preservation
4. Tire marks
5. Document Examination – Detection
6. Alterations in document examination
7. Handwriting analysis
8. Sampling Design
9. Collection of Intelligence
10. Interrogation Techniques

17CR2016 INDIAN PENAL CODE AND INDIAN EVIDENCE ACT

Credit 3:0:0

Course Objectives

- To make a student understand various definitions
- To know about the various punishments envisaged under the Indian Penal Code
- To understand the basic concepts of evidence in the court of law as given in the Indian Evidence Act

Course Outcomes

By the end of the course, students should be able to:

- Various definitions of crimes against person, properties and country and the punishments relating to that as given in the Indian Penal Code.
- Understand the basic of Evidence as given in the Indian Evidence Act.
- Students will get good conceptual knowledge about Indian Penal Code and Evidence Act.
- Students will understand the various landmark judgements under the Indian judicial system.
- Students will be able to interpret case decisions and precedent.
- Application of punishments for various crimes.

Unit I: Indian Penal Code – Explanation, Explanations and Definitions

Unit II: General Exceptions – The rules and essentials of exemptions from punishments as given in the Indian Penal Code

Unit III: Crimes against Persons – Definitions and Punishments as given in the Indian Penal Code

Unit IV: Crimes against Properties and National – Definitions and Punishments as given in the Indian Penal Code

Unit V: Indian Evidence Act – Types of Evidences – Admissibility – Confession – Dying Declaration

References

1. Indian Penal Code, 1860
2. Indian Penal Code with Classification of Offences & State Amendments, 2015
3. Indian Evidence Act, 1872

17CR2017 VICTIMOLGY

Credit 4:0:0

Course Objectives

- The Objective of the Course is to help the students understand the concepts of crime victimization
- To know about role of Judiciary, government, citizen in victim assistance.
- Knowledge on basic principles of Justice for victims and abuse of power

Course Outcomes

By the end of the course, students should be able to:

- Understand the origin and development of victimology
- Gain knowledge on dimensions of victimization and types of victims.
- Students will have a systematic understanding of the key debates and a critical awareness of current problems and new insights at the forefront of Victimology.
- Students will be equipped for critical analysis of victimization, victim justice and the development of victim justice policies.
- Students will understand the history and development of the global movement towards rights of victims of crime.
- Appreciate various victim assistance measures and support systems in India and other countries.

Unit I: Introduction to Victimology Origin and development of Victimology – Definitions – Dimensions of victimization – Typology – Victims in the criminal justice system – Retributive justice – Restorative justice – Scope of Victimology

Unit II: Key Concepts Victim precipitation – Fear of crime – Reporting behaviour – Dark figure – Crime victimization survey – Victim blaming – Victimological theories – Bystander effect –

Unit III: Patterns and Impact of Victimization Victims of conventional crime – Gender-based violence — Hate crime – Domestic violence – Women victims of crime – Child victimization – Victims of group violence – Cultural victimization – Elderly victimization – Victims of natural disaster – Impact of crime victimization – Trauma – Post-Traumatic Stress Disorder (PTSD),

Unit IV: National and International Concern for Victims U. N. Declaration on Basic Principles of Justice for Victims of Crime and Abuse of Power – International Criminal Court – Amnesty International – World Society of Victimology – South Asian Society of Criminology and Victimology – Indian Society of Victimology

Unit V: Victim Assistance and Services Needs of victims – Victim assistance – Role of Judiciary, Government (Observation homes, vigilance homes) – Citizens and voluntary organizations – Concepts and forms of victim services – Compensation and Restitution

References

1. Das, B. B. (1997). *Victims in the criminal justice system*. New Delhi: APH Publishing Corporation.
2. Elias, R. (1993). *Victims still: The political manipulation of crime victims*. London: Sage Publications.
3. Hentig von, H. (1981). *The criminal and his victims*. New York: Schocken Books.
4. Karmen, A. (2012). *Crime victims: An introduction to victimology*. Boston: Cengage Learning.

5. Maguire, M., & Ponting J. (1988). *Victims of crime: A new deal?*. Milton Keynes: Open University Press.
6. National Law University. (2012). Justice Verma Committee Report to Criminal Law. New Delhi.
7. Rajan, V. N. (1995). *Victimology in India perspectives beyond frontiers*. New Delhi: Ashish Publishing House.

17CR2018 – FORENSIC ANALYSIS

Credit 4:0:0

Course Objectives

- Make them understand the role of Forensic Analysis in the crime scene investigations
- Teach the type of analysis carried out during the investigation procedures in the criminal justice system.
- To know the different approaches of solving a crime

Course Outcomes

By the end of the course, students should be able to:

- Student will be able to use different analysis for investigation
- Apply different methods of approach to crime scene from the forensic perspective.
- Students will be equipped for critical thinking and analysis.
- Students will acquire the ability to apply diverse information to solve a real problem.
- Students will be equipped for legal analysis and application.
- Apply theoretical knowledge to practical problems.

Unit I: Crime Scene Investigation Concepts – Nature and type of crime scene – Crime scene search methods: Recovery and packaging of evidences – Crime scene documentation – Preservation of evidences.

Unit II: Fingerprinting and Other Impressions History and development of fingerprints – Formation and variation of ridges at various stages of life – Factors affecting fingerprint patterns – Classification of fingerprints: Henry system, single digit, extension of Henry system – Fingerprint bureau – Poroscopy – Edgeoscopy – Conventional methods of latent fingerprint development– Recent techniques of fingerprinting –Footprints – Tyre marks/prints and skid marks – Cheiloscopy – Ear prints – Striation marks – Tool marks and mechanical fits – Forensic significance of impression marks and its accountability in criminal investigation

Unit III: Bloodstain Forensics Biological and physical properties of human blood – Bloodstain Pattern Analysis (BPA) – Droplet dynamics in flight and on impact – Droplet directionality from bloodstain patterns

Unit IV: Crime Scene Reconstruction (CSR) Nature and importance of CSR – Basic principles and stages involved– Types and classification of reconstruction – Pattern evidence and shooting scene reconstruction – Manual and computer-assisted reconstruction of BPA –Role of logic in CSR – Writing a reconstruction report – Correlation of crime scene analysis with behavioral analysis – Cases of special importance pertaining to forensic examination

Unit V: Voice identification – Forensic Psychology – Narco-analysis – Brain fingerprinting – Criminal profiling and its legal status in India

References

1. Park, C. (2010). *Computer forensics: Investigating data and image files*. NY: Course Technology Cengage Learning.
2. Gardner, R., & Bevel, T. (2009). *Practical crime scene analysis and reconstruction*. Boca Raton, Florida: CRC Press.
3. James, S. (2005). *Forensic science: An introduction to scientific and investigative techniques* (2nd ed.). Boca Raton, Florida: CRC Press.

4. James, S., & Kish, P. (2005). *Principles of bloodstain pattern analysis: Theory and practice*. Boca Raton, Florida: CRC Press.
5. Kleiner, M. (2002). *Handbook of polygraph testing*. San Diego, California: Academic Press.
6. Nanda, B., & Tewari, R. (2001). *Forensic science in India: A vision for the twenty-first century*. New Delhi: Select Publishers.
7. Saferstein, R. (2011). *Criminalistics: An introduction to forensic science* (10th ed.). Upper Saddle River, New Jersey: Prentice Hall.

17CR2019 PRIVILEGED CLASS DEVIANCE

Credit 3:0:0

Course Objectives

- The course helps in understanding the offences caused by the deviance of the privileged class people in the society.
- The course focuses on the crimes committed by the people who are vested with various kinds of powers by the society.
- The course also enables students to understand the remedial measures which are in practice.

Course Outcomes

By the end of the course, students should be able to:

- Knowledge about the concept of privileged class deviance.
- To know the areas where the privileged class deviance is predominantly takes places.
- Students understand the fundamental difference between conventional crimes and privileged class deviance.
- Students understand the prevalence of criminality among the privileged classes.
- Students understand the issues and dilemmas in penal and sentencing policies.
- Apply theoretical knowledge to practical problems.

Unit I: Privileged Class Deviance – Definitions, Concepts and Types.

Unit II: Official deviance – crime of the powerful - deviance by bureaucrats, legislators - discretionary powers and permissible limits

Unit – III: Professional deviance - deviance by doctors, journalists, doctors, legal professionals, engineers, architects and publishers - Police deviance - Military deviance

Unit – IV: Trade union deviance - class/caste-based deviance – landlord deviance – Gender based aggression by socially influential individuals - Deviance on electoral process – impersonation

Unit – V: DVAC- Vigilance commission - Ombudsman – Whistle Blowers - Prevention of Corruption Act, 1947

Reference Books

1. Vaidya, S. V. (2013). *Privileged class deviance*. India: Allahabad Law Agency
2. Sheetal K., & Khan, F. (2014). *Privileged Class Deviance*. India: Amar Law Publication.
3. Reddy, G. V. (2014). *White collar crimes: Privileged class deviance*. India: Sujatha Law Books Pvt. Ltd.

17CR2020 CRIMINOLOGY PRACTICAL LAB - III

Credit 0: 0: 2

Course Objectives

- To equip students to have a practical hand on training and exposure for joining uniformed services
- Physical and Psychological trainings will be imparted for the job trainings.
- Industrial safety and Fire Fighting exposures

Course Outcome:

- Students will be able to have field exposure on the physical and psychological training so as to successfully clear the preliminary tests in the uniformed services.
- Students will be equipped with skills that are required to handle real time emergencies.
- Students will be able to meet the requirements at workplace as the safety handling is mandate for security professionals.
- Students will gain knowledge in Fire and Safety which will enable them to train others.
- Will be well-versed in the Fire safety and its procedure to handle extinguishers.
- Apply theoretical knowledge in the practical real-life scenario

Exercises:

1. Rope Climbing
2. Trekking
3. Fire Shots / Gun shots
4. Running
5. Long jumps and hurdling
6. Crime Scene Investigation
7. Crime Scene Photography
8. Criminal Profiling
9. Transcendental Meditation/Jacobson's deep muscle relaxation
10. Fire safety

17CR2021 PRIVATE DETECTIVE AND INVESTIGATION**Credit 4: 0: 0****Course Objective:**

- To familiarize the students with security measures as per the standard practices of the industry
- To expose the students to detective and investigative skills
- To teach the various interrogation techniques.

Course Outcomes

- Able to practice different types of investigation
- Remember and practice the various interrogation methods used during investigation
- Know the records used for identification of crimes.
- Students will be well versed with witness interviewing and suspect interrogation techniques.
- Students will understand various private investigation techniques and methodologies.
- Students will understand the techniques to compare and contrast different specialized scientific methods commonly utilized by the criminal investigator.

Unit I: Introduction to Private Investigation – Private Investigation Profession and Career – Code of Ethics for Private Investigators – Concepts of Detective

Unit II: Introduction to Investigative Theory – Investigative Methodology – Principles of Investigative Methodology.

Unit III: Types of Investigations – Insurance Investigations – Civil Investigations – Criminal Investigations – Pre – Post Matrimonial Investigations

Unit IV: Basic Identifiers – Sources of information – Public, Private and Restricted Records – Tools for identifiers

Unit V: Interviewing – Interviewing techniques – Tools for interview – Objectives of Interviews – Interrogation – Interrogation Techniques – Report Writing

References

1. Woodhull, A. (2002). *Private investigation: Strategies and techniques*. Texas: Thomas Investigative Publications.

2. Copeland, B. (2001). *Private investigation: How to be successful*. FL: Absolutely Zero Loss Inc.
3. Cruise, D. (2002). *The business of private investigations*. Texas: Thomas Investigative Publications.
4. Corun, M. (2003). *Training manual on private investigation*. Texas: Thomas Investigative Publications.
5. Post, R. S., Kingsbury, A. A., & Buckley, C. L. (1973). *Security administration: An introduction*. Illinois: Thomas.
6. Methahon, R. J. (2000). *Practical handbook for private investigations*. CRC Press.
7. Materials for Diploma in Private Investigation, Institute of Intelligence and Investigation, Eagle's Eye Detective Agency, Chennai.

17CR2022 FIRE AND INDUSTRIAL SAFETY

Credit 4: 0: 0

Course Objective:

- To train the students in the field of Industrial safety and Fire Prevention.
- To teach Fire risk assessment structure and layout
- Understand the basic concepts and techniques of different types of safety.

Course Outcome:

- Get trained in Industrial safety and prevention of fire.
- Analyze the risk of fire in structure and layout.
- Students will understand the scientific and technical knowledge pertaining to the safety.
- Students will be well versed with the designing and installation of fire protection systems.
- Students will acquire the knowledge of hazards and control measures, industrial safety and management and other psychological grooming which makes them self-reliant safety personnel.
- Create a risk assessment model.

Unit I: Classification of fire, Portable fire extinguishers, Pumps and primers, Foam and foam making equipment's - Hose and hose fittings, Water relay systems, Breathing apparatus, Small gears - Fire protective clothing, Ladders, Ropes and lines, bends & hitches, Fire prevention, Special appliances, Firefighting codes and standards, Electrical fire hazards, Structures under fire.

Unit II: Fire Risk Assessment: Introduction, understanding fire: How and why people die in fires, Human behavior in fire: How people behave in emergencies, Legislative requirements: The Regulatory Reform (Fire Safety) Order 2005, Fire hazards & risks, Plan Drawing, Brief look at drawing to scale, and how plans can be used to good effect

Unit III: Fire risk assessment structure and layout, means of escape principles: Basic requirements and what to look for, Fire signage: National requirements, Fire Alarms & fire detection: Basic components, and testing, Emergency lighting: When it is required, Basic components, and testing, Alternatives to emergency lighting

Unit IV: Emergency Plans & Staff Training, Highly Flammables & LPG, Firefighting equipment requirements, Fire resisting construction & compartmentation, Active fire safety for building protection: Sprinklers & Automatic roof vents Unit-IV The process of fire risk assessment, Fire risk assessment recording and review procedures, The potential for pollution arising from fires, Measures to prevent and reduce fire pollution

Unit V: Household safety, Industrial Safety, Environment Safety, Construction Safety – Basic concepts and techniques – Need for safety.

References

1. Ganguly, D. S. S., & Changeriya, C. S. (2016). *Fire technology & industrial safety*, Rajasthan: Chetan Prakashan Publishers.
2. Gupta, R.S. (1977). *Hand Book of Fire Technology*. Bombay: Orient Longman, Bombay.
3. Mohan. B. (2008). *Fire protection and prevention*, (1 ed). UBS Publishers & Distributors Pvt. Ltd.
4. Dennis P Nolan, D. P. (2007). *Hand book of fire and explosion protection engineering* (1 ed). Crest Publishing House Edition.

17CR2023 HUMAN RIGHTS AND CRIMINAL JUSTICE ADMINISTRATION

Credit 4: 0: 0

Course Objective:

- Teach the importance of Criminal Justice in preservation of peace and security in society.
- Understand the role of criminal justice in prevention of human dignity of both victims of crime and person accused of it.
- To explain the human right perspective of criminal justice administration.

Course Outcome:

- To exercise criminal justice in preserving peace and security in society.
- To apply criminal justice in safe guarding human dignity of both victims and the offender.
- Students understand the principles and institutions of human rights law, including their origins, assumptions, contents, limits and potentials.
- Helps students to think analytically about the implementation and development of international and national human rights law and mechanisms.
- Students will be equipped with improved ability to conduct research on human rights.
- Gain knowledge about various homes and rehabilitation centers for victims and offenders.

Unit I: Introduction to Human Rights Meaning, nature and scope – History.

Unit II: National and International Instruments Genesis: Constitutional guarantees on human rights – Part III of the Constitution: Fundamental rights – Part IV of the Constitution: Directive principles of state policy – Fundamental duties enshrined in the Constitution – Protection of Human Rights Act, 1993 – United Nations documents: Universal Declaration of Human Rights, 1948

Unit III: Criminal Justice System Criminal Justice System and its relevance to Human Rights – Handcuffing, custodial violence, third degree method of interrogation – Rights of the accused – Rights of prisoners – Rights of victims of human rights violations – Access to justice – Fair treatment – Restitution – Assistance – Compensation

Unit IV: Human Rights of Women and Children Human rights violations against women – International instruments relating to women – Convention on the Elimination of all forms of Discrimination against Women (CEDAW), 1979 – Rights of women in custody – Human rights violations against children – International instruments relating to children: UN Convention on the Rights of the Child (UNCRC), 1989 and Protecting the rights of children in conflict with the law – National Campaign on Dalit Human Rights (NCDHR) – Human Rights Advocacy and Research Foundation (HRF)

Unit V: National Human Rights Commission and State Human Rights Commission – Role, structure and functioning – Amnesty International, International Red Cross Society, Human Rights Watch – Peoples Watch – PUCL – AIDWA

References

1. Begum, M. (2000). *Human rights in India: Issues and perspectives*. New Delhi: APH Publishing Corporation.
2. Bharti, D. (2002). *The constitution and criminal justice administration*. New Delhi: APH Publishing Corporation.

3. Chakrabarty, M. (1998). *Human rights and refugees: Problems, laws and practices*. New Delhi: Deep & Deep Publications.
4. Kumar, A. (2002). *Human rights: Global perspective*. New Delhi: Sarup & Sons.
5. Thilagaraj, R. (2000). *Human rights and criminal justice administration*. New Delhi: Manohar Publications.

17CR2024 CRIMINOLOGY PRACTICAL LAB IV

Credit: 0:0:2

Course Objectives

- This practical paper will enable the students have an exposure in the collection, preservation, packaging, transportation, and documentation of physical evidence left at the crime scene.
- Teach the various procedures followed in maintaining security
- To gain knowledge how to handle workplace violence or harassments.

Course Outcomes

- Able to know the steps taken in collection, preservation, packaging, transportation, and documentation of physical evidence left at the crime scene.
- Know to apply the various procedures followed in maintaining security in transport, travel, international travel etc.
- Students will gain knowledge in handling security operations of both physical and electronic security.
- Students will be able to understand the contemporary issues in the corporate security industry.
- Apply theoretical knowledge to practical issues.
- Able to handle workplace violence or harassments.

List of Experiments:

1. Physical Security Experiment:
An Intruder has gained an unauthorized access into the secured building, briefly elucidate the role of the different levels of security personnel in that organization.
2. Physical Security & Data loss Experiment:
During the working day in the morning, the employee reports a theft of desktop hard disk from his cabin, here what is the role of the Security officer and how the case is investigated further
3. Physical Security:
A Security guard deputed in the parking area reports to his security supervisor or security officer that there is suspicious vehicle spotted in the parking area, what is the scope of action here for Security officer?
4. Workplace Violence:
Two male employees having a physical altercation at workplace and it was reported to the Security officer on duty. What is the role of Security officer and Security Manager?
5. Workplace Harassment:
Female employee reports to HR (Human Resource Department) that her manager has tried alleged to sexually harass her during the course of performance appraisal. What is the role of Security Manager and HR MANAGER?
6. International Travel Security:
One of the company's leadership team member was in an International travel, during the transit at the airport he / she has lost the Laptop, How the further investigation will be carried out.
7. Travel Security:
One of the company's staff was deputed on the onsite trip to US, during the time of departure from US, the employee has realized that he/she has overstayed 2 days beyond the visa date, what will be the next course of action?
8. Transport Security:

At the time of transporting a female employee during enroute the vehicle has lost signal from GPS and disappeared without any communication, what will be the next course of action?

9. Security Controls:

In a IT Sector company there is a Data center situated one of the unauthorized person is trying to gain access into the floor in spite of the two-layer security control such as Bio-metric and Access Control.

10. Handling Bomb Threat Calls:

In case of a Bomb threat call lands to the company's board number what is the course of action taken by the different level of employees from the security department.

17CR2025 WHITE COLLAR CRIME AND ORGANIZED CRIME

Credit 4:0:0

Course Objective:

- Course provides the student with an understanding of the, issues and varieties of white-collar crime, applicable theories and research, intricacies in detecting, prosecuting and sentencing white-collar offenders; and overview of corporate crime and professional deviance.
- The paper on white collar and organized crimes will expose the students to the concepts of prevention of these crimes with latest understanding.
- The students will have a basic knowledge about white collar crime from India and global perspective.

Course Outcome:

- Types and techniques of white collar crimes, organized crimes, money laundering and corporate crimes.
- To understand the role of various governmental, nongovernmental and political agencies in prevention of these crimes.
- Helps the students to demonstrate critical awareness of the criminological theories relevant to prevention and suppression of organized crime.
- Students understand the effective financial crime control mechanisms in workplace and able to critically evaluate current research and practices.
- Helps the students to understand the process of identifying and evaluating the effective strategies for the prevention, deterrence and control of white collar crimes and organized crimes.
- Apply the theoretical knowledge to the practical problem in the real time scenario.

Unit I: Introduction Origin and evolution of white collar and organized crime – Definitions – Typology of white collar crime – Edwin H. Sutherland and white-collar crime – Forms and types of white collar crimes in India.

Unit II: Bribery and Corruption - Definition – Types of Corruption and Bribery – Scandals in India - Prevention of Corruption Act, 1988 – The Right to Information Act, 2005, Jan Lok Pal and Lokayuktha – Anti-corruption movements in India – Role of national and international institutions in combating corruption

Unit III: Money Laundering - Introduction – Definitions, Types and Techniques of Money Laundering – Drugs, terrorism and money laundering – Anti-money laundering standards – Prevention of Money Laundering Act, 2002 - Impact of Money laundering in Economy.

Unit IV: Corporate Crime Introduction – An overview of corporate crime – Corporate crime in a globalized economy Types of corporate crime – Corporate crime against: Government, investors, consumers, workers and public – Case studies on corporate crime – Legal provisions to prevent corporate crime – Impact of corporate crime on the Indian economy.

Unit V: Role of media law enforcement agencies and Non-Governmental Organizations in the prevention of white collar crimes, social movements and political institutions – Whistle-blowers – Whistle Blowers Protection Act, 2011

References

1. Friedrichs, O. D. (2010). *Trusted criminals: White collar crime in contemporary society* (4th ed.). USA: Cengage Brain User.
2. Lal, B. (2003). *Money laundering: An insight into the dark world of financial frauds*. Delhi: Siddharth Publications.
3. Pontell, H.N., & Geis, G. (2010). *Introduction: White collar and corporate crime in Asia*. Asian Criminology.
4. Prevention of Corruption Act, 1988.
5. Prevention of Money Laundering Act, 2002.
6. Prevention of Illicit Traffic in Narcotic Drugs and Psychotropic Substances Act, 1988.
7. Srinivasan, M. (2008). Criminal breach of trust and cheating as sources for money laundering. *The Indian Journal of Criminology & Criminalistics*, XXIX (2), 104–112.
8. Srinivasan. M. (2009). Drug trafficking as a source for money laundering. *The Indian Police Journal*, LVI (2), 76-82.
9. Right to Information Act, 2005.

17CR2026 PREVENTION OF CRIME AND DELINQUENCY

Credit 4:0:0

Course Objective:

- Recognize factors relating to crime: causation, prevention, treatment, and control.
- Understand different crime prevention methods and programs adopted by the police
- Overview of the international perspective on the crime prevention

Course Outcome:

- The should be have basic understanding on crime prevention and its different methods
- Critically analyze the different programs adopted in the crime prevention techniques.
- Help students to develop analytical and critical capacities in assessing crime prevention theory and practice.
- Students will be able to assess the issues relating to the adoption and implementation of crime prevention policies.
- Help the students to understand the systematic crime prevention process and situational crime prevention methods.
- Apply theoretical knowledge to practical problems.

Unit I: Introduction Primary, secondary and tertiary crime– History of crime prevention –Definition of concepts Training and– Educational programmes – Prevention of various types of crime –prevention Fear of crime– Recidivism –assistance.

Unit II: Methods of Crime Prevention Punitive methods, defense methods, intervention method, mechanical method, mass method, Crime Prevention Through Environmental Design–clinical method, group relations’ method Situational crime prevention methods– Reducing first offenders and recidivism –(CPTED)

Unit III: Conventional Programmes Crime prevention by police: Police information centres, ‘May I Help You’ squad, community – Surveillance – Intelligence –policing, intervention programmes, patrolling and beats Correctional services and prevention of– Corruption control methods –Mediation in courts Crime prevention in urban and rural areas–crime

Unit IV: Contemporary Programmes – De-motivating potential offenders – Potential victim protection –Public relations campaign – Programmes aimed at slums and disruptive family situations –Socialization of youth at risk Programmes to reduce school failure, change school policies and increase availability of mentors

Unit V: Crime Prevention Organizations – Prevention of Crime and Victim Care (PCVC) –Role of Boys Clubs and Friends of Police International cooperation– Community involvement – neighborhood Watch –Community Watch Chicago Area Project– Local community organizations –in crime prevention Responsibilities of NGOs in crime prevention–(CAP) and Delinquency prevention

References

1. Bawa, P.S. (1989). *Policing for people*. Calcutta: Rupa & Co.
2. Bursik, R., & Grasmick, H. G. (1993). *Neighbourhoods and crime: The dimensions of effective crime control*. New York: Lexington Books.
3. Clarke, R. (1997). Introduction. In: R. Clarke (Ed.), *Situational crime prevention: Successful case studies*. Guilderland, NY: Harrow & Heston.
4. Hughes, G. (2002). *Crime prevention and community safety: New directions*. London: Sage.
5. Shaftoe, H. (2004). *Crime prevention: Facts, fallacies and the future*. New York: Palgrave Macmillan.
6. Wroblewski, H. M. & Hess, K. M. (2000). *An introduction to law enforcement and criminal justice* (6th ed.). Belmont, CA: Wadsworth Publishing.

17CR2027 MEDIA AND CRIME

Credit 4:0:0

Course Objective

- Teach to critically interpret media and recognize different constructions of crime and justice.
- To enhance your capability to formulate your own ideas about and reflect on the causes of crime and the connection between crime and the media.
- Able to make independent media analyses.

Course Outcome:

- At the end of the course, students will have obtained knowledge of the most central questions and positions surrounding the connection between media and crime.
- You will have an understanding of the link between media representations and crime.
- Students acquire the skill to critically interpret media and recognize the construction of crime and justice.
- Students will be able to determine how media coverage varies across various forms of crime.
- You will have an understanding of how images of crime and justice vary across different forms of media.
- Students understand how images of crime and justice vary across different forms of media.

Unit I: Media: Definition and concept of Media – History of Media – Types and forms of Media - Use and abuse of various types of media

Unit II: Media and Crime: Types of crimes reported in media – Crime reporting in media – Media images of crime and criminals.

Unit III: Investigative Journalism – Definition and types of investigative journalism – Importance of investigative journalism – characteristics of investigative journalism and investigative journalists

Unit IV: Threats in Social Media – Concepts of reliability, validity of social media reporting – threats involved in social media reporting – causes and consequences.

Unit V: Media and Crime Prevention – The role of media in the prevention of crimes against women and children – Ethics of a crime reporter and an investigative journalist – Do's and Don'ts in Social Media reporting.

References

1. Barker, M., Petley, J. (2001). *Ill effects: the media/violence*. London: Routledge.
2. Brown, S. (2003). *Crime, law and media culture*. London. Open University Press.

3. Chibnall, S. (1977). *Law-and-order news: an analysis of crime reporting in the British press*. London: Tavistock Publications.
4. Ericson, R. V., Baranek, P. M., & Chan, J. B. L. (1991). *Representing order: crime, law and justice in the news media*. Toronto: University of Toronto Press.
5. Gauntlett, D. (2000). *Web studies: rewiring media studies for the digital age*. London: Hodder Education Publishers.
6. Howitt, D. (1998). *Crime, the media and the law*. Wiley.
7. Kidd-Hewitt, D., & Osborne, R. (1995). *Crime and the media: the post-modern spectacle*. London: Pluto Press.

17CR2028 ENVIRONMENTAL CRIMES

Credit 4:0:0

Course Objective:

- This course seeks to bring attention to this important and emerging area of criminology by introducing to students the scope and prevalence of environmental harms and crimes
- The students will have an overview of environmental law and regulation, and issues in environmental justice.
- The course content will expose students to information on: rates of environmental harms, environmental databases, special topics like global warming, exposure to toxins and deviance, and distribution of environmental hazard sites relative to race, class, and ethnicity

Course Outcomes

At the end of this course,

- Students will have a general understanding of environmental crime, victimization, and offending.
- They will learn how to define crimes against the environment, examine pollution rates in their area, identify and describe threats to human health and sustainability.
- Help the students to identify environmental victims and offenders.
- Help the students to review criminological theories that focus on the interaction between individuals, environment and crime.
- Help the students to analyze the difference between “Green Crime” and “Ordinary Crime”.
- Student should be able to assess why the continued study of environmental crime is critical for the field of criminology.

Unit I: Introduction

Definition – Environmental Crime, Eco- Criminology, Green Crimes, Oceanic Crimes: Wildlife Crimes, Forest Crimes, environmental terrorism, environmental racism, environmental justice

Unit II: Historical Development of Environmental Crimes, Types of Environment Crimes, Civic Responsibilities.

Unit III: Environment Pollution – Types of Pollution, Theories and Views on Environmental Pollution and Crimes

Unit IV: Environmental Law - Environmental rights – Provisions in the Indian Penal Code for environmental protection – Penalties and punishments of environmental offences – Key policies relating to the environment in India – The Water (Prevention and Control of Pollution) Act, 1974 – The Air (Prevention and Control of Pollution) Act, 1981 – The Environment (Protection) Act, 1986 – The Forest - Compensation to victims of environmental crimes - (Conservation) Act, 1980 – The Wildlife Protection Act, 1972

Unit V: Enforcement Agencies Central and State Pollution control boards: its structure, duties and functions – Forest Department – Role of Forest Department and Forest Officers - Environmental loss assessment and prevention authority – Wildlife Crime Control Bureau – Green Tribunals.

References

1. Bullard, R. D. (1992). *Dumping in Dixie: Social justice, race and the environment*. Boulder, CO: Westview Press.
2. Chand, A. (1985). *Environmental challenges*. Delhi: UDH Publishers.
3. Clifford, M. (Ed.). (1998). *Environmental crimes*. Aspen: Gaithersburg, MD.
4. Edelstein, M. (1988). *Contaminated communities: The social and psychological impacts of residential toxic exposure*. Boulder, CO: Westview Press.
5. Katyal, T., & Sataka, M. (1989). *Environmental pollution*. New Delhi: Anmol Publications.
6. Mohan, I. (1989). *Environmental pollution and management*. New Delhi: Ashish Publishing House.
7. Sastri, S. (1989). *Pollution and environmental law*. Jaipur: Printwell Publishers.
8. Schnaiberg, A. & Gould, K. A. (1994). *Environment and society: The enduring conflict*. New York: St. Martin's Press.
9. Singh, Shekar (1984). *Environmental policy in India, Indian Institute of Public Administration*. New Delhi: IIPA
10. Situ, Y., & Emmons, D. (1996). *Environmental crimes*. London: Sage publications Inc.
11. Tewari, D. N. (1987). *Victims of environmental crisis*. Dehra Dun: EBD Educational Pvt. Ltd.
12. Yeager, P. C. (1991). *The limits of law: The public regulation of private pollution*. Cambridge, England: Cambridge University Press.

17CR2029 DOCUMENT EXAMINATION

Credit 4:0:0

Course Objective:

- Study of the scientific methods of identification and examination of questionable documents,
- To have an understand of the different methods of examinations pertaining to areas of examinations
- Identify some of the techniques to uncover alterations, erasures, obliterations, and variations in pen inks, Nature and problems of document examination, Classification of documents, Preliminary examination of documents

Course Outcome:

- Students should be able to have an overview of Document examinations and its procedures.
- Students understand the fundamentals, underlying principles, and practical methods of forensic document examination.
- Help students to understand document structure, information retrieval, classification and clustering.
- Students will get trained to examine a range of questioned documents and skilled them in producing strong examination reports.
- Students should be able to implement different techniques on the examining part.
- Apply theoretical knowledge into practical problems.

Unit I: Definition of documents – Questioned documents - Forensic documents – Document examiner

Unit II: Determination of authorship of handwriting – Examination of signatures - Examination of altered documents – fraudulent documents – additions- alterations -interlineations and substitution - Examination of writing materials – Dating problems – paper quality – date of manufacturing of paper – examination of ink – Age of documents – size of paper – thickness of paper – weight of paper – design of paper – colour of paper- texture of paper – water mark – location of stitch marks – binding holes – pin holes – stapler marks – perforations – wire mark, etc.

Unit III: Mechanical erasure or physical erasure – detection - decipherment – pencil erasure – typewriting erasure - Chemical erasure – detection and decipherment – chemical methods of restoring erased or faded writings

Unit IV: Examination of postal stamps – examination of rubber stamps metal seal. Anonymous letters – disguise handwriting – standard for comparison. Examination of typescript and printed materials –

standards for document examination – size and design of typefaces – horizontal alignment – vertical alignment – type face defect - double impressions or rebound clogged type faces – identification typist - classification of typewriter makes – examination of printed matter.

Examination of forged currency

Unit V: Law relating to evidence on documents - Instruments in forensic document examination – magnifier – microscope – scales – photography – ultra violet light – infra red rays – spectrophotometer – spectrograph – Video Spectral Comparator (VSC)

Reference

1. Pitchandi, N., & Sivamurthy. A. (Eds.). (1993). *Forensic Document Examination*, Institute of Criminological Research, Education and Services and Indian Bank.

17CR2030 CYBER CRIMES

Credit 4:0:0

Course Objective:

- The objective of the course is to enrich the students with the knowledge of prevention of cyber-crimes and thereby to protect themselves and the society from cybercrimes.
- To learn the different forms of cyber-crimes and its nature and extend
- To learn the legal perspective of the cyber laws from the Indian context.

Course Outcome:

End of the course every student will be able to

- Know various forms of cyber crimes
- Understand the prevention techniques of cybercrimes.
- Help the students to understand the role of victims and offenders in cyberspace.
- Students understand the definitional, technical and social aspects of cybercrimes.
- Students understand the emerging crime threats and trends in cyberspace.
- Have an awareness on the existing legal provisions for cyber-crime prevention

Unit I: Introduction Historical development – Definition and Classification of cybercrime – Conventional crime vs. cybercrime – Causes for cybercrime – Uniqueness of Cyber Crimes.

Unit II: Forms of Cybercrimes Hacking, cracking, DoS – Viruses, worms, malwares, bombs, email bombing, data diddling, salami attacks, phishing, steganography, cyber stalking, spoofing, pornography, defamation, computer vandalism, cyber terrorism, cyber warfare – Countermeasures to prevent cyber crimes

Unit III: Crimes in social media – Definitions, types and its impact on youth, Card frauds – Types, definitions, modus operandi, prevention and counter measures.

Unit IV: Intellectual Property violations – Definition and types of IPR – Violations of IPR in the cyber space, measures to prevent IPR violations.

Unit V: Cyber Laws Cyber laws in India – Information Technology (amended) Act, 2008 – Cyber Crime Cells – Cyber Appellate Tribunals – Information Security – Need, types and methods of information security.

References

1. Atkins, D., Buis, P., Hare, C., et al. (1997). *Internet security professional reference* (2nd ed.). Indianapolis, IN: New Riders Pub.
2. Goodman, S., & Soafer, A. (Ed.). (2002). *The transnational dimensions of cybercrime*. Washington: Hoover institution Press.
3. Hynson, C. (2012). *Cybercrime*. Mankato, Minnesota: Smart Apple Media.
4. Information Technology Act, 2000.

5. Marcella, A. J., & Greenfield, R. S. (Ed.) (2002). *Cyber forensics: A field manual for calculating, examining and preserving evidence of computer crimes*. Boca Raton, Florida: Auerbach.
6. Reyes, A. (2007). *Cybercrime investigations bridging the gaps between security professionals, law enforcement and prosecutors*. Rockland, MA: Syngress Pub.
7. Owens, C. L. (1997). *Computer crimes and computer related or facilitated crimes*. Federal Bureau of Investigation.
8. Walker, C. (1998). *Crime, criminal justice and the Internet*. London: Sweet & Maxwell.

17CR2031 ABNORMAL PSYCHOLOGY

Credit 4:0:0

Course Objective:

- Students and its impact on criminality.
- Enhance personal and social interactions by using the knowledge of the history and major theories of abnormal behavior.
- Better understand one's own and others behavior by applying the knowledge of assessment.

Course Outcome:

End of this course, the student will be able to

- Understand various concepts and types of abnormal behavior
- Its impact on criminal behavior and treatment
- Students will be able to discuss and interpret abnormal behavior.
- Students will be able to define and discuss classification, diagnosis and assessment of abnormal behaviors.
- Students will understand the assessment techniques for abnormal behaviors.
- Apply theoretical knowledge to the practical issues

Unit I: Introduction to Abnormal Behavior – Definition and Concept of abnormal behavior – Normal Vs. Abnormal Behavior – Culture and Abnormal Behavior - Abnormal behavior and criminality

Unit II: Theoretical Approaches to Abnormality Psycho-dynamic approach – Sigmund Freud, Carl Jung, Alfred Alder – Humanistic approach: Carl Rogers, Abraham Maslow – Behavioral approach – Ivan Pavlov

Unit III: Types of Abnormal Behavior – Neurosis and Psychosis – Differences between neurosis and psychosis - Psychological Disorders – DSM - Classification of disorders under DSM-V Neuro-developmental disorders – Schizophrenia spectrum and other psychotic disorders – Bipolar and related disorders – Depressive disorders – Anxiety disorders – Obsessive-compulsive and related disorders – Trauma and stressor related disorders – Personality disorders and other disorders

Unit IV: Anxiety Disorders – GAD, OCD, Phobias and Manias – Types – Differences between phobia and mania – Personality Disorders – Types, definitions, onset and treatment

Unit V: Psychopathic Personality – Sociopathic personality – Characteristics, causes and treatment – Impact of Psychopathic personality in criminal behavior.

References

1. Bartol, C. R. (1999). *Criminal behaviour: A psychosocial approach* (5th ed.). Englewood Cliffs, NJ: Prentice-Hall
2. Canter, D. (1997). *Criminal detection and the psychology of crime*. Aldershot, Hants, England: Dartmouth Pub.
3. Canter, D., & Youngs, D. (2009). *Investigative psychology: Offender profiling and the analysis of criminal action*. Chichester, West Sussex, UK: John Wiley & Sons.
4. Cassel, E., & Bernstein, D. (2007). *Criminal behaviour* (2nd ed.). Mahwah, NJ: L. Erlbaum Associates.
5. Bryant, Clifton D. (2000). *Encyclopedia of criminal and deviant behaviour* (10th ed.). New York: Brunner Routledge Taylor & Frances Group.

6. Harvard LPC Forensic Psychology (1981). Professor of Clinical Psychology, University of Surrey, Batsford Academic & Educational Ltd. London.
7. Hollin, C. R. (2013). *Psychology and crime: An introduction to criminological psychology* (2nd Ed.). London: Routledge.
8. Howitt, D. (2002). *Forensic and criminal psychology*. UK: Prentice Hall.
9. Jones, D. W. (2008). *Understanding criminal behavior: Psycho-social approaches to criminality*. Cullompton: Willan.
10. Miller, L. (2012). *Criminal psychology nature, nurture, culture: A textbook and practical reference guide for students and working professionals in the fields of law enforcement, criminal justice, mental health, and forensic psychology*. Springfield, Ill.: Charles C. Thomas.

17CR2032 DIGITAL FRAUDS

Credit 4:0:0

Course Description:

- This course deals where fraud and misconduct threaten and key signs of fraud in financial statements

Course Objective:

It helps the students by providing guidance on how to

- Access organizations vulnerability to fraud and misconduct, design and implement controls to prevent, detect, and respond to these occurrences
- Address increased regulatory enforcement and enhanced scrutiny
- Preserve and create value from corporate governance and compliance programs.
- Students apply diverse viewpoints to ethical dilemmas in the information technology field and recommend appropriate actions.
- Use technology and data analytics to mitigate fraud and misconduct risks
- Evaluate the ongoing effectiveness of your compliance program

Course Outcome:

- The students shall have an overall understanding of Frauds and its nature and impact.
- Understanding of different forms of electronic frauds
- Apply theoretical knowledge to the practical problems.

Unit I: Fundamentals of Frauds – Fraud – Definitions, Fraud Triangle – Types of fraudsters

Unit II: Banking Frauds – Authentication Management, Payment Fraud, Fraud Consulting and Services, Card & Emerging Payments Fraud, Cheque Fraud, Internal Threats.

Unit III: IT Frauds - IT Frauds (Theft of Proprietary Information, Insider abuse of internet access, system penetration, unauthorized access to information, laptop/mobile theft, financial fraud, misuse of public web application, virus, abuse of wireless network) – Countermeasures

Unit IV: Financial Frauds – Financial Inclusions and mobile financial Services, Regulating for financial inclusions, Agent network issues, Telecommunication access network issues, Account to account interoperability issues, Customer data and risk based financial issues, Consumer Protection, Collaboration among financial, telecommunications and competition authorities

Unit V: Telecom Frauds - Telecom Frauds - Organizational or Non-Technical Fraud (involving Administration services, processes) - Human Fraud - Insider Fraud - Call-sell Fraud - Facilitation Fraud - Creeping Fraud - Chaining Fraud - Calling-Card Fraud - Phantom Account - Partnership Fraud - Process Fraud – Ghosting - Abuse of test or emergency lines or accounts - Unauthorized Feature/Service Activation – Accounting - Dealer or Reseller Fraud - Subscription Fraud - Roaming Subscription Fraud - Premium-Rate Services Fraud- Illustrative Cases - Technical Fraud (involving Network Systems, Billing Systems) – Cloning – Tumbling - Voice-mail Hacking - PBX Hacking - SIM Stuffing- Clip-on Fraud - Line Tapping - War Dialing - Handset Fraud – Fixed Network Fraud – Mobile Network Fraud – Frauds in 2G, 3G and 4G Frauds

References

1. Jackson, C. W. (2014). *Detecting accounting fraud: Analysis and ethics* (1st edition). UK: Pearson.
2. Pedault, S. (2010). *Anatomy of a fraud investigation: From detection to prosecution* (1st edition). NJ: John Wiley & Sons.

Text Books:

1. Managing the risk of fraud and misconduct, first edition – Richard H Girgenti, and Timothy P Hedley
2. Telecom and Network Security: Toll Fraud and Telabuse update – Jan Wilson

17CR2033 CRIMES AGAINST WOMEN AND CHILDREN

Credit 4:0:0

Course Objective

- This course will examine crimes against women and children in domestic environment
- Understanding the legal perspectives of the gender-based crimes.
- Helps the students to identify the behavior's and attitude of victims experiencing violence against women and violence against children.
- Students understand the complexities of the causes, risk factors and adverse effects of violence against women and children.
- Helps the students to understand the responses and services for the survivors.
- Have an overview of the other external agencies that part of the victims of gender-based crimes.

Course Outcome

- Demonstrate understanding of the historical, social, and political contexts that contribute to violence against women.
- Describe key feminist and sociological theories relevant to violence against women.
- Be familiar with key social science research on intimate partner violence, domestic abuse, and sexual assault

Unit I: Gender based violence – Definition, history and concepts

Unit II: Crimes against women – types and definitions of crimes against women – causes and consequences

Unit III: Crimes against children - types and definitions of crimes against children – causes and consequences

Unit IV: Laws relating to crimes against women and children

Unit V: The role of Non-Governmental Agencies in Preventing Crimes against Women and Children – PCVC - AIDWA

References

1. Aadesh, K. D. (2008). *Crime against women and child: An emerging social problem*. New Delhi: Cyber Teck Publications.
2. Acharya, N. K. (2005). *The protection of women from domestic violence Act*. Hyderabad: Asia Law House.

17CR2034 SPECIAL LAWS

Credit 4:0:0

Course Objective

- This course will be enable the students to understand the legal aspects of the different laws from the Indian Context.
- Use of law in the different areas of Criminal Justice Administration from the Indian perspectives.
- Understand the recent changes and amendments made in the Special Laws.

Course Outcome

- Students will be enable to think on the different laws pertaining to domestic violence and Juvenile justice and other areas.

- Students will demonstrate an understanding of the special and local laws enacted in India and the States.
- Students will be familiar with and can be effectively communicate the various legal terminologies.
- Students will be able to apply basic legal knowledge to various social issues pertaining in the society.
- Demonstrate and critically analyse the legal
- Apply theoretical knowledge to the real-life problems.

Unit I: Introduction - local and special laws - Various Local and Special Laws existing in India and Tamil Nadu

Unit II: Protection of Civil rights Act; Prevention of Atrocities Act, 1989

Unit III: Salient features of Juvenile Justice (Care and Protection) Act, 2000 and latest amendments - Immoral Traffic (Prevention) Act - Probation of Offenders Act – FERA – COFEPOSA

Unit IV: Prevention of Corruption Act, Prevention of Food and Adulteration Act,

Unit V: Dowry Prohibition Act and narcotic and psychotropic Substances Act, Anti-terrorism Legislations.

References

1. Protection of Civil Rights Act, 1955 alongwith Rules, 1977. Bare Act with Short Comments. Professional Book Publishers.
2. Ajay. (2013). Social inclusion vis-à-vis the protection of Civil Rights Act, 1955 – Success or failure! A critical evaluation” By Ajay. *The Lex-Warrier: Online Law Journal*.
3. Scheduled Castes & Scheduled Tribes (Prevention of Atrocities) Act 1989. Published by Eastern Book Company.
4. NHRC. (2004). Report on Prevention of Atrocities against SCs. New Delhi.
5. Sait, N. A. (2014). *Juvenile justice – Care and protection of children Act, 2000*. LexisNexis.
6. Adenwall, M. (2006). *Child Protection and Juvenile Justice System for Juvenile in Conflict with Law*. Childline India Foundation, Mumbai.
7. Mazhar Hussain. (1997). *Immoral Traffic (Prevention) Act, 1956*. Eastern Book Co. India.
8. Probation of Offenders Act, 1958 (Lawmann’s series). (2017). Kamal Publishers. New Delhi, India.
9. Mehta, V. P. (1985). *Fera/Exchange Control in India (Foreign Exchange Regulation Act)*, Stosius Inc/ Advent Books Division.
10. Kably, H. S. (1988). *COFEPOSA, 1974: The Conservation of Foreign Exchange and Prevention of Smuggling Activities Act, 1974*. N. M. Tripathy. India.
11. Ramachandra Rao, A. S. (2016). *Commentary on the Prevention of Corruption Act*, 3rd Edition. Universal Law Publishing.
12. Prevention of Food and Adulteration Act, 1954 (Bare Act with short notes). (2016). Universal Law Publishing. India.
13. Dowry Prohibition Act 1961 (Act No. 28 of 1961) (Lawmann’s series). (2015). Kamal Publishers. New Delhi, India.
14. De, D. (2009). *Guide to the narcotic drugs and psychotropic substances Act*. New Delhi: LexisNexis.
15. Shruti, B. (2015). *Indian Counter Terrorism Law*. New Delhi: LexisNexis.
16. Sharanjith. (2014). *Anti-terror laws in India: Legislative developments under compulsions and restraints*. New Delhi: Regal Publications.

17CR2035 NGO MANAGEMENT

Credit 4:0:0

Course Objective

- Overview of the role of NGO in the Criminal Justice Process
- Students will be enabled with the understanding of the law and its scope pertaining to the NGO’s

- International Organizations and their functions for the welfare and NGO's and Human rights organizations.

Course Outcomes

- Students will have an understanding about the nature and scope of NGO's in the Criminal justice process.
- Students can critically analyse the various laws pertaining to the organization that works for the welfare of the society.
- Students will understand the concepts as well as the practices of NGO management.
- Helps the students to understand how to strengthen the capacities to improve the functioning of an NGO.
- Students will understand the institutional and organizational framework, resource and capacity constraints, projects and program objectives, community needs and cultural contexts.
- Apply theoretical knowledge to the practical issues.

Unit I: Introduction Concept – Origin and development – Organizational structure – Functions and types – Limitations – Challenges and issues – Developmental issues and indicators

Unit II: Procedures for Establishment of NGOs Strategic planning and development – Legal procedures: Formation and differences of Trust and Society – Registration procedure for NGOs – Tax reliefs under various Acts – Salient features of Indian Companies Act, 1956 – Societies Registration Act, 1860 – The Indian Trusts Act, 1882

Unit III: Financial process: Fund-raising, accounting and budgeting – Administration: Office procedure and documentation – Social marketing – Resource mobilization and allocation – Project management

Unit IV: International, National and Regional Organizations vis-a-viz Crime, Justice and Victims United Nations Office on Drugs and Crime (UNODC) – United Nations Children Fund (UNICEF) – United Nations Inter-regional Crime and Justice Research Institute (UNICRI) – International Federation of Red Cross and Red Crescent – Amnesty International – Transparency International – Asian Criminological Society (ACS) - Save the Children – Help-age – World Society of Victimology – INTERPOL – Human Rights Watch – World Health Organization – Victim support organizations – Adventist Development & Relief Agency (ADRA) - National Human Rights Commission – People's Union for Civil Liberties – Indian Society of Criminology - Indian Society of Victimology — Green Tribunals

Unit V: Schemes for NGOs under Government of India Ministries of Government of India: Home Affairs, Human Resource Development, Women and Child Development – Communication and Information Technology – Environment and Forest – Health and Family welfare – Labour and Rural development – Law and Justice – Social Justice and empowerment

References

1. Clark, John (1991). *Voluntary organisations: Their contribution to development*. London: Earth Scan.
2. Hilhorst, D. (2003). *The real world of NGOs: Discourses, diversity and development*. London: Zed Books Ltd. Drucker,
3. Peter (1993). *Managing the non-profit organization: Principles and practices*. New Delhi: Macmillan Publication.
4. Edwards, M., & Hulme, D. (2003). *NGO performance and accountability: Introduction and overview in Michael Edwards and Alan Fowler's the earthscan reader on NGO management*. London: Earthscan Publication Ltd.
5. Fisher, Julie (2003). *Governments, NGOs and the political development of the third world*. Jaipur: Rawat Publications.
6. Ginberg, Leon H. (2001). *Social work evaluation: Principles and methods*. Singapore: Allyn & Bacon.

7. Kandasamy, M. (1998). *Governance and financial management in non-profit organizations*. New Delhi: Caritas India.
8. Kapoor, K. K. (1986). *Directory of funding organizations*. New Delhi: Information & News Network.
9. Kumar, A. (2003). *Social change through NGOs*. New Delhi: Anmol Publishers.
10. Lawant, B. T. (1999). *NGOs in development*. Jaipur: Rawat Publications.
11. Mukherjee, A. (1995). *Participatory rural appraisal: Methods and application in rural planning*. New Delhi: Vikas Publishing Co.
12. Mukherjee, K. K., & Mukherjee, S. (1986). *Voluntary organization: Some perspectives*. Hyderabad: Gandhi Peace Centre.

17CR2036 CYBER CRIMES PRACTICAL LAB

Credit 0:0:2

Course Objectives

- To teach the efforts taken to prevent cyber crimes
- Knowledge on regulations pertaining to cybercrimes in India
- TO gain knowledge on the various law enforcement agencies in Central and State level to detect and investigate Cybercrimes.

Course Outcomes

Students should able to

- Understand the concept of cyber security
- write and analyze the different forms of cyber crimes
- articulate loss due to the impact of cyber crimes
- develop a capacity to detecting and investigating cyber frauds
- Understand cyber space jurisdiction and its types
- Comprehend various types of domain name disputes

List of Experiments:

1. Theft of telecommunications services
2. Telecommunications piracy
3. Dissemination of offensive materials
4. Electronic money laundering and tax evasions
5. Electronic vandalism and terrorism
6. Sales and investment frauds
7. Illegal interception of telecommunications
8. Electronic fund transfer frauds
9. Human rights and piracy safeguards
10. Communications in furtherance of criminal conspiracies

CRIMINOLOGY

LIST OF COURSES

Course Code	Name of the Course	Credit
17CR2001	Introduction to Criminology and Criminal Justice Administration	3:0:0
17CR2002	Psychology and Criminal Behavior	4:0:0
17CR2003	Indian Criminal Justice Administration	4:0:0
17CR2004	General Principles of Criminology	3:0:0
17CR2005	Principles of Criminal Laws	4:0:0
17CR2006	Juvenile Justice System	4:0:0
17CR2007	Contemporary Forms of Crimes	3:0:0
17CR2008	Field visit to Criminal Justice Institutions	0:0:2
17CR2009	Criminology Practical Lab 1	0:0:2
Total Credits		24

17CR2001 INTRODUCTION TO CRIMINOLOGY AND CRIMINAL JUSTICE ADMINISTRATION

Credit: 3:0:0

Course Objectives:

- To give a basic understanding of criminology and terminology.
- To understand about various forms of crimes and about crime prevention.
- To have a general idea about the criminal justice system.

Course outcomes:

By the end of the course, students should be able to:

- Have an awareness of the different sources of information available to academics, policy-makers and the public on crime;
- Understand the contested nature of what is (and is not) considered to be ‘crime’;
- Have acquired knowledge of the contrasting schools of explanations that have emerged in relation to explaining criminal behaviour and crime causation
- To understand about various forms of crimes
- Apply theoretical knowledge to practical problems.
- History of criminology.

Unit I - Introduction Criminology - definitions and historical perspective - Social concept of Crime - Crime and deviance – Crime and society - Criminology as a social science - Criminology and medicine –Criminology and law -Crimes in changing society -Why crime is committed/ reasons

Unit II - Criminology- Nature , origin and scope – Culture – Characteristics of Culture- Crime and culture – Community - Social Context – Socio cultural disparity. Socio economic disparity like unemployment, poverty, no proper distribution of wealth etc. Desire/ moral, exposure to crime, drugs and liquors etc, psychiatry enjoying others suffering

Unit III - Crime and Criminal Typology - crimes against persons and crimes against property; Adult and Juvenile –Habitual offenders, Professional offenders, and violent offenders Crimes against nature and natural resources - Crime against community (caste, race etc). Crime against nation (counterfeit currency, spread of disease, hazardous waste disposal etc). Crimes against humanity (weapons of war, religious fanatics etc)

Unit IV - Crime and crime prevention - Criminal Justice System- Roles of legislature policy of govt – Police Science - Cooperation and coordination of criminal justice system. Can crime be prevented by criminal justice system or reasons for Criminal Justice System failure?

Unit V - History of Criminology - Pre classical, Classical, Neo Classical, Positive, Cartographic, Biological and Constitutional Schools. Crimes in India: Statistics, Crime rate, National Crime records- Bureau, State Crime records Bureau, and District crime records bureau; Patterns and current trends of crime in India

Text Book:

1. Nadeem Husnain, Fundamental of criminology, Edition 2012, Surendra Publications, ISBN: 9789382192077, 9382192077

Recommended readings:

1. Ahmed Siddique Criminology, Problems and Perspectives, (3rd Edition), Eastern Book House, Lucknow.
2. Allen, Friday, Roebuck and Sagarin, Crime and Punishment: An introduction to Criminology, The Free press. New York.
3. Paranjpe, N.V. Criminology and Penology: Central Law Publications, Allahabad; ISBN 9381292108
4. Gaur.KD (2015); Criminal Law, Criminology and Administration of Criminal Justice Universal Law Publishing
5. Clive Coleman & Clive Norris, Introducing Criminology

17CR2002 PSYCHOLOGY AND CRIMINAL BEHAVIOUR

Credit: 4:0:0

Course Objectives:

- To understand the delinquent and criminal behavior from a developmental, cognitive-behavioral, and psychological perspective.
- To examines the risk and protective factors that are believed to influence the developmental pathways on the road to delinquency and crime.
- To examine the behavioral, emotional and cognitive aspects of crime focusing primarily on the offender but occasionally on the victim as well

Course Outcome:

- To provide students with a deep understanding of both general psychological theory
- Learn to apply the psychological concepts and theories learnt to criminal and forensic settings.
- Learn the personality traits acting behind the psychological behavior of a person.
- To find the answer to the question why do people commit crimes,
- Explain the main behavioural assumption about offenders

Unit I - Definition of Psychology – Psychology and Criminology - Human Mind and behavior – Desirable and undesirable behavior - Human Anger and Aggression - Relation between Psychology and Criminology.

Unit II - Psychology of crime – Deviant behavior – impulsive violence – Emotion and Mood – attitude.

Unit II - Personality – Freud – Defense Mechanisms - Motivation - Society and personality - Beliefs and desires

Unit IV - Learning theories – Conditioning – Perception and learning – sensory process, memory, intelligence. Various sources of learning – general culture, mass media, other criminals and non-criminal who have values conducive to crime, specialized skills for learning criminal techniques.

Unit V - Nervous system - Anger and Aggression – Stanley Milgram's. Experiment- Mental Diagnosis, Prognosis and treatment of Criminal and delinquent behavior - Organized crime syndicates.

Text Book:

1. Navin Kumar (2015); Criminal Psychology:, Published by Lexis Nexis

Reference Books:

1. Adrian Raine, The Anatomy of Violence: The Biological Roots of Crime:, Penguin Books Ltd, ISBN: 9780141046860
2. Ray Bull (2015), Criminal Psychology (Beginners' Guide): Published by Pan Macmillan India; 2 edition
3. Page D.J. (1970), Abnormal Psychology: A clinical Approach to Psychological Deviants", Tata McGraw Hill, New Delhi.
4. Bharati, A. (2012). Studies on Criminological Psychology. G.S. Rawat for Ceber Tech Publications. New Delhi- 110 002
5. Andreassi, J.L. (2000) Psychophysiology : Human Behaviour and Physiological Response (4th Edition). Hillsdale, NJ : Lawrence Erlbaum Associates, Inc.
6. Murphy K.R. and Charles O. Davidshofer (2001) Psychological testing : Principles and Applications, Prentice Hall, New Jersey.

17CR2003 INDIAN CRIMINAL JUSTICE SYSTEM

Credit: 4:0:0

Course Objective:

- To understand the various Government Agencies enforcing law, adjudicating and in charge of correcting criminal conduct.
- To enable the student as how the Indian Criminal Justice System apprehends and control the anti-social behaviours and punish the offenders to deter the recurrence.
- To understand the law enforcement agencies in India.

Course Outcome

- Identify various agencies encompassing the administration of justice and the inter-relationships between them.
- Give an overview of the organization and operation of administration of justice agencies.
- Learn the theory behind the usage of appropriate type of punishment theory.
- Learn the various correctional institution in India.
- Analyze the legal liabilities and other consequences of police, prosecutorial, and judicial misconduct.

Unit I - Criminal Justice Definition - The evolution of Criminal Justice System –Historical perspective – Criminal Justice system in western countries.

Unit II - Crime – Criminal intent – IPC-Cr.P.C.-Evidence Act- Law enforcement agencies – Agencies of Criminal Justice System - Police as an agency of Criminal Justice system – Court and Judiciary. Unfettered powers of police, role of revenue authorities (Collector, Tahsildhar...)

Unit III - Punishment –definition, nature and scope - Types of Punishments - Theories of Punishment: - Retributive theory - Preventive theory - Deterrence theory - Reformation theory.

Unit IV - Correctional Institutions in India – Historical development of correctional system in India – Probation – concept and scope – Probation in India – probation procedure

Unit V - Police and Constitution of India - Police Act – Role of police in social legislation enforcement – Human Rights issue – Up-holding Human Rights. (prison act, rules) Agencies of human rights.

Text Books:

1. Gaur.KD (2015); Criminal Law, Criminology and Administration of Criminal Justice
Universal Law Publishing

Reference Books:

1. Justice U.L ; Lectures on the Indian Evidence Act, Universal Law Pub Co.P.Ltd.-Delhi
2. Police Act – Bare Act Book
3. P D Sharam:Police and Criminal Justice System in India
4. G S Rajpal (2012); Criminal Justice System Reconsidered: Victim& Witness perspectives;
ISBN: 8183875165

17CR2004 GENERAL PRINCIPLES OF CRIMINOLOGY

Credit : 3:0:0

Course Objectives:

- To learn the effect culture community and its disparity on crime.
- Learn the various types of crimes prevailing in the modern world and particularly in the Indian Society.
- To link general elements of theory to the typologies of crime.

Course Outcomes:

On successful completion of this course, student will be able to:

- Analyze the various trends in types of crime (both traditional and emerging)
- Identify the general elements of criminological theory;
- Show the possible ways in which personal and social correlates interact, and;
- Identify future possible trends in crime and
- Understand the important role of criminological research in charting its course.

Unit I - Crime and Criminology - Theoretical perspectives (retributory, content, love etc theory) – Classical and Neo Classical – Contemporary theories- Anomie theory – Differential Association theory – Subculture theory – labelling theory

Unit II - Radical approach to Criminology – Multi-factor approach – Social deviance – Social deviance and disorganization - Urbanization and crime-Juvenile Delinquency

Unit III - Crime against women – Crime against children (including female infanticide) – Crime against elders – Predatory crime – Organised crimes – White collar crime – Cyber Crime human trafficking

UNIT IV - Investigation of Crimes: Complaint, F.I.R., Powers of Police Officers, Arrest, Search, Seizure, Police Custody, Judicial Remand and Bail.

Unit V - Crime prevention – Criminal law in India – Global initiatives for crime prevention – Role of policing, parenting, school, society, religion – State Crime Records Bureau (SCRB) – National Crime Records Bureau (NCRB)

Text Book:

1. Prafullah Padhy (2006), Crime and Criminology (Principles of Criminology), Vol. 1: Isha Books, ISBN: 9788182053434, Edition: 1, 2006

Reference Books:

1. Ahmed Siddique, Criminology, problems and Perspectives , Eastern Book house, Lucknow. U.P.,
2. Paranjpe, N.V., Criminology and Penology, Central Law Publications, Allahabad, U.P.,
3. Crime in India, (2011), National Crime Record Bureau, Ministry of Home Affairs, New Delhi.
4. V.D. Devasia and Leelamma Devasia; (1992); Criminology, Victimology Corrections, S.B. Mangia for Ashish Publishing House, New Delhi
5. Gaur, K.D. (2015); Criminal Law, Criminology and Administration of Criminal Justice Universal Law Publishing.

17CR2005 PRINCIPLES OF CRIMINAL LAW

Credit : 4:0:0

Course Objective:

- To introduce the students to the fundamentals of criminal laws like CrPC, IPC and Indian Evidence Act.
- To provide the ability to explain and evaluate several offences and defences as well as the general principles governing liability
- To have knowledge and understanding of the main concepts and principles of criminal law

Course Outcomes:

- Analyze criminal law principles and apply concepts to factual situations.
- Examine general principles of criminal liability, a range of fatal and nonfatal offences against the person and selected offences against property and public tranquility.
- Demonstrate understanding of the hierarchy of courts and the appeal process in criminal cases.
- Apply criminal law to complex issues, and critique the operations of criminal law from both a policy and theoretical perspective.
- Apply skills in statutory interpretation to legislation that create criminal offences and defences.

Unit I – Introduction: Criminal Law – Concepts & Definition of Crime – Relationship between sin, crime, tort – IPC and IEA – Nature and Scope – Doctrine of Actus Reus and Mens Rea – Statutory Offences – Stages of crime – Joint Liability – Vicarious Liability

Unit II - Legal Provisions of Indian Penal Code: Legal provisions in IPC – Crime against Person – culpable homicide – Murder – Rape - Outraging Modesty- Kidnapping and Abduction - Hurt - Crime against property – Theft – Robbery – Dacoity – House Breaking – Extortion – Crime against Public Tranquillity – Riot – Unlawful Assembly – Arson – Perjury, economic crimes counterfeited currency, etc

Unit III - Legal Provisions of Criminal Procedure Code: Organizational Setup of Courts in India – Complaint – Inquiry – Investigation – Police Report Charge sheet – Public Prosecutor – Defence Council – Arrest – Bail – Search – Seizure – Types of Trial.

Unit IV - Court Procedures: Summons – Warrant – Information regarding Cognizable & Non – cognizable offences – Trials – Summary – Summon and Warrant trials.

Unit V - Legal Provisions of Indian Evidence Act: Evidence: Meaning, Principles, Concepts of Relevancy and Admissibility. Presumption of innocence – the concept of fair trial – burden of proof; Types of Evidence: Declarations, Confessions ; Expert Evidence: Medico-legal opinion. Forensic Science Expert; Examination in Chief, Cross Examination and Re-examination

Text Book:

1. Gaur.KD (2015); Criminal Law, Criminology and Administration of Criminal Justice Universal Law Publishing.

Reference Books:

1. Ratanlal & Dhirajlal (2000) The Code of Criminal Procedure, Nagpur : Wadhwa & Co.
2. Gaur, K.D. (1985) Criminal Law, Second Edition, N.M.Tripathi, Bombay.
3. Kelkar, R.V. (1996) Outlines of Criminal Procedure.
4. Ratanlal & Dhirajlal (1984) The Indian Penal Code, Nagpur : Wadhwa & Co.
5. Singh, A., (1995) Law of Evidence, Allahabad Law Agency.
6. Sarathy, V.P. (1994) Elements of Law of Evidence, Lucknow : Eastern Book C

17CR2006 JUVENILE JUSTICE SYSTEM

Credit: 4:0:0

Course Objective:

- To study the deviant behavior by legal minors in contemporary society
- To learn the factors and conditions contributing to delinquency
- To understand the control mechanism and treatment of offenders and various programs for prevention of crime.

Course outcomes:

The student will be able to :

- Apply criminal justice terms to juvenile justice and evolution of juvenile justice in India
- Analyze the factors contributing to juvenile delinquency
- Analyze the process of legislative approach when juvenile in conflict with law
- Learn to apply preventive strategies for delinquent behavior by children
- Differentiate between the various foreign juvenile justice programs.

Unit I - Concept of Juvenile Delinquency - Pre delinquency stages: Vagrancy , Truancy Nature and Scope - Evolution of juvenile justice in India - Conception of child under the Indian constitutional Law and under penal Law.

Unit II - Determining factors of Juvenile Delinquency - Differential association - Media and Delinquency - Family and Delinquency - Economic pressure-Peer group influence -gang sub culture-class differentials, Intelligence and Delinquency

Unit III - Legislative approach -Juvenile Justice (care and protection of children) Act 2016 - Juvenile in conflict with law - Juvenile in need of care and protection - Competent Authorities - Procedural safeguards- Community participation in juvenile care.

Unit IV - Indian context of Juvenile Delinquency - the Child population percentage- Delinquent behavior by children - Juvenile below poverty line - physically and mentally disabled, orphans, destitute and vagrant - impact of child labour.

Unit V - Preventive strategies- Social and -welfare programs - compulsory education - Role of Community, family NGO's etc., - social action litigation -judicial decisions. Comparison with foreign juvenile laws and reformation

Text Book:

1. Manish Dwivedi(2011); Juvenile Justice System in India; Adhiyayan Publisher; ISBN: 8184352832

Reference Books:

1. Kristin Bates (2017); Juvenile Delinquency in a Diverse Society; Sage Publications; ISBN: 1506347495
2. Children in India-2012, A Statistical Appraisal, Ministry of Statistics and Programme Implementation, New Delhi, 2012
3. R. N. Choudhary : Law Relating to Juvenile Justice in India;
4. Juvenile Justice (care and protection of children) Rules, 2007
5. Law relating to Juvenile Justice in India –R.N. Choudhry
6. The right of the child in India – Justice Rajkumar Manisana Singh.

17CR2007 CONTEMPORARY FORMS OF CRIMES

Credit: 3:0:0

Course Objective:

1. To study the different forms of crimes.
2. To study the prevention and control strategies of crimes.
3. To understand the Social and legal measures for controlling crime.

Course outcomes:

The student will be able to:

1. Apply the knowledge gained in identifying the forms of crime.
2. Analyse the problems in investigating and prosecuting crimes.
3. Learn how to protect one self and ultimately society from crimes.
4. To learn the regional and international linkages among forms of crime.
5. To find solutions for various societal problems arising out of crimes.
6. Learn to apply the Social and legal measures for controlling crime.

Unit I - White Collar Crime - Nature, meaning and forms - Tax-evasion - Import/export violations - Insurance frauds - Misbranding and adulteration - Corporate crimes

Unit II - Organized Crime - Nature, meaning and forms - Criminal syndicates - Organized crimes: Regional and international linkages - Problems of identification, investigation and prosecution - Prevention and control strategies.

Unit III - Terrorism - Nature, meaning and forms -Types of terrorism - Narco-terrorism and Amino-terrorism - National and international roots of terrorism

Unit IV - Cyber Crime - Copyright violation of software - Nature, meaning, definition, forms and etiology - Internet frauds - Prevention, detection and prosecution of cyber criminals.

Unit V - Environmental Crimes - Nature, meaning and forms- Crime against wild life: Fauna & Flora - Crime against forest conservation - Industrial waste and pollution -River pollution- Social and legal measures for controlling crime.

References

1. Gandhirajan, C K 2004, Organised crime, A P H Publishing Corporation
2. Karan Raj, 2002, Dictionary of Terrorism and Bioterrorism, IVY Publishing House, Delhi.
3. Shah, Giriraj, 2002, Encyclopedia of International Terrorism, Anmol Publications, New Delhi.
4. Holmes, Ronald M, 2001, Murder in America, Sage Publications, New Delhi.

5. Sain, Bhim, 1991, Drug Addiction Alcoholism, Smoking Obscenity and its Impact on Crimes, Terrorism and Social Security, Mittal Publications, New Delhi.
6. Attar Chand, 1988, Terrorism: Political Violence and Security of Nations, Gian Publishing House, New Delhi.

Karunya University

LIST OF COURSES

Course code	Name of the course	Credit
17CA1001	Fundamentals of computing and programming	3:1:0
17CA2001	Principles of Web Programming	3:0:0
17CA2002	Introduction to Information Technology	3:0:0
17CA2003	Computer Organization and Architecture	3:0:0
17CA2004	Programming in C	3:0:0
17CA2005	Principles of Data Communication	3:1:0
17CA2006	Database Management Systems	3:0:0
17CA2007	Object Oriented Principles using C++	3:0:0
17CA2008	Operating System Concepts	3:0:0
17CA2009	Essentials of Software Engineering	3:0:0
17CA2010	Data Structures and Applications	3:0:0
17CA2011	Programming in Java	3:0:0
17CA2012	Network Fundamentals	3:0:0
17CA2013	Visual Programming	3:0:0
17CA2014	Principles of Computer Graphics	3:0:0
17CA2015	System Administration	3:0:0
17CA2016	Business Analytics	3:0:0
17CA2017	Object Oriented Analysis and Design	3:0:0
17CA2018	Web Technology	3:0:0
17CA2019	Programming in Python	3:0:0
17CA2020	.Net Programming Using C#	3:0:0
17CA2021	Software Testing and Quality Assurance	3:0:0
17CA2022	System Software	3:0:0
17CA2023	Elements of E-Commerce	3:0:0
17CA2024	Network Security	3:0:0
17CA2025	Network Components and Troubleshooting	3:0:0
17CA2026	Professional Ethics	3:0:0
17CA2027	General Aptitude	3:0:0
17CA2028	Web Programming lab	0:0:2
17CA2029	Programming in C Lab	0:0:2
17CA2030	MS-Office Lab	0:0:2
17CA2031	Hardware Troubleshooting Lab	0:0:2
17CA2032	Programming in C++ Lab	0:0:2
17CA2033	Database Management Systems Lab	0:0:2
17CA2034	Programming in Java Lab	0:0:2
17CA2035	Data Structures Lab	0:0:2
17CA2036	Visual Programming Lab	0:0:2
17CA2037	Computer Graphics Lab	0:0:2
17CA2038	System Administration Lab	0:0:2
17CA2039	Web Technology Lab	0:0:2
17CA2040	Python Lab	0:0:2
17CA2041	.Net Programming Using C# Lab	0:0:2
17CA2042	Software Quality Testing Lab	0:0:2
17CA2043	Network Components and Troubleshooting Lab	0:0:2
17CA2044	Basics of Computer Applications	3:0:0
17CA2045	Operating System and its Security	3:0:0
17CA2046	Operating System and Its Security Lab	0:0:2
17CA2047	Forms of Cyber Crimes and Frauds	3:0:0
17CA2048	Computer Forensics	3:0:0

17CA2049	Fundamentals of Information Security	3:0:0
17CA2050	Security of Web Applications	3:0:0
17CA2051	Malware Analysis and Security	3:0:0
17CA2052	Malware Analysis and Security Lab	0:0:2
17CA2053	Fundamentals of General Forensic Science	3:0:0
17CA2054	Database Security Fundamentals	3:0:0
17CA2055	OSI Layers and Security Protocols	3:0:0
17CA2056	Security Assessment of Information Systems Through Ethical Hacking	3:0:0
17CA2057	Security Assessment of Information Systems Through Ethical Hacking Lab	0:0:2
17CA2058	Cyber Crimes and Cyber Law	3:0:0
17CA2059	Biometric Security	3:0:0
17CA2060	Biometric Security Lab	0:0:2
17CA2061	Vigilance and Security Management	3:0:0
17CA2062	Information Security Management System Standards	3:0:0
17CA2063	Mobile Computing	3:0:0
17CA2064	Mobile Computing Lab	3:0:0
17CA2065	Advanced Computer Forensics	3:0:0
17CA2066	Advanced Computer Forensics Lab	3:0:0
17CA2067	Cyber Security Governance	3:0:0
17CA2068	Cloud Security	3:0:0
17CA2069	Security Threat Management	3:0:0
17CA3001	Cyber Criminology and Criminal Justice Administration	3:0:0
17CA3002	Cyber Crimes and Frauds	3:0:0
17CA3003	Fundamentals of Network Security	3:0:0
17CA3004	Fundamentals of Network Security Lab	0:0:2
17CA3005	Information Security	3:0:0
17CA3006	Digital Forensics	3:0:0
17CA3007	Digital Forensics Lab	0:0:2
17CA3008	Information Technology Act	3:0:0
17CA3009	Advanced Digital Forensics	3:0:0
17CA3010	Advanced Digital Forensics Lab	0:0:2
17CA3011	Information Security Management	3:0:0
17CA3012	Database Security	3:0:0
17CA3013	Database Security Lab	0:0:2
17CA3014	Governance, Risk & Compliance	3:0:0
17CA3015	Business Continuity and Disaster Recovery Planning	3:0:0
17CA3016	Intellectual Property Rights	3:0:0
17CA3017	Incident Response And Computer Forensics	3:0:0
17CA3018	Security in the Cloud	3:0:0
17CA3019	Security in the Cloud Lab	0:0:2
17CA3020	Intrusion Detection and Prevention System	3:0:0

17CA1001 FUNDAMENTALS OF COMPUTING AND PROGRAMMING

Credits: 3:1:0

Course Objectives:

- To learn basics of computing
- To enhance the problem solving skills
- To empower the students with an idea of developing the programming logic
- To learn about the basics of C programming

Course Outcome:

The student will be able to

- describe fundamentals of computers and internet.
- design an algorithmic solution for a given problem

- explain programming concepts to solve the computational problems.
- develop C program to solve computational problems.
- develop C programs using arrays, and functions.
- develop C program for simple applications of real life using structures and union

Unit I - Fundamentals of Computers, Number System, Computer Software, Hardware, Information Technology and Internet. Introduction to Programming, Problem solving Techniques,

Unit II - Variables and Constants, Data Types, Operators and Priority, Input and Output in C.

Unit III - Control statements: Branching, Selection, Looping statements, break, continue, goto statement.

Unit IV - Functions, Arrays, Functions with Pointers, Pointer to Function, Strings, Storage classes in C.

Unit V - User-defined Data Types, Structure, Array of Structures, Union.

Text Book:

1. Ashok N. Kamthane. "Computer Programming", Second Edition, Pearson Publications, New Delhi, 2012, ISBN: 978-81-317-6494-7.

Reference Books:

2. Byron S. Gottfried, "Programming with C", Indian Adapted Edition, Tata McGraw Hill, 2006, ISBN: 0-07-059369-8.
3. Herbert Schildt, "The Complete Reference C", Fourth Edition, McGraw-Hill Publications, 2007, ISBN: 978-0072121247.
4. Yashwant kanetkar, "Let us C", 10th Edition, BPB Publications, 2010, ISBN: 978-81-8333-163-0.
5. Kashi Nath Dey, Samir Bandyopadhyay, "C Programming Essentials", 2010, Dorling Kindersley (India) Pvt. Ltd., ISBN: 978-81-317-2889-5.
6. Anita Goel, Ajay Mittal, "Computer Fundamentals and Programming in C", 2013, Dorling Kindersley (India) Pvt. Ltd., ISBN: 978-93-325-1934-3.
7. E. Balagurusamy, "Programming in ANSI C", Sixth Edition, Tata McGraw Hill, 2012, ISBN: 978-1-25-900461-2.

17CA2001 PRINCIPLES OF WEB PROGRAMMING

Credits 3:0:0

Course Objective:

- To study about the Basic web concept.
- To learn about HTML tags.
- To learn about CSS

Course Outcome:

Upon successful completion of this Course, the student will be able to

- Apply the design principles, techniques and technologies in web designing.
- Demonstrate the HTML tags used in designing a web page.
- Select and apply markup languages for processing, identifying and presenting information in web pages.
- Use critical thinking skills to design and create web sites.
- Design web pages using HTML and CSS.
- Construct web sites that conforms to the web standards.

Unit I - Defining web design- Web design pyramid- The medium of the web – Types of websites- Web design themes.

Unit II - Fundamentals of HTML- working with text – organizing text in HTML- working with links and Urls- creating tables

Unit III - Working with Images, colors and canvas, working with forms, interactive elements, working with multimedia

Unit IV - Overview of CSS- Backgrounds and color gradients in CSS- font and text styles-creating boxes and columns

Unit V - List styles, table layout-effects, frames and controls.

Text Books:

1. Thomas Powell, "Web Design: The Complete Reference Second Edition", Tata McGraw Hill Education Private Limited, Fifteenth reprint 2013, ISBN: 978-0-07-058252-1.
2. Kogent Learning Solutions Inc., "HTML 5 Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP & jQuery Black Book", Kogent Learning Solutions Inc., 2013, ISBN: 978-93-5004-095-9.

Reference Books:

1. Joel Sklar, "Principles of Web Design: The Web Warrior Series", Cengage Learning, Sixth Edition, 2014, ISBN: 81-315-0961-3.
2. Jon Duckett, "Beginning Web Programming with HTML, XHTML and CSS", 2nd Edition, Wiley India Pvt. Ltd, 2011, ISBN: 978-81-265-1697-1.
3. Kris Jamas, Konrad King, Andy Anderson, "HTML and Web Design: Tips and Techniques", Tata McGraw-Hill, 12th Reprint 2010, ISBN: 978-0-07-049921-8.
4. Elisabeth Robson and Eric Freeman, "Head First HTML and CSS", O'Reilly Media Inc., 2012, ISBN: 9780596159900

17CA2002 INTRODUCTION TO INFORMATION TECHNOLOGY

Credits: 3:0:0

Course Objective:

- Understand the fundamentals of Information Technology.
- Learn more concepts of computing and modern systems.
- Learn more about upcoming IT technologies.

Course Outcome:

After completing this Course the student will be able to:

- Understand the fundamentals of communication
- Apply Multimedia content for an effective visualization.
- Understand the networking principles and concepts
- Gain knowledge about recent trends and future of information technology
- Apply information technology for solving real life problems

Unit I - Introduction to Information Technology: Introduction to Information Technology – Understanding the Digital Domain – Representing Numbers and Text in Binary

Unit II - Fundamentals of Computers and Digital Multimedia: Computer Hardware – Software – Digital Audio Technology – Digital Images and Video

Unit III - Transmission of Information: Fundamentals of Communications – Introduction to Fibre Optics – Wireless Communications

Unit IV - Computer Networking: Local Area Networks – Wide Area Networks – Communication Protocols – Internet Architecture – Network Security

Unit V - Telephony and Wireless Multimedia: The Telephone System – Voice over IP – Wireless Multimedia

Text Book:

1. Pelin Akshoy, Laura DeNardis, "Information Technology in Theory", Thomson Course Technology, 2012, ISBN: 978-8131517901.

Reference Books:

1. V. Rajaraman, "Introduction to Information Technology", PHI learning private limited, 2013, ISBN: 978-81-203-4731-1.
2. Charles Hargis Davis, Debora Shaw, "Introduction to Information Science and Technology", American Society for Information Science and Technology, 2011, ISBN: 157387423X, 9781573874236.
3. Rainer & Cegielski, "Introduction to Information Systems", 3rd Edition, John Wiley & Sons, Inc. 2007, ISBN: 978-0470-47352-8.
4. David Bawden, Lyn Robinson, "An Introduction to Information Science", Facet Publications, 2012, ISBN: 1856048101, 9781856048101.
5. Deepak Bharlhoke, Fundamentals of Information Technology, 3rd Edition, Excel Books, 2010, ISBN: 81-7446-481-6

17CA2003 COMPUTER ORGANIZATION AND ARCHITECTURE

Credits: 3:0:0

Course Objective:

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.
- To study the hierarchical memory system including cache memories and virtual memory.

Course Outcome:

Students will have thorough knowledge about

- Explain the organization of basic Computer, its design and the design of control unit.
- Perform Arithmetic operations of binary number system
- Demonstrate the working of central processing unit.
- Describe the operations and language the register transfer, micro operations and input-output organization.
- Understand the organization of memory and memory management hardware.
- Elaborate advanced concepts of I/O organization

Unit I - Basic Computer Organization and Design: Instruction codes – Computer registers – Computer instructions – Memory reference Instructions – Input-output and interrupt

Unit II - Central Processing Unit: Introduction – General register organization – Stack organization – Instruction formats – Addressing modes – Data transfer and manipulation – Program control

Unit III - Computer Arithmetic: Introduction – Addition and subtraction – Multiplication algorithms – Division algorithms

Unit IV - Input-Output Organization: Peripheral devices – Input output interface – Asynchronous data transfer – Modes of transfer – Direct memory Access

Unit V - Memory Organization: Memory Hierarchy – Main memory – Auxiliary memory – Associative memory – Cache memory – Virtual memory – Memory management hardware.

Text Book:

1. M. Morris Mano, "Computer System Architecture", Pearson Education, Third Edition, 2007, ISBN: 978-81-317-0070-9.

Reference Books

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Pearson Education, Seventh Edition, 2008, ISBN: 978-81-7758-993-1.
2. Nicholas Carter, "Schaum's outline of Computer Architecture", Tata McGraw Hill, First Edition, 2006, ISBN: 0-07-13627-X.
3. John L. Hennessy and David A Patterson, "Computer Architecture - A quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fourth Edition, 2007, ISBN: 978-0-12-370490-0.
4. Andrew S. Tanenbaum, Todd Austin, "Structured Computer Organization", Prentice Hall, Sixth Edition, 2013, ISBN-10: 0132916525, ISBN-13: 9780132916523.
5. Alka Vishwa, "Computer Organization and Architecture", I.K. International Publishing House, First Edition, 2013, ISBN: 978-93-82332-47-3.
6. Douglas E. Comer, "Essentials of Computer Architecture", Pearson education, First Edition, 2011, ISBN: 9780133002089.

17CA2004 PROGRAMMING IN C

Credits: 3:0:0

Course Objective:

- To gain experience about structured programming.
- To help students to understand the implementation of C language.
- To understand various features in C.

Course Outcome:

Students will be able to

- Understand the fundamental principles of programming

- Understand the concepts of structured programming
- Develop solutions to problems using programming
- Gain knowledge about programming constructs
- Apply programming to solve real world problems
- Illustrate the role of programming in various scenarios

Unit I - Introduction: Computers- Classification of Computers- System Software- Software Lifecycle – Algorithms – Flowcharts – Pseudo code – Structured programming – Compilers – Operating Systems – Running C programs - Popular features of C.

Unit II - Variables and Expressions: Introduction – Character set – Identifiers and keywords – Variables – Characters and Character strings – Qualifiers – typedef statement – Constants – Operators and Expressions – Operator precedence and associativity. **Basic Input/Output:** Introduction – Single character Input-Output – String Input and Output – Types of characters in format strings.

Unit III - Control Structures: Introduction – if statements – Multiway decision – Compound statements – Loops – break- switch- continue and goto statements. **Functions:** Introductions – Function main – Functions accepting more than one parameter – User defined and Library functions – Functions parameters – Return values – Recursion – Variable length argument lists. **Scope and Extent:** Introduction – Scope – Extent.

Unit IV - Arrays, Strings and User Defined Data Types: Introduction – How arrays are useful – Multidimensional arrays – Strings -Arrays of strings – Functions in string.h. **Structures and Unions:** Introduction – Declaring and using structures – Structure Initialization – Operation on Structures – Array of Structures – Unions.

Unit V - Pointers and Files: Introduction – Definition and users of pointers – Address operator & - Pointer variables – Dereferencing pointers – Introduction to Files – File structure – File handling functions

Text Book:

1. K R Venugopal, Sudeep R Prasad, “Mastering C”, Second Edition, McGraw Hill Education, 2015, ISBN: 978-9332901278.

Reference Books:

1. Yeshwant kanetkar, “Let us C”, Thirteenth Revised and Updated Edition, BPB Publication 2016, ISBN: 978-8183331630.
2. Ajay Mittal, “Programming in C, A Practical Approach”, First Edition, Pearson Education, 2010, ISBN: 978-8131729342.
3. Brian W Kernighan, Dennis M. Ritchie, “The C Programming Language”, Second Edition, 2015, ISBN: 978-9332549449
4. S. K. Srivatsava, Deepali Srivatsava, “C in Depth”, Third Revised and Updated Edition, BPB Publications, 2009, ISBN: 978-8183330480.
5. Stephen G. Kochan, “Programming in C”, 4th Edition, Pearson Education, India, 2015, ISBN: 978-9332554665.
6. Greg Perry, Dean Miller, C Programming Absolute Beginner’s Guide, 3rd Edition, Pearson Education India, 2014, ISBN: 978-9332539570.

17CA2005 PRINCIPLES OF DATA COMMUNICATION

Credits: 3:1:0

Course Objectives:

- Develop an understanding of data communication techniques.
- Understand the necessity of signal encoding techniques.
- Learning the Routing in switched networks and Congestion control in Data networks.

Course Outcomes:

After completing this course, the student will be able to:

- Understand the basics of communication.
- Realize the need for Information theory and coding.
- Differentiate between an analog and a digital signal.
- Differentiate between guided and unguided transmission media.
- Know the various signal/data encoding techniques.
- Recognize the need for data link control.

Unit I - Basics of Communication: Basics of AM, FM and PM Block Diagram, Concepts of AM, FM modulators and demodulators - Pulse modulation systems - Pulse amplitude modulation - Sampling, Quantisation, Quantisation error.

Unit II - Information Theory and Coding: Discrete Messages - Concepts of entropy and information rate - Shannon's theorem – channel capacity - Orthogonal signals and their use - Introduction to coding - Coding and Decoding.

Unit III - Data Transmission Concepts: Concepts and Terminology- Analog and Digital transmission, Transmission impairments - Transmission media - Synchronous/Asynchronous transmission - Line Configurations - interfacing.

Unit IV - Data Encoding: Digital data Digital signals - Variations of NRZ and biphase - Digital data Analog signals - ASK, FSK, PSK, QPSK - Analog Data Digital signals - PCM, DM.

Unit V - Data Link Control: Flow control, Error control - HDLC, Multiplexing.

Text Books:

1. William Stallings, "Data and Computer Communication", Eight Editions, Pearson Prentice Hall, 2009, ISBN: 978-81-317-1536-9.
2. Taub and Schilling, "Principles of Communication Systems", Tata Mc Graw Hill Pub. Co., New Delhi, 2002 ISBN: 978-0-07-064811-1.

References Books:

1. William Stallings, "Data and Computer Communication", Eight Editions, Pearson Prentice Hall, 2009, ISBN: 0135071399, 9780135071397.
2. Prakash C. Gupta, "Data Communications", Prentice-Hall of India Private Limited, 1996.
3. William Schweber, "Data Communications", McGraw-Hill Inc, 1988.
4. Fitzgerald and Dennis, "Business Data Communications and Networking", 5th edition, John Wiley and Sons Inc, 1996.

17CA2006 DATABASE MANAGEMENT SYSTEMS

Credits: 3:0:0

Course Objective:

- Understand the role of a database management system in an organization.
- Understand basic database concepts, including the structure and operation of the relational data model.
- Construct simple and moderately advanced database queries using Structured Query Language (SQL).

Course Outcome:

After completing this Course, the student should be able to:

- differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
- define the terminology, features, classifications, and characteristics embodied in database systems.
- analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
- demonstrate with database design.
- describe on transaction management.
- demonstrate on internal storage structures.

Unit I - Database systems and relational model: database-system application, Purpose of database system, view of data, database language, relational database, database Design, database architecture, database users and administrators. Relational model: structure of relational databases, fundamental relational-algebra operations, additional relational-Algebra operations, extended relational algebra, null value, modification of the database.

Unit II - Structured query language: background, data definition, basic structure of SQL Queries, set operations, aggregate functions, null values, nested sub queries, complex Queries, views, modification of database. Advanced SQL: SQL data types and schema, Integrity constraint, authorization, embedded SQL, dynamic SQL.

Unit III - Database design and E-R model: overview of the design process, E-R model, Constraints, E-R diagram, E-R design issues, weak entity, extended E-R features, database Design for banking enterprise, reduction to relational schema.

Unit IV - Relational database design: features of good relational design, atomic domains And normalization application design and development: triggers, authorization in SQL. Storage and file structure: file organization, organization of records in files, data dictionary Storage.

Unit V - Transaction management and control -transactions: concept, state, Implementation of atomicity and durability, concurrent execution - concurrency control: Lock-based protocols, dead lock handling.

Text Book:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, “Database System Concepts”, Mc Graw-Hill International Edition, Fifth Edition, 2006, ISBN 007-124476-X.

Reference Books:

1. Ramez Elmasri, Durvasula V.L.N. Somayajulu, Shamkant B. Navathi and Shyam K Gupta, “Fundamentals of Database Systems”, Pearson Education, 2006, ISBN 81-7758-476-6.
2. Ramez Elmasri and Shamkant B. Navathe, “Fundamental Database Systems”, Third Edition, Pearson Education, 2003, ISBN 0-321-36957-2.
3. Rajesh Narang, “Database Management System”, Prentice Hall of India, 2004, ISBN-81-

17CA2007 OBJECT ORIENTED PRINCIPLES USING C++

Credits: 3:0:0

Course Objective:

- To get a clear understanding of object-oriented concepts.
- To understand object oriented programming through C++.
- To develop applications using object oriented model

Course Outcome:

After completion of the course, the students will be able to

- Gain the basic knowledge on Object Oriented concepts.
- Develop programs using object oriented model
- Design, write and test programs that uses object oriented features in C++
- Differentiate Structural and Procedural programming from object oriented programming
- Develop applications using Object Oriented Programming Concepts.
- Implement features of object oriented programming to solve real world problems.

Unit I - Introduction to Object Oriented Programming: Need for Object Oriented Programming - Characteristics of Object Oriented Languages – Comparison of C and C++

Unit II - Structures: Structures - Enumerations – Functions: Simple Functions – Passing Arguments to Functions– Returning Values from Functions – Reference Arguments - Overloaded Functions – Recursion – Inline Functions – Scope and Storage Class.

Unit III - Objects and Classes: A Simple Class – C++ Objects as Physical Objects – C++ Objects as Data Types - Constructors – Objects as Function Arguments - Copy Constructor – Structures and Classes – Classes, Objects and Memory - Static class data - Arrays and Strings: Array Fundamentals – Arrays as Class Member Data – Array of Objects – C-Strings – The Standard C++ String Class.

Unit IV - Operator Overloading: Overloading Unary Operators – Overloading Binary Operators - Data Conversion – explicit and mutable keywords – Inheritance: Derived Class and Base Class – Derived Class Constructors – Overriding Member Functions – Which Function is Used – Class Hierarchies – Public and Private Inheritance – Levels of Inheritance- Multiple Inheritance – Ambiguity – Containership: Classes within classes.

Unit V - Pointers: Address and Pointers – The Address of Operator - Pointers and Arrays – Pointers and Functions – Memory Management – Pointers to Objects – Pointers to Pointers - Virtual Functions: Virtual Functions - Friend Functions – Static Functions – Assignment and Copy Initialization – The this pointer – Dynamic Type Information Streams and Files: Stream Classes – Stream Errors – Disk File I/O with Streams – File Pointers – Error Handling in File I/O – File I/O with Member Functions.

Text Book:

1. Robert Lafore, “Object Oriented Programming in C++”, Fourth Edition, Pearson Education,Sams Publishing, 2008, ISBN: 978-81-317-2282-4.

Reference Books:

1. Stanley B. Lippman, Josee Lajoie, “C++ Primer”, Third Edition, Pearson Education, ISBN: 81-7808-048-6
2. Bjarne Stroustrup, “Programming: Principles and Practice Using C++”, Addison Wesley, Pearson Education.
3. K.R. Venugopal, Rajkumar Buyya, T.Ravishankar, “Mastering C++”, Tata McGraw Hill Publishing Company Limited 1999, ISBN-13: 978-0-07-463454-7, ISBN-10: 0-07-4634542.
4. Herbert Schildt, “C++ The Complete Reference”, Fourth Edition, Tata McGraw – Hill, 2003, ISBN: 0-07-053246-X.

17CA2008 OPERATING SYSTEM CONCEPTS**Credits: 3:0:0****Course Objective:**

- Build an understanding Operating System Services.
- Familiarize with Process Management Techniques.
- Familiarize with Memory Management Techniques.

Course Outcome:

After completing this Course the student will

- Familiarize with the concepts of the operating systems.
- Describe about the fundamental concepts and algorithms used in existing commercial operating systems.
- Demonstrate on various process scheduling algorithms and IPC.
- Understand and explain Operating System Components.
- Identify the different types of Operating System Services.
- Observe the Methods of troubleshooting.

Unit I - Introduction - Types of operating systems- Operating System Services: User Operating System Interface – System Calls – Types of System Calls – System Programs – Operating System Design and Implementation – Operating System Structure – Virtual Machines – Operating System Generation – System Boot.

Unit II - Processes: Process Concept – Process Scheduling – Operation on Processes – Interprocess Communication –Communication in Client Server Systems

Unit III - CPU Scheduling – Basic concepts – Scheduling Criteria – Scheduling Algorithms – Thread Scheduling – Multiple Processor Scheduling – Algorithm Evaluation. Deadlocks: System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlock

Unit IV - Memory management: Main Memory: Swapping – Contiguous memory Allocation – Paging – Structure of the Page Table – Segmentation. Virtual Memory: Demand Paging – Copy-on-Write - Page Replacement – Allocation of Frames – Thrashing – Memory-mapped Files – Allocating Kernel Memory

Unit V - File System Implementation : File System Structure – File System Implementation – Directory Implementation –Allocation Methods – Free Space Management – Efficiency and Performance – Recovery – NFS. Mass Storage Structure: Overview of Mass Storage Structure – Disk Structure – Disk Attachment - Disk Scheduling – Disk Management – Swap-Space Management – RAID Structure – Stable-Storage Implementation.

Text Book:

1. Abraham Silberschatz, Galvin and Gagne, “Operating System Concepts”, Ninth Edition, 2012, Wiley. ISBN: 9781118063330.

Reference Books:

1. A.M. Lister and R.D. Eager, “Fundamentals of Operating Systems”, Fifth Edition, Springer, 2013, ISBN: 1475722524 (Print) 978-1-4757-2252-9 (Online).
2. William Stallings, “Operating Systems Internals and Design Principles”, Sixth Edition, 2009, Pearson Prentice Hall, ISBN: 0-13-600632-9.
3. Andrew S Tanenbaum and Albert S Woodhull, “Operating Systems Design and Implementation”, 3rd Edition, 2009, Prentice Hall Software Series, ISBN: ISBN-13: 978-0131429383.
4. Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, “Operating Systems”, 3rd Edition, 2004, Pearson/Prentice Hall, ISBN-13: 978-0131828278.

17CA2009 ESSENTIALS OF SOFTWARE ENGINEERING

Credits: 3:0:0

Course Objective:

- To Understand the software life cycle models.
- To Understand the importance of the software development process.
- Understand the importance of modelling and modelling languages.
- Design and develop correct and robust software products.

Course Outcome:

Students will be able to

- Understand the principles of various software process models widely used in software construction
- Make effective project management plans, manage time and physical resources.
- Acquire knowledge about how to analyze, design and develop any application.
- Design test cases and effective testing procedures.
- Design human-computer interfaces.
- Develop an appreciation of the cost, quality and management issues involved in software application

Unit I - Process Models: Prescriptive Process Models- Specialized Process Models - The Unified Process- Personal and Team Process Models. Agile Development: What Is Agility?-Extreme Programming-Other Agile Process Models. Understanding Requirements: Establishing the Groundwork - Eliciting Requirements.

Unit II - Design Concepts: The Design Process- The Design Concepts- The Design Model- The The Design Model. Architectural Design: Software Architecture - Architectural Styles - Architectural Design. Component Level Design: What is a Component? - Designing Class-Based Components

Unit III - User Interface Design: The Golden Rules- User Interface Analysis and Design- Interface Design Steps. Software Quality- Achieving Software Quality.- Review Techniques: Informal Reviews- Formal Technical Reviews

Unit IV - Software Testing Strategies:- A Strategic Approach to Software Testing- Test Strategies for Conventional Software - Validation Testing- System Testing. Estimation for Software Projects: The Project Planning Process- Resources- Decomposition Techniques-

Unit V - Project Scheduling: Project Scheduling - Defining a Task Set for the Software Project – Scheduling. Software Risks- Risk Projection- Risk Refinement- Risk Mitigation, Monitoring, and Management

Text Book:

1. Roger S. Pressman, Bruce R Maxim, “Software Engineering: A Practitioner's Approach”, Tata McGraw Hill, Eighth Edition, 2015, ISBN: 0078022126

Reference Books:

1. Ian Sommerville, “Software Engineering”, Pearson Education, Ninth Edition, 2015, ISBN: 978-93-325-4243-3.
2. James F Peters and WitoldPedryez, “Software Engineering - An Engineering Approach”, John Wiley, Second Edition, 2007, ISBN: 9788126511884.
3. P. Fleeger, “Software Engineering”, Pearson Prentice Hall, Third Edition, 2009, ISBN: 978-81-317-2098.
4. Suraiya Hussain, “Software Engineering”, I. K. International Publishing House, First Edition, 2012, ISBN: 978-93-81141-74-8.
5. Rajib Mall, “Fundamentals of Software Engineering”, Prentice Hall, Fourth Edition, 2014, ISBN: 8120348982.
6. Frank Tsui, Orlando Karam, Barbara Bernal, “Essentials of Software Engineering”, Jones & Bartlett Publishers, 2013, ISBN: 9781449691998.

17CA2010 DATA STRUCTURES AND APPLICATIONS

Credits: 3:0:0

Course Objective:

- To learn the systematic way of solving problems.
- To understand the different methods of organizing large amounts of data.
- To efficiently implement the different data structures.
- To efficiently implement solutions for specific problem Prerequisites.

Course Outcome:

Students will be able to

- define basic data structures and relevant standard algorithms for them: stack, queue, linked lists, trees, graphs
- define basic searching and sorting algorithms
- demonstrate advantages and disadvantages of specific algorithms and data structures
- analyze and compare algorithms for efficiency and correctness
- choose the appropriate data structure and algorithm design method for a specified application.
- Implement and use the data structures in developing application.

Unit I - Introduction to Data Structures- Arrays and Structures- Stacks: Implementation of stacks as arrays, Programming Example, Application of stack

Unit II - Linked List-Representation- Unordered List-Ordered List-Doubly Linked list-Circular linked list

Unit III - Queues-Array implementation of queue- linked implementation of queue-Operation-Priority Queue- Application of Queue

Unit IV - Searching- Sequential Search –ordered list- Binary search- Sorting: Selection sort –insertion sort Shell sort – Merge sort –Quick sort – Heap sort

Unit V - Trees- Binary tree- Binary Search Tree – Graphs: Graph representation – Operations on Graphs –Graph traversals

Text Book:

1. D.S. Malik, “Data Structures Using C++”, Second Edition, Cengage Learning, 2010, ISBN-13-978-0-324-78201-1.

Reference Books:

1. Frank M.Carrano, “Data Structures and Abstractions with Java”, Pearson education, 2014, ISBN: 9780133750362.
2. Mark A.Weiss, “Data Structures and Algorithm Analysis in C++”, Fourth Edition, Pearson Education, 2013, ISBN: 0-321-44146-X.
3. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Computer Algorithms C++”, 2011, ISBN: 978-0-929306-42-1.
4. Reema Thareja, “Data Structures Using C”, Second Edition. Oxford University Press, 2014, ISBN: 9780198099307.

17CA2011 PROGRAMMING IN JAVA

Credits: 3:0:0

Course Objective:

- To learn basic programming structures in java.
- To learn about fundamental concepts in java.
- To learn about graphics programming in java.
- To solve problems using Object Oriented Paradigm.

Course Outcome:

Students will be able to

- Understand various programming structures in java
- Create Java programs that solve simple business problems.
- Implement the basic principles of Object Oriented Programming which includes constructors, inheritance, polymorphism
- Implement exception handling
- Understand Multithreading
- Apply I/O methods in applications
- Develop simple Graphical User Interfaces.

Unit I - Fundamentals: Evolution of Java: Java and internet-Bytecode,-Java Buzzwords-Evolution of Java. Overview of Java: Object Oriented Programming- A sample program, : Data Types-Primitive types- Literals- Variables-Type Conversion and Casting- Operators- Control statements

Unit II - Classes: Class Fundamentals-Declaring Objects-Adding Methods-Constructors-Overloading methods. Inheritance: Basics- Using Super-Method Overriding

Unit III - Packages interfaces and Exception: Defining Packages-Access Protection- Importing Packages. Interfaces: Defining interfaces –Implementing interfaces. Exception Handling Basics-Exception types-try and catch-throw –throws-finally- Built in exceptions-creating exception subclasses

Unit IV - Multithreading and Applets: – Multithreading: Creating Thread- Interthread communication- Suspending, Resuming and stopping threads. Applet Class: Applet Basics-Applet Architecture–Applet Skeleton-repaint()-A sample Applet.

Unit V - Graphics: Event Handling-Event handling mechanisms-Delegation event model-Event Classes: ActionEvent, MouseEvent, Window Fundamentals-Working with frame windows- Handling events in frame window- AWT Controls, Layout Managers and menus

Text Book:

1. Herbert Schildt, “Java™: The Complete Reference”, Ninth Edition, McGraw – Hill Edition, 2014, ISBN 978-9339212094.

Reference Books:

1. Cay S. Horstmann and Garry Cornell, “Core Java 2 Volume I Fundamentals”, Prentice Hall, Ninth Edition, 2012, ISBN 978-0137081899.
2. James Gosling, Bill Joy, Guy L. Steele Jr., Gilad Bracha and Alex Buckley, “The Java Language Specification, Java SE 8 Edition”, Addison-Wesley Professional, 2014, ISBN: 0133900797.
3. Deitel H. M and Deitel P. J, “Java How to Program”, Prentice Hall India, Tenth Edition, 2014, ISBN: 0131483986.
4. K. Rajkumar, “Java Programming”, Pearson, First Impression 2013, ISBN: 978-81-317-9909-3.
5. Pravin M Jain, “The class of Java”, Pearson, Third Impression 2011, ISBN: 978-81-317-5544-0.
6. E. Balagurusamy, “Programming with Java –a Primer”, Fourth edition 2010, ISBN: 978-0-07-014169-8.

17CA2012 NETWORK FUNDAMENTALS

Credits: 3:0:0

Course Objective:

- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparing the student for entry Advanced Courses in computer networking.
- Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Outcome:

After completing this course, the student will be able to:

- Recognize the need for networks.
- Identify the responsibility of physical layer.
- Realize the mechanisms of Ethernet and Wireless LANs.
- Understand the different routing algorithms.
- Distinguish between UDP and TCP.
- Know the importance of Application layer.

Unit I - Introduction to Computer Networks and the Physical Layer: Uses of Computer Networks – Network Hardware – Network Software – Reference Models – The theoretical basics of data communication – Guided Transmission Media – Wireless Transmission – Communication Satellites.

Unit II - The Data Link Layer and the Mac Sublayer: Data Link Layer design issues – Error Detection and Correction – The channel allocation problem – Multiple access protocols – Ethernet – Wireless LANs.

Unit III - The Network Layer :Network layer design issues – Routing Algorithms – The optimality principle – Shortest path algorithm – Flooding – Congestion Control Algorithms – Quality of Service – Internetworking – The network layer in the Internet – IPv4 – IPv6 – Mobile IP.

Unit IV - The Transport Layer: The transport service – Elements of transport protocol – Congestion control – The internet transport protocols: UDP & TCP.

Unit V - The Application Layer: The Domain Name System – Electronic mail – The World Wide Web – Streaming Audio and Video.

Text Book:

1. Andrew S. Tanenbaum and David J. Wetherall, “Computer Networks”, 5th Edition, Pearsons Education, 2014, ISBN: 9780132126953.

Reference Books:

1. Behrouz A Forouzan and Firouz Mosharraf, “Computer Networks A Top-Down Approach”, Third Reprint 2013, McGraw Hill Education, ISBN: 978-1-25-900156-7.
2. Vilas S. Bagad and Iresh A. Dhotre, “Computer Networks”, Technical Publications, 2010, ISBN: 9788184312591.
3. James F. Kurose, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson Education, Sixth edition, 2012. ISBN: 9780132856201.
4. Prakash C. Gupta, “Data Communications and Computer Networks”, 2nd Edition, PHI, 2013, ISBN: 1587201011.

17CA2013 VISUAL PROGRAMMING

Credits: 3:0:0

Course Objective:

- To understand the concepts of visual programming.
- To know the importance of controls and file handling.
- To understand the process involved in developing any application.

Course Outcome:

Students will be able to

- make effective project management plans.
- analyze, design and develop any application.
- design human-computer interfaces.
- Understand the Visual Basic .NET and its frame work
- Develop the windows based applications in Visual Basic .NET
- apply the object oriented Concept in applications

Unit I - Visual basic .net and its framework : Introduction to .net framework - Common Language Runtime (CLR)- Visual Studio.Net – IDE - Navigating the IDE- Creating a Visual Basic .NET Solution.

Unit II - Programming fundamentals in vb .net : Elements of Visual Basic .net - Naming and Notation – Character and Lines - Statements and Blocks - Data types - Type conversion - Variables and Constants - Visual Basic .Net Operators - Operator Overloading

Unit III - Control Structures - Conditional Statements: If Then, If Then Else, Nested If, Select Case, goto - Looping Statement: Do loop, For Next, For Each Next Loop, While Loop - Pausing, Resuming, and Exiting Iteration – Methods.

Unit IV - Windows programming with vb .net : Windows Forms - MDI Applications - Components and controls - Menus and Toolbars - Responding to User Input - Collecting User Input - Presentation and Informational Controls- Drag and Drop.

Unit V - Object oriented concepts :Classes - Class characteristics - Abstract classes - Inheritance - Sealed Classes - Shared Classes - Interfaces - Collections - Arrays - Exception handling.-Create an application with database connectivity.

Text Books:

1. Jeffery R. Shapiro, “The Complete Reference Visual Basic .NET”, Tata McGraw Hills.,4th reprint 2004, ISBN: 9780070495111.
2. Steven Holzner, “Visual Basic.NET Black Book”, Dreamtech Press,2009. ISBN:JZH-ZW61-Y7FL

Reference Books:

1. Thearon Willis, Jonathan Crossland, Richard D. Blair, “Beginning VB.NET”, Wiley Publications, First Edition, 2008. ISBN: 81-265-0508-7.
2. Paul Vick, “Visual Basic .NET Programming”, Pearson Education, 2004. ISBN-10: 0134569555.

3. Jeremy Shapiro, "Visual Basic.Net. Complete Reference", McGrawHill Education, 2002, ISBN-10: 0070495114, ISBN-13: 978-0070495111
4. David Schnieder, "An Introduction to Programming with Visual Basic.NET ", Pearson Education, Fifth Edition, 2002, ISBN-10: 0130306576, ISBN-13: 978-0130306579
5. Schneider, "Introduction to Visual Basic 6.0," Prentice Hall, First Edition, 2001, ISBN-10: 0130268135; ISBN-13: 9780130268136.
6. Michael Halvorson, "Microsoft Visual Basic 2013 Step by Step," Microsoft Press, 2014, ISBN-10: 0735667047 • ISBN-13: 9780735667044
7. Paul Deitel, Harvey Deitel and Abbey Deitel, "Visual Basic 2012 How to Program", 6th Edition, Pearson Education, 2013, ISBN-13: 978-0133406955, ISBN-10: 0133406954.

17CA2014 PRINCIPLES OF COMPUTER GRAPHICS

Credits: 3:0:0

Course Objective:

- To understand the principles of computer graphics.
- To study the algorithms for 2D and 3D operations.
- To learn how to produce realistic illustrations.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Understand the basics of computer graphics, different graphics systems and
- Understand applications of computer graphics.
- Discuss various algorithms for scan conversion and their comparative analysis.
- Use of geometric transformations on graphics objects and their application in composite form.
- Illustrate different clipping methods and its transformation to graphics display device.
- Understand various colour models and shading algorithms.

Unit I - Graphic Systems: Video display devices, Raster and Random scan Systems, Graphic Monitors and work stations, Interactive input devices, Graphics software, Coordinates representations, Graphics functions

Unit II - Output Primitives and attributes: Line drawing algorithms, Circle generating algorithm, Ellipse generating algorithm, Polynomials, Line attributes –Curve attributes –Color and Gray scale Levels –Area fill attributes,

Unit III - Two dimensional Transformations and viewing: Basic Transformations, Matrix representation's & homogeneous co-ordinates, Composite transformations, Reflection, Two dimensional viewing: Window-to viewport Coordinate transformation, Clipping Algorithms- Line-Polygon-Curve

Unit IV - Three dimensional Concepts: Three dimensional display methods- parallel Projection - Perspective Projection - Depth Cueing - Visible line and surface identification - Three dimensional views.

Unit V - Color Models: Properties of Light, XYZ, RGB, YIQ, CMY , HSV, HLS, Color selection and applications.

Text Book:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics, C Version", Prentice Hall, 1997, Digitized 2007, ISBN: 013-5309247, 978-013-5309247.

Reference Books:

1. Andries van Dam, F. Hughes John, James D. Foley and Steven K. Feiner, "Computer Graphics Principles and Practice in C", Pearson, Second Edition, 2007, ISBN:13: 978-8131705056.
2. Donald D. Hearn and M. Pauline Baker, "Computer Graphics with Open GL", Prentice Hall, Fourth Edition, 2010, ISBN-13: 978-0136053583.
3. David F. Rogers and J. Alan Adams, "Mathematical Elements for Computer Graphics", McGraw-Hill, Second Edition, 2007(Digitised), ISBN-13: 978-0070535305.
4. David F. Rogers, "Procedural Elements for Computer Graphics", McGraw Hill, 2010, ISBN-13: 9780070473713.
5. Edward Angele and Dave Shreiner, "Interactive Computer Graphics, A top-down Approach with OpenGL", Addison Wesley, Sixth Edition, 2011, ISBN-13: 978-0132545235.
6. G Farin, "Curves and Surfaces for Computer Aided Geometric Design", Third Edition, Elsevier, 2014, ISBN-13: 978-1558607378.

17CA2015 SYSTEM ADMINISTRATION

Credits: 3:0:0

Course Objective:

- Understand the role and responsibilities of a system administrator
- Understand the structure of the Linux file system and how to work in the file system.
- Describe the system boot process
- Setup and manage user accounts and groups
- Configure and manage simple network services on a Linux system
- Learn how to manage software with RPM.
- Configure the Linux operating system
- Manage the resources and security of a computer running Linux
- Make effective use of Unix utilities, and scripting languages

Course Outcome:

The student will be able to

- gain in-depth knowledge on the working of Linux systems
- understand Linux and Unix operating systems and their historical significance and modern usage
- install the Linux OS and tailor it for specific usage including creation and management of user accounts and installation of software
- be able to write sed and awk commands and bash shell scripts
- work on Linux system and to locate additional utilities, configurations and maintenance.
- demonstrate a working knowledge of networking terms and concepts pertaining to system administration.

Unit I - Introduction to Linux – A Brief History – Linux in the Market – The work of a system Administrator – Starting to use Linux – Exploring the file system – Finding Command Help- Exploring the Desktop – Linux Graphical Desktops – Configuring GNOME and KDE

Unit II - Manage the Linux file system – File Permissions- Introducing the File system – Managing File Archives – Exploring the Bash Shell – Shell Variables – Data Redirection – Editing Text with vi – Printing from the command line-

Unit III - Boot process- Bootstrapping – Booting PCs- Boot Loaders: LILO and Grub – Booting single user mode – Startup Scripts – Rebooting and Shutting down - Software Maintenance (RPM, Yum)

Unit IV Linux Users and Groups – Adding new users – the /etc/passwd – /etc/shadow- /etc/group – adding users - Linux installation – Reviewing hardware – Configuring Disk Space – Installing Linux –

Unit V - Linux file system administration LVM & RAID – manage hardware - Configure the network – Monitor Linux system – manage backup and recovery – administer user access and system security

Text Books:

1. Nicholas Wells, “The Complete Guide to LINUX System Administration”, Indian Edition, Cengage Learning, 2005, ISBN: 0619216166.
2. Evi Nemeth, Garth Snyder and Trent R. Hein , “Linux administration Handbook”, Second Edition, Pearson Education, 2007, ISBN 0-13-148004-9.

Reference Books:

1. Suse Linux, Novell Inc., USA.
2. Tom Adelstein and Bill Lubanovic, “Linux System Administration”, O’Reilly Media Inc., First Edition, 2007, ISBN -13:978-0-596-00952-6.
3. Evi Nemeth, Garth Snyder, Trent R. Hein and Ben Whaley, “Unix and Linux System Administration Handbook”, Fourth Edition 2010, Pearson Education, ISBN 0132117363.

17CA2016 BUSINESS ANALYTICS

Credits: 3:0:0

Course Objective:

- To understand the fundamental knowledge of business intelligence.
- To analyze business data in a wide range with different tools available into the current market.
- To understand BI terminologies and framework, basics of data integration (Extraction Transformation Loading), multi-dimensional data modeling.

Course Outcome:

Upon completion of the Course, graduates will be able to:

- Construct an end-to-end data warehousing solution for business intelligence involving various data sources, ETL, multi-dimensional modeling, OLAP, reporting and analytics.
- Differentiate between Transaction Processing and Analytical applications and describe the need for Business Intelligence.
- Demonstrate understanding of technology and processes associated with Business Intelligence framework.
- Applying the BI process across the organization and making predictive analytics work for your bottom line
- Blend BI process into daily management activities
- Given a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

Unit I - Introduction to Business Intelligence – Equipping the organization for effective decision making- Making the most of what You’ve got – using Business Intelligence- Seeking the Source- the source of Business Intelligence – First Steps Beginning the development of Business Intelligence.

Unit II - Types of digital data – Introduction – Getting to know structured data - Getting to know unstructured data - Getting to know semi-structured data – Difference between semi- structured and structured data – Introduction to OLTP and OLAP- OLTP – OLAP

Unit III - BI Framework - BI Component Framework – Who is BI for? – BI users – BI Applications – BI roles and responsibilities - Basics of Data Integration – Need for Data warehouse – Definition of Data ware house- what is Data Mart? – Extract - Transform - Load - Data Integration

Unit IV - Introduction to data quality - Why data quality matters – What is Data Quality – How do we maintain Data Quality - data profiling concepts and applications – Introduction to Multi-Dimensional Data Modeling – Data Modelling Basics – Types of Data model – Data Modelling Techniques

Unit V - Fact Table – Dimension Table – Typical Dimensional models - Business metrics and KPIs – Understanding Measures and Performance – Measurement System Terminology – Fact Based Decision Making and KPIS – KPI usage

Text Books:

1. R N Prasad and Seema Acharya, “Fundamentals of Business Analytics”, Wiley-India, 2011.
2. Brain and Larson, “Delivering Business Intelligence with Microsoft SQL server 2008”, 2nd Edition, McGraw Hill, 2009, ISBN-13: 858-0001276991.

Reference Books:

1. David Loshin, “Business Intelligence -The Savvy Manager's Guide”, Morgan Kaufmann Publishers 2012, ISBN: 978-0-12-385889-4.
2. Galit Shmueli, Nitin R. Patel and Peter C. Bruce, “Data Mining for Business Intelligence”, John Wiley and Sons, 2011, ISBN: 9781118126042.
3. Cindi Howson, “Successful Business Intelligence: Secrets to making Killer BI Applications”, Tata McGraw Hill, 2nd Edition, 2014, ISBN: 9780071809191.
4. William H. Inmon, “Building the Data Warehouse”, Wiley India Ltd., Reprint 2010.

17CA2017 OBJECT ORIENTED ANALYSIS AND DESIGN

Credits: 3:0:0

Course Objective:

- To understand the importance of Object Oriented Analysis Processes.
- To learn the concept of object oriented analysis and design to software development process.
- To get acquainted with UML Diagram and its notations.

Course Outcome:

Students will be able to:

- Show the importance of system analysis and design in software development.
- Understand Object Oriented Software Development Process
- Gain exposure to Object Oriented Methodologies & UML Diagrams
- Apply Object Oriented Analysis Processes for software projects
- Construct various UML models.

- Apply object oriented methodologies in developing software projects.

Unit I - Object Basics:-Objects- classes- attributes- object behavior and methods- encapsulation and information hiding-class hierarchy- polymorphism- object relationships and associations, aggregations and object containment. Object oriented systems development life cycle:- Software development process, building high quality software, use- case driven approach, reusability.

Unit II - Object Oriented Methodologies: Rumbaugh et al.'s object modeling technique- Booch methodology- Jacobson et al methodologies- The unified approach. Unified modeling language:- Static and dynamic models- UML diagrams- UML class diagrams- use-case diagrams -UML dynamic modeling

Unit III - Object Oriented Analysis Process: Use-case model, developing effective documentation. Object Analysis Classification:- Classification theory, noun phrase approach- common class patterns approach- use-case driven approach.

Unit IV - Identifying Object Relationships, Attributes and Methods: Association- super-subclass relationships- a-part of relationships-

Unit V - Object Oriented Design Process and Design Axioms:-Design Process -design axioms: Corollaries, design patterns.

Text Book:

1. Ali Bahrami, “Object Oriented Systems Development using the Unified Modeling Language”, McGraw Hill, Reprint 2015, ISBN: 9780070265127.

Reference Books:

1. Simon Bennett, Steve McRobb and Ray Farmer, “Object-Oriented Systems Analysis and Design: Using UML, 4/e”, McGraw Hill, Reprint 2011, ISBN: 9780077125363.
2. Bernd Oestereich, “Developing Software with UML, Object-Oriented Analysis and Design in Practice”, Addison-Wesley, Second Edition, 2002, ISBN-10: 020175603X, ISBN-13: 978-0201756036.
3. James Rumbaugh, Ivar Jacobson and Grady Booch, “The Unified Modeling Language Reference Manual”, Addison Wesley, Second Edition, 2005, ISBN: 020130998X.
4. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen and Kelli A. Houston, “Object Oriented Analysis and Design with Applications”, Addison-Wesley, Third Edition, 2009, ISBN:0-201-89551-X.
5. Noushin Ashrafi and Hessam Ashrafi, “Object Oriented Systems Analysis and Design”, Prentice Hall, First Edition, 2013, ISBN: 1292051752.
6. Jim Arlow and Ila Neustadt, “UML2 and the Unified Process: Practical Object-Oriented Analysis and Design”, Addison-Wesley, Second Edition, 2005, ISBN-10: 0321321278, ISBN-13: 9780321321275.

17CA2018 WEB TECHNOLOGY

Credits 3:0:0

Course Objective:

- To understand how to develop dynamic web pages using PHP.
- To familiarize web application development using PHP.
- To use MySQL in developing web application using PHP.

Course Outcome:

After the completion of the Course, students will be able to

- Know the concepts of PHP and its advantages over other languages.
- Use HTML form elements that work with the server scripting language.
- Design and develop input validation tests.
- Perform various mysql database queries.
- Use PHP to build dynamic web pages.
- Develop web application with database.

Unit I - Introducing PHP: History, General language feature - PHP basics, Embedding PHP code in web page- Commenting the code- Outputting data to the browser- PHP’s supported data base, identifiers, variables-Constants, Expressions-String Interpolation

Unit II - Control structures: Conditional statements, Looping statement-File- Inclusion statements- Functions: Invoking a function, creating a function- Array: What is an array? - Creating an Array- Outputting an array- Adding and removing array elements-Locating array elements- Determining array size and uniqueness

Unit III - Object-Oriented PHP: The Benefits of OOP-Key OOP concepts- Constructors and Destructors- Static class member-The instance of keyword-Object Cloning-Inheritance-Interfaces-Abstract class

Unit IV - Strings and Regular Expressions: Regular Expressions-Other string specific functions-Regular expression function- Session Handlers: what is session handling? Configuration directives- Working with Sessions

Unit V - Introducing MySQL: Why MySQL so popular- Evolution of MySQL- MySQL storage engines- data types and attributes- Working with database and table- using PHP with MySQL: Using mysqli extension-Interacting with the database.

Text Book:

1. Jason Gilmore, “Beginning PHP and MySQL, From Novice to Professional”, Apress, Fourth Edition, 2010, ISBN: 978-1-4302-3115-8.

Reference Books:

1. Kogent Learning Solutions Inc., “HTML 5 Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and jQuery Black Book”, Dreamtech Press, Reprint 2013, ISBN: 978-93-5004-095
2. Chris Bates, “Web Programming: Building Internet Applications”, Wiley DreamTech India (P) Ltd., Third Edition, 2009, ISBN: 978-81-265-1290-4.
3. Tim Converse and Joyce Park with Clark Morgan, “PHP 5 and MySQL Bible”, Wiley India Pvt.Ltd., 2008, ISBN: 10:81-265-0521-4.
4. Steven Holzner, “PHP: The Complete Reference”, McGraw Hill, 2008, ISBN: 0071508546.
5. Robert Sheldon and Geoff Moes, “MySQL”, WILEY, First Edition, 2005, ISBN: 81-265-0592-3.
6. Steve Suehring, Tim Converse and Joyce Park, “PHP6 and MySQL Bible”, John Wiley, 2009, ISBN: 9788126520220.

17CA2019 PROGRAMMING IN PYTHON

Credits: 3:0:0

Course Objective:

- Build an understanding of the Python Programming.
- Familiarize with the basic terminology of the Python Programming.
- To gain expertise in specific areas of Database Support in Python Programming.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Understand and explain Python Programming.
- Apply various string manipulations in python. .
- Understand the concept of scripting and the contributions of scripting languages
- Understand the object- oriented concepts of Python
- Understand of the built- in objects of Python
- Develop the different applications in Python Programming

Unit I - Instant Hacking: The Basics- Lists and Tuples-Conditionals, Loops and Some Other Statements

Unit II - Working with Strings- Abstraction – Exceptions- Methods, Properties and Iterators

Unit III - Files and Stuff -Graphical User Interfaces

Unit IV - Database Support - Network Programming

Unit V - Python and the Web- Extending Python –Packaging Your Programs –Instant Markup –XML for all occasions

Text Book:

1. Magnus Lie Hetland, “Beginning Python- From Novice to Professional”, Apress Publishers, 2009, ISBN: 978-81-8489-092-1

Reference Books:

1. Mark Lutz, “Learning Python”, O’ Reilly, 2007, ISBN: 978-0-596-15806-4.
2. David Beazley and Brian K Jones “Python Cookbook”, O, Reilly, Third edition, 2013. ISBN: 978-1449340377.

3. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, First Edition, 2013, ISBN: 978-1449319793.
4. David M Beazley, "Python Essential Reference", Developer's Library, Fourth Edition, 2013, ISBN: 075-2063329788.
5. Alex Martelli, "Python in a Nutshell", O'Reilly, Second Edition, 2013, ISBN: 978-0596100469.
6. John Zelle, "Python Programming: An Introduction to Computer Science", Second Edition, 2013, ISBN: 860-1200643879.

17CA2020 .Net PROGRAMMING USING C#

Credits: 3:0:0

Course Objective:

- To get a clear understanding of the .NET framework.
- To understand the object oriented programming concepts of C#.
- To develop standalone applications using C#.

Course Outcome:

After completion of the course, the student will be able to

- Understand the basic programming concepts of .NET framework
- Understand of the object oriented programming concepts of C#
- Develop standalone applications in C#
- Evaluate user requirements for software functionality required to decide whether the programming language C # can meet user requirements
- Propose the use of .Net technologies by implementing them in the C # programming language to solve the given problem
- Choose an object oriented approach for solving problems

Unit I - Introduction: A Short History of Object Oriented Programming – A Test Program Using C# - Objects and Classes: Understanding Objects – Getting Started with Objects – Developing a Program Plan – Creating Simple Application using Objects.

Unit II - Understanding Data Types and Syntax: Understanding Data Types: Computer Data – Floating Point Datatypes – The Decimal Data type – The Boolean Data Type – **C# Statements:** Basic Building Blocks of a Programming Language – Defining Variables – Using a variable in a Program – Types of Program Errors – Reference Data Types: String Variables – Using String Variables – DateTime Reference Objects

Unit III - Programming Constructs and Collections: Making Decisions: Relational Operators – RDC – Logical Operators – The Switch Statement – Statement Repetition using Loops: Program Loops – Nested for loops – While loops – Do...while program loops – The continue statement – **Arrays and Collections:** Array – ListView – Multidimensional Arrays – Collections – ArrayList Objects

Unit IV - Object Oriented Concepts: Designing Classes: Class Design – Designing a Program – UML Light – Custom Classes: Constructors – Property Methods – Exception Handling: Input Errors – Exception Handling – Inheritance - Polymorphism

Unit V - Databases: Database – Creating Databases – Using SQL – A DBMS System

Text Book:

1. Jack Purdum, "Beginning Object Oriented Programming with C#", Wiley Publications, 2012, ISBN: 978-8126538799.

Reference Book:

1. Tom Archer, Andrew Whitechapel, "Inside C#", Microsoft Publications, 2nd Edition, 2002, ISBN:
2. Herbert Schildt, "The Complete Reference C# 4.0", Tata McGraw-Hill Publishing Company Limited, 2010, ISBN: 978-0-07-174117-0.
3. Christian Nagel, Jay Glynn, Morgan Skinne, "Professional C# 5.0 and .Net 4.5.1", Wiley, 2014, ISBN: 978-8126548538.
4. Ben Albahari, "C# 5.0 In a Nutshell", Shroff, Fifth Edition, 2012, ISBN: 978-9350237625.
5. Sharp John, "Microsoft Visual C# 2013, Step by Step", Microsoft Press, 2014, ISBN: 978-8120349551.
6. Mohammad Rahman, "Expert C# 5.0: with the .NET 4.5 Framework", Apress, 2012, ASIN: B00ACC6BK4.
7. Vidya Vrat Agarwal, "Beginning C# 5.0 Databases", Apress, 2nd Edition, 2012, ISBN: 978-1430242604.

17CA2021 SOFTWARE TESTING AND QUALITY ASSURANCE

Credits: 3:0:0

Course Objectives:

- To learn fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods
- Systematic approach to the development, operation, maintenance, and retirement of software.
- To apply software testing knowledge and methods in testing software projects.

Course Outcomes:

Students will be able to

- Summarize different types of testing.
- Apply modern software testing processes in relation to software development and project management.
- Create, execute and perform complex maintenance related operations.
- Create test strategies and plans, design test cases, prioritize and execute them.
- Manage incidents and risks within a project.
- Contribute to efficient delivery of software solutions and implement improvements in the software development processes

Unit I - Principles of Testing - Software Development Lifecycle Models: – Phases of software project – Quality, Quality Assurance and Quality Control – Testing verification and validation-Process model to represent different phases – life cycle models - Spiral or Iterative model - The V Model - Modified V Model – Comparison of Various life cycle models.

Unit II - Software Testing Types: - White box testing – What is white box testing – Static testing – Structural testing – Challenges in White box testing.

Unit III - Black box testing - What is black box testing – Why black box testing – When to do black box testing – How to do black box testing - Integration testing - What is integration testing integration testing as a type of testing - integration testing as a phase of testing – Scenario testing

Unit IV - System and acceptance testing – System testing overview – Functional Versus Non Functional testing – Functional System testing – Non Functional testing - Acceptance testing – Summary of Testing Phases

Unit V - Performance testing – Factors Governing Performance testing - Methodology for Performance testing – Tools for Performance testing – Process for Performance testing - Regressing testing – What is regression testing – Types of regression testing – When to do regression testing – How to do regression testing

Text Book:

1. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing Principle and Practices”, Sixth Impression, 2008, ISBN: 978 – 81 – 7758 – 121 – 8.

Reference Books:

1. William E Perry, “Effective Methods for Software Testing”, John Wiley & Sons, Second Edition, 2005, ISBN: 9971–51–345–5.
2. Sandeep Desai and Abhishek Srivastava, “Software Testing a Practical Approach”, PHI Learning, 2012, ISBN: 978-81-2034-534-8.
3. S.A. Kelkar, “Software Quality and Testing - A Concise Study”, PHI Learning Private Limited, 2012, ISBN: 978-81-203-4628-4.
4. Dorothy Graham, Erik van Veenendaal, Isabel Evans and Rex Black, “Foundations of Software Testing ISTQB Certification”, Cengage Learning India Private Limited, 2007, ISBN-13: 978-81-315-0218-1.
5. Jason Germbi, “Developing Secure Software”, Cengage Learning India Private Limited, 2008, ISBN 13: 978-81-315-0888-6.
6. Illene Burnstien, “Practical Software Testing”, Springer International Edition, First Edition, 2004, ISBN: 81-8128-0 89-X.
7. Illene Burnstien, “Practical Software Testing”, Springer International Edition, First Edition, 2004, ISBN: 81-8128-0 89-X.

17CA2022 SYSTEM SOFTWARE

Credits: 3:0:0

Course Objective:

- To understand the relationship between system software and machine architecture.
- To know the design and implementation of assemblers linkers and loaders.
- To have an understanding of system software tools.

Course Outcome:

Students will be able to:

- Explain system software's.
- Distinguish between various system software's and their functionalities.
- Apply the principles of design in building system software's.
- Apply different approaches of concurrent programming.
- Compare different batch processing systems.
- Develop remote execution techniques.

Unit I - Introduction: System software and machine architecture - The simplified instructional Computer(SIC) – Machine architecture - Data and instruction formats - addressing modes -instruction sets - I/O and programming

Unit II -

Assemblers:Basic assembler functions - A simple SIC assembler –Assembler algorithm and data structures- Machine dependent assembler features-Instruction formats and addressing mode –Program relocation –Machine independent assembler features -Literals–Symbol refining statement–Expressions - one pass assemblers and Multi pass assemblers implementation example - MASM assembler.

Unit III - Loaders And Linkers: Basic loader functions – Design of an Absolute Loader – A Simple Bootstrap Loader – Machine dependent loader features –Relocation – Program Linking – Algorithm and Data Structures for Linking Loader- Machine-independent loader features – Automatic Library Search – Loader Options – Loader design options -Linkage Editors – Dynamic Linking – Bootstrap Loaders – Implementation example - MSDOS linker.

Unit IV - Macro Processors: Basic macro processor functions –Macro Definition and Expansion –Macro Processor – Algorithm and data structures - Machine- independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels –Conditional Macro Expansion – Keyword Macro Parameters - Macro within Macro-Implementation example - MASM Macro Processor – ANSI C Macro language.

Unit V - System Software Tools: Text editors – Overview of the Editing Process - User Interface – Editor Structure Interactive debugging system Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria. System software and Machine Architecture – The Simplified Instructional Computer (SIC) – Traditional (CISC) Machines – RISC Machines – Assemblers – Machine-Dependent and Independent Assemblers – Assembler design options – Loaders and Linkers – Machine Dependent and Independent Loader features – Loader design features - Macro Processors – Machine-Independent Macro Processors – Macro Processor Design options - Compilers – Other System Software.

Text Book:

1. Leland L. Beck and D. Manjula, “System Software: An Introduction to Systems Programming”, Pearson Education, Third Edition, 2012, ISBN- 978-81-317-6460-2.

Reference Books:

1. Santanu Chattopadhyay, “System Software”, Prentice-Hall India, 2007, ISBN: 978-81-20330511.
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman, “Compilers: Principles, Techniques, and Tools”, Pearson Education Asia, Second Edition, 2011, ISBN: 0133002144.
3. D. M. Dhamdhare, “Systems Programming”, Tata McGraw-Hill, 2011, ISBN: 071333118.
4. M. Joseph, “System Software”, Laxmi Publications, 2007, ISBN: 978-813-1800362.

17CA2023 ELEMENTS OF E-COMMERCE

Credits: 3:0:0

Course Objective:

- To understand the scope of ecommerce in the realm of modern business.
- To know the technologies used to develop and deliver e-commerce applications.
- To know the marketing methods used in e-commerce.
- To learn the security and implementation aspects of internet marketing.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Summarize contemporary e-commerce concepts and terminology.
- Apply the processes and management decisions that are involved in launching, operating and managing business activity on the World Wide Web.
- To model technologies used to deliver e-commerce applications.
- Explain technologies supporting e-commerce, including Web services and electronic payment systems.
- Describe scenarios for B2B e-commerce, including SCM, CRM and EDI.
- Explain enablers and issues in business-to-consumer e-commerce.

Unit I - What is E- Commerce? – Advantages and Limitations of E- Commerce – The Role of Strategy in E-Commerce – Value Chains in E- Commerce – Integrating E – Commerce – Managerial Implications. The Internet and The World Wide Web: The Internet Today – In the beginning – Unique Benefits of the Internet – Searching Online – Bulletin Board Systems (BBSs) and Pay Services – Some Web Fundamentals – The Language of the Internet – Managerial Implications

Unit II - Launching a Business on the Internet: The Life Cycle Approach – The Business Planning and Strategizing Phase – Hardware, Software, Security, and Setup Phase - The Design Phase – The Marketing Phase – The Fulfillment Phase – The Maintenance and Enhancement Phase. Internet Architecture: What Is a Network? – Information Transfer – Network Hardware – Designing a Network – Managing the Network – Management Implications.

Unit III - Payment Systems: Getting the Money: From Barter to Money – Requirements for Internet- Based Payments – Electronic Payment Credit Cards, Debit Cards, Smart Cards. ESecurity: Security in Cyberspace – Designing for Security – How Much Risk Can You Afford? – The Virus: Computer Enemy Number One – Security Protection and Recovery – How to Secure Your System.

Unit IV - Encryption: A Matter of Trust: What Is Encryption? – The Basic Algorithm System –Authentication and Trust – Key Management – Internet Security Protocols and Standards – Other Encryption Issues. Marketing on the Internet: The Pros and Cons of Online Shopping –Internet Marketing Techniques – The E- Cycle of Internet Marketing – Marketing Your Presence – Attracting Customers to Your Site – Tracking Customers – Customer Service –Managing Implication

Unit V - Implementation and Maintenance: Implementation Strategies – Managing Implementation –Maintenance Strategies – Management Implications. Web-Based Business –to-Business ECommerce: What Is B2B E-Commerce? – B2B Models – B2B Tools – EDI – Beyond B2B:A2Z – Management Applications

Text Book:

1. Elias M. Awad, “Electronic Commerce: From Vision to Fulfillment”, Prentice-Hall of India, Third Edition, 2007, ISBN: 978-81-203-3027-6.

Reference Books:

1. Bharat Bhasker, “Electronic Commerce: Framework, Technologies and Applications”, Tata McGraw – Hill, 2007, ISBN: 0-07-060095-3.
2. Kenneth C. Laudon and Carol Guercio Traver, “E-Commerce – Business, Technology, Society”, Addison Wesley, Third Edition, 2007, ISBN: 0-13-173516-0.
3. Gray P. Schneider, “Electronic Commerce”, Cengage Learning, 8th Edition 2008, ISBN: 9781423903055.
4. Sanjay Mohapatra, “E-Commerce Strategy: Text and Cases”, Springer Science & Business Media, 2012, ISBN: 9781461441427.

17CA2024 NETWORK SECURITY

Credits: 3:0:0

Course Objective:

- To understand security goals and ethics.
- To understand security threats and mechanisms to counter them.
- To understand relevant cryptographic techniques.

Course Outcome:

Students will be able to:

- Identify security threats and determine efforts to counter it.
- Familiarity with information security awareness and a clear understanding of its importance
- Develop security algorithms in the network.
- Compare various Cryptographic Techniques
- Design Secure applications
- Define the terms vulnerability, threat and attack

Unit I - Security goals- Cryptographic attacks-services and mechanism-Techniques for security goals implementation- Mathematics of cryptography: Integer Arithmetic- Modular arithmetic- Traditional Symmetric- key Ciphers- Categories of traditional ciphers- stream and block ciphers

Unit II - Introduction to modern symmetric key ciphers: Modern Block ciphers, components of a modern block cipher-two classes of product ciphers-attacks designed for block ciphers-modern stream ciphers

Unit III - Data Encryption Standard: History of Data Encryption Standard, DES Structure, DES Analysis, Security of DES, Multiple DES, Advanced Encryption Standard

Unit IV - Asymmetric –key Cryptography: Difference between symmetric key and asymmetric key cryptosystems- RSA cryptosystem- Rabin cryptosystem- Elgamal cryptosystem-Elliptic curve cryptosystems- Message integrity and message authentication

Unit V - Cryptographic Hash functions: Iterated hash function-description of MD hash family, Whirlpool, SHA-512, Digital Signature- Firewalls

Text Book:

1. Behrouz A Forouzan and Debdeep Mukhopadhyay, "Cryptography and Network Security, 3rd edition, Mc Graw Hill Education, 2015, ISBN: 978-93-392-20194-5.

Reference Books:

1. William Stallings, "Network Security Essentials Applications and Standards", 4th Edition, Pearson Education, 2011, ISBN: 978-0-13-610805-9.
2. Cryptography and Network Security, second impression, 2012, ITL Education solutions limited, ISBN: 978-81-317-6452-7
3. Mark Ciampa, "Security+ Guide to network Security Fundamentals", Fourth Edition, Cengage Learning, 2011, ISBN: 1111640122.
4. Chris Brenton and Cameron Hunt, "Mastering Network Security", Second Edition, Sybex inc. Publishing, 2006, ISBN: 0782151485.
5. Eric Cole, Ronald Krutz and James W. Conley, "Network Security Bible", 2nd Edition, Wiley India, 2011, ISBN: 0470570008.
6. Roberta Bragg, Mark Rhodes-Ousley and Keith Strassberg, "Network security: The complete reference", McGraw-Hill, Ninth reprint, 2008, ISBN: 0072226978.

17CA2025 NETWORK COMPONENTS AND TROUBLESHOOTING

Credits: 3:0:0

Course Objective:

- To provide an understanding of the Networking Components.
- To familiarize with the basic taxonomy and terminology of the computer networks.
- To give exposure in specific areas of networking such as the design and troubleshoot of individual networks.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Explain data communications system and its components.
- Identify the different types of network topologies and protocols.
- Explain physical properties and characteristics of systems networking.
- Identify the different types of network devices and their functions within a network.
- Identify and describe the nature and roles of protocols and services at the application, network, data link, and physical layers
- Solve network related problem.

Unit I - Introduction: Physical Network Design – IP Subnet Design – VLAN Network – Routed Network.

Unit II - Advanced Router Configuration I – Configuring Static Routing – Dynamic Routing Protocols – Configuring RIPv2 – TFTP.

Unit III - Advanced Router Configuration II – Configuration Link State Protocols OSPF – Configuration Link State Protocols – IS-IS – Configuring Hybrid Routing Protocols – EIGRP – Advanced Routing Redistribution – Analysis OSPF “HELLO” Packets.

Unit IV - Configuring and Managing the Network Infrastructure – Domain Name and IP Assignment – IP Management with DHCP – Scaling the Network with NAT and PAT – Domain Name Service (DNS).

Unit V - Analysing Data and Network Traffic – Protocol Analysis – Wireshark Protocol Analyser – Analysing Network Data Traffic - Filtering

Text Book:

1. Jeffrey S. Beasley and Piyasat Nilkaew, “Practical Guide to Advanced Networking”, Pearson Education, Third Edition, 2013, ISBN: 1439832234.

Reference Books:

1. McCabe James, “Network Analysis, Architecture, and Design”, Morgan Kaufmann Publishers, Third Edition, 2010, ISBN: 008054875X.
2. Vilas S. Bagad and Iresh A. Dhotre, “Computer Networks”, Technical Publications, 2010, ISBN: 9788184312591.
3. James F. Kurose, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson Education, Sixth edition, 2012. ISBN: 9780132856201.
4. Odom, “Computer Networks First Step”, Cisco Press, First Edition, 2004, ISBN: 1587201011.
5. Patrick Ciccarelli and Christina Faulkner, “Networking Foundation - Technology Fundamentals for IT Success”, John Wiley, First Edition, 2006, ISBN: 0782151140.
6. Uyless Black, “Sams Teach Yourself Network Troubleshooting”, Sam Techmedia, Fourth Edition, 2009, ISBN: 0768686504.

17CA2026 PROFESSIONAL ETHICS

Credits: 3:0:0

Course Objective:

- Understand about Professional life.
- Learn more about Psychology and Philosophy of Ethics.
- Learn more about Code of Ethics for Scientists and Engineering.

Course Outcome:

After completing this course, the student will be able to:

- Understand the ethical framework in professional life.
- Know the psychology and philosophy of ethics.
- Recognize the ethics in scientific and engineering societies.
- Diagnose the code of ethics and ethical standards.
- Understand the integrity in research.
- Realize the Enforcement of Code of Ethics.

Unit I - Introduction to Ethics: Explaining Ethics: Introduction – The impact of Science and Engineering – The framework of Ethics – Ethics in Professional life – Scientists and Engineers: Definitions – Scientific Disciplines – Engineering Disciplines – Expert Willingness – Professionalism.

Unit II - The Psychology and Philosophy Of Ethics: Ethical responsibilities in research – Ethics in Science and Engineering – A phenomenological theory of ethics – Conflicts of Interest – Education of Scientists and Engineers:

The High School experience – The Baccalaureate experience – The Graduate degree experience – Postdoctoral experience – morals and values – Evaluating Scientists and Engineers – Intellectual Property.

Unit III - Ethics in Scientific and Engineering Societies: Scientific societies – Engineering societies – Code of ethics and ethical standards – Promoting research integrity – The effectiveness of society activities – Academic freedom – Code of Ethics and Ethical Standards: Ethics – Code of Ethics – The premise behind code of ethics – Code of ethics and peer reviews.

Unit IV - Integrity in Research and Publication: The nature and conduct of research – Collecting research data – The Controls – Publication and Communication: The Scientific and Engineering literature – The Journals – Data Manipulation for publication – Detection Falsified Data – Peer reviews and their duties – Duties and responsibilities of a journal editor.

Unit V - Enforcement of Code of Ethics: Following a code of ethics – Enforcing a code of ethics – Reporting misconduct – Examples of unethical behaviour.

Text Book:

1. James G. Speight, Russell Foote, “Ethics in Science and Engineering”, Wiley, 2011, ISBN: 978-0-470-62602-3.

Reference Books:

1. Mike Martin and Roland Schinzinger, “Introduction to Engineering Ethics”, McGraw Hill, New York, 2010, ISBN: 0071267905, 9780071267908.
2. Robert Elliott Allinson, “Saving Human Lives Lessons in Management Ethics”, Springer, 2005, ISBN: 978-1-4020-2905-9 (HB), 978-1-4020-2980-6.
3. Charles E Harris, Michael S Pritchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Thompson Learning, 2000.
4. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, 1999.
5. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, 2003.

17CA2027 GENERAL APTITUDE

Credits: 3:0:0

Course Objective:

- To solve problems on aptitude and reasoning.
- To apply concepts to solve real life problems.
- To develop comprehensive ability.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to

- solve problems involving numerical computation.
- solve problems involving numerical estimation
- solve problems involving numerical reasoning
- interpret data and solve them.
- apply the English grammar and vocabulary in sentences
- Identify the errors in sentences

Unit I - Data Interpretation & Data Sufficiency - Logical Reasoning - Quantitative Aptitude: - Number Systems, Number Theory,

Unit II - Problems on Ages, Algebra, Clocks and Calendars, Profit, Loss & Discounts, Partnerships, Unit

Unit III - Theoretical Geometry and Races and Games, Average, Time & Distance, Time & Work, Mensuration, Percentages, Permutation and Combination, Probability,

Unit IV - Ratio, Proportion, Solutions and Mixtures, Simple Interest and Compound Interest, Sets and Simple Quadratic equations

Unit V - Verbal English: - Basic Grammar, Synonyms and Antonyms Reading Comprehension, Error Spotting.

Text Book:

1. R.S. Agarwal, “Quantitative Aptitude for Competitive Examinations”, Paperback, S Chand, 20th edition, 2013, ISBN -13: 978-8121924986.

Reference Books:

1. R.S. Aggarwal, "A Modern Approach to Logical Reasoning", Paperback, S. Chand, 2007, ISBN-13: 978-8121919050.
2. Anantha Ashisha, "Accredited Guide to Data Interpretation and Data Sufficiency Paperback, Arihant; 2012 edition, ISBN-13: 978-9350942123.
3. Jaikishan and Premkishan, "How to Crack Test of Reasoning: In All Competitive Exam", Paperback, 2014, Arihant; Single Edition, ISBN-13: 978-9351762225.
4. Ashok Gupta, "A Comprehensive Study of Data Interpretation Analysis and Sufficiency", Paperback, 2012, Upkar, ISBN-13: 978-9350131640.

17CA2028 WEB PROGRAMMING LAB**Credits: 0:0:2****Co-requisite:** 17CA2001 Principle of Web Programming**Course Objective:**

- To design websites using markup languages.
- To design and develop website using Style Sheets.
- To develop online applications using HTML and CSS.

Course Outcome:

Students will be able to

- Design and develop static web pages using markup languages.
- Design and develop webpages using Style Sheets.
- Creating websites with images, forms and animations
- Develop online applications using HTML and CSS.
- Construct a web site that conforms to the web standards
- Design, develop and host a user friendly website.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2029 PROGRAMMING IN C LAB**Credits: 0:0:2****Co-requisite:** 17CA2004 Programming in C**Course Objective:**

- To make the students to understand the concepts of C Language and motivate them to develop the Coding.
- To solve problem using arrays and functions.
- To solve problems using data files.

Course Outcome:

After completion of the course the student will be able to

- Write efficient coding using structured programming
- Use a modular programming approach for solving problems
- Develop programs using different programming constructs
- Develop programs that are non-trivial with efficiency, readability and modularity
- Utilize data structures like arrays in problem solving
- Solve problems using pointers, structures and data files

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2030 MS-OFFICE LAB**Credits: 0:0:2****Course Objective:**

- To study the features of MS-Word
- To learn to make power point presentation with effects and animations

- To study the various features of MS- Excel
- To learn to use MS-Access

Course Outcome:

By learning the course, the students will be able to

- Perform documentation by analysing and applying appropriate techniques utilized in starting the Word program.
- Performing basic text editing functions by keying text into a document.
- Perform presentation skills by analysing the needs and expectations of your audience.
- Examine slide show presentation concepts and explore the Microsoft Office PowerPoint environment.
- Evaluate and select the most appropriate means for inserting text, values and formulas into a worksheet.
- Perform accounting operations.

Reference Books:

1. Guy Hart-Davis, "Beginning Microsoft Office 2010", Apress, 2010, ISBN: 974-1-4302-2950-G
2. Ed Bott, Woody Leonhard, "Using Microsoft Office 2007", Pearson Education Asia, ISBN: 978-81-317-1354-9
3. Ed Bott, Carl Siechert, "Microsoft Office Inside Out: 2013 Edition", Microsoft, 2013, ISBN: 9780-7356-6906-2
4. Vikas Gupta, "Comdex Information Technology course tool kit", WILEY Dreamtech, 2005

17CA2031 HARDWARE TROUBLESHOOTING LAB

Credits: 0:0:2

Course Objective:

- To enable the students to get a detailed knowledge of all the hardware components.
- To understand the different interfaces required for connecting these hardware devices.
- To understand system related problems and methods of troubleshooting.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Identify the components of a computer.
- Understand what takes place with the computer's hardware when the computer operates in a normal fashion
- install an operating system,
- troubleshoot using system tools
- Demonstrate system administration task.
- Solve system related problems.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

Reference Books:

1. Scott Mueller, "Upgrading and Repairing PCs", Que Publishing, 22nd Edition, 2015, ISBN: 0789756102.
2. Mike Meyers, "Managing and Troubleshooting PCs", 4th Edition, Tata McGraw Hill, 2012, 007179591X.
3. Craig Zacker and John Rourke, "The complete reference: PC hardware", Tata McGraw Hill, New Delhi, 2001.
4. Ron Gilster, "PC Hardware: A Beginners Guide", Tata McGraw Hill, 2008, ISBN: 978-0-07-044736-3.
5. Hans Peter Messmer, "The Indispensable PC Hardware Book", Addison-Wesley, 4th Edition, 2002, ISBN: 9780201596168.
6. B. Govindarajulu, "IBM PC and Clones Hardware Troubleshooting and Maintenance", Tata McGraw-Hill, New Delhi, 2002.

17CA2032 PROGRAMMING IN C++ LAB

Credits: 0:0:2

Co-requisite: 17CA2007 Object Oriented Principles Using C++

Course Objective:

- To implement the object oriented concepts to solve problems.

- To develop an application using object oriented concepts.
- To develop applications using files.

Course Outcome:

After completion of the course, the students will be able to

- Understand object oriented programming model
- Develop solutions using object oriented programming model
- Implement object oriented concepts to solve problems.
- Develop applications using object oriented concepts.
- Develop applications using files.
- Differentiate Structural and Procedural programming from object oriented programming

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2033 DATABASE MANAGEMENT SYSTEMS LAB

Credits: 0:0:2

Co-requisite: 17CA2006 Database Management Systems

Course Objective:

- To impart students with the knowledge of database system by using DDL and DML statements.
- To facilitate students to understand the concept of sub queries, multiple sub queries.
- To facilitate students to understand the concept of triggers.

Course Outcome:

Students will be able to

- classify DDL and DML statements.
- apply normalisation to the tables.
- develop queries consisting of sub queries and multiple sub queries.
- create view
- understand the transaction management
- have knowledge on internal storage structures

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2034 PROGRAMMING IN JAVA LAB

Credits: 0:0:2

Co-requisite: 17CA2011 Programming in Java

Course Objective:

- To apply the object-oriented paradigm features of Java.
- To implement java concepts like interface, packages, multithreading etc.
- To develop graphic applications in applet and using AWT.

Course Outcome:

Students will be able to

- Implement java programs with simple class and methods
- Implement java programs with multiple classes and methods
- Implement java packages and importing packages
- Handle exceptions in java
- Implement threads in java
- Implement simple GUI programs

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2035 DATA STRUCTURES LAB

Credits: 0:0:2

Co-requisite: 17CA2010 Data Structures and Applications

Course Objective:

- To develop skills to design and analyze simple linear and non-linear data structures.
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem.
- To Gain knowledge in practical applications of data structures.

Course Outcome:

At the end of this lab session, the student will be able to

- Identify the data structures suitable for real world problems
- Implement data structures like stacks and queues
- Implement lists and tree structures and apply it in real time applications
- Implement various sorting algorithms
- Implement various searching algorithms
- Apply the data structures to real world problems

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2036 VISUAL PROGRAMMING LAB

Credits: 0:0:2

Co-requisite: 17CA2013 Visual Programming

Course Objective:

- To interact with the mouse and keyboard using forms.
- To understand the concepts of event-driven programming using data types, variants, and arrays etc.
- To familiarize with the file system controls and database controls.

Course Outcome:

After completing the Course, the student must demonstrate the knowledge and ability to:

- Understand the Visual Basic .NET and its frame work
- Develop the windows based applications in Visual Basic .NET
- Select appropriate controls required for the application.
- Develop event driven programs.
- Create applications with database connectivity.
- apply the object oriented Concept in applications

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2037 COMPUTER GRAPHICS LAB

Credits: 0:0:2

Co-requisite: 17CA2014 Principles of Computer Graphics

Course Objective:

- To measure the students' understanding of the Computer Graphics techniques concepts and algorithm.
- To implement of line drawing, circle drawing, polygon drawing, transformation of objects, scaling, viewing, and curve designing and modeling algorithm practically for graphics.
- To motivate students to think critically and creatively in order to come with an alternate solution for an existing problem with computer graphics.

Course Outcome:

At the end of the Course students will be able to

- Understand practical fundamental of line drawing, circle drawing, polygon drawing and curve drawing.
- .Design scan conversion problems using C++ programming.
- Apply clipping and filling techniques for modifying an object

- Understand the concepts of different type of geometric transformation of objects in 2D and 3D.
- Understand the practical implementation of modeling, rendering, viewing of objects in 2D and 3D.
- Design drawings that demonstrate computer graphics and design skills.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2038 SYSTEM ADMINISTRATION LAB

Credit 0:0:2

Co-requisite: 17CA2015 System Administration

Course Objective:

- To learn about SUSE Linux Enterprise.
- To manage system initialization.
- To administer Linux processes and services.
- To administer storage.
- To configure the network.
- To manage hardware.
- To configure remote access.
- To monitor SUSE Linux Enterprise system.

Course Outcome:

The student will be able to efficiently use of SUSE Linux in productive environment

- Install, configure, and troubleshoot a Linux Operating System on a PC.
- maintain user accounts, manage file systems and processes,
- install and configure software and hardware
- Perform routine system maintenance and backup functions
- install the Linux OS and tailor it for specific usage including creation and management of user accounts and installation of software
- Work on Linux system and to locate additional utilities, configurations and maintenance.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2039 WEB TECHNOLOGY LAB

Credits: 0:0:2

Co-requisite: 17CA2018 Web Technology

Course Objective:

- To develop application development skills in PHP.
- To familiarize in array, object oriented programming using PHP.
- To develop web applications using cookies and session.

Course Outcome:

Students will be able to

- Develop web based applications using PHP.
- Implement user interface validation procedures.
- Design and develop a Web site using form controls for presenting web based content
- Design and develop interactive, executable web applications.
- Using database technologies to store persistent data for a web application.
- Create dynamic Website/ Web based Applications, using PHP, MySQL database

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2040 PYTHON LAB

Credits: 0:0:2

Co-requisite: 17CA2019 Programming in Python

Course Objective:

- To write basic programs using conditionals and iterations.
- To develop programs using object oriented programming Concepts.
- To develop programs using files and functions.

Course Outcome:

After the completion of the course students will be able to

- Build the understanding of the underlying principles and equip future academics with basic skills to create computer programs for small-scale use.
- Solve problems with well documented programs.
- Solve problems in Python language including use of logical constructs.
- Adequately use standard programming constructs: repetition, selection, functions, composition, modules.
- Design code using the built- in objects of numbers, strings, lists, tuples and dictionaries, iterators and generators.
- Demonstrate significant experience with Python program development environment.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2041 .NET PROGRAMMING USING C# LAB

Credits: 0:0:2

Co-requisite: 17CA2020 .Net Programming using C#

Course Objective:

- To develop applications using object oriented concepts in C#.
- To develop applications using delegates, interface, collections and generics.
- To develop applications using database connectivity.

Course Outcome:

At the end of the course student will be able to

- Understand the structure and model of the programming language C # (note)
- Use the programming language C # for various programming technologies (understanding)
- Develop software in C # (application)
- evaluate user requirements for software functionality required to decide whether the programming language C # can meet user requirements (analysis)
- Propose the use of certain technologies by implementing them in the C # programming language to solve the given problem (synthesis)
- Choose an engineering approach to solving problems, starting from the acquired knowledge of programming and knowledge of operating systems. (evaluation)

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2042 SOFTWARE QUALITY TESTING LAB

Credits: 0:0:2

Co-requisite: 17CA2021 Software Testing and Quality Assurance

Course Objective:

- To identify and document test cases for a given user interface design.
- To identify and document test cases for a given functionality.
- To understand how to test the software.

Course Outcome:

Students will have an ability to

- Apply software testing knowledge and engineering methods.
- Design and conduct a software test process for a software testing project.
- Identify the needs of software test automation, and define and develop a test tool to support test automation.
- Understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.
- Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects.
- Understand the contemporary issues in software testing, such as component-based software testing problems.
- Use software testing methods and modern software testing tools for their testing projects.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2043 NETWORK COMPONENTS AND TROUBLESHOOTING LAB

Credits: 0:0:2

Co-requisite: 17CA2025 Network Components and Troubleshooting

Course Objective:

- To understand network concepts and components.
- To learn about Network hardware, Media Types (cables, Wireless), Categories of UTP, Connectors, and Network interface card.
- To learn connecting hosts, Peer to Peer Networks.

Course Outcome:

At the end of the Course students will be able to

- Show practical base in computer network issues
- Identify and use various networking components
- Understand different transmission media and design cables for establishing a network.
- Make use of Networking Devices (Layer 1, Layer 2).
- Implement device sharing on network
- Support network Troubleshooting.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2044 BASICS OF COMPUTER APPLICATIONS

Credits: 3:0:0

Course Objectives:

- To familiarize with the computer system
- To understand windows, MS Word, MS Excel, MS PowerPoint and MS Access.
- To expose on Internet and Email.

Course Outcomes:

- To make the student capable of working smoothly on computer systems
- Execute the work on a desktop or laptop
- To prepare the documents using MS Office tools
- To execute the basic functions with the help of computers
- To execute the presentations using MS PowerPoint.
- To do the bookings online with the help of internet.

Unit I - Features of Windows XP – The Desktop – Structure of Windows – Windows XP Explorer – The Search – The Recycle Bin – Configuring the Screen – Configuring the Mouse – Adding or Removing Programs – Adding New Hardware – System Tools – The Scandisk – Windows XP Media Player – Window Help – Windows Vista – Windows 7.

Unit II - MS-Word 2007 – Starting MS- Word – MS-Word Screen and Its Components – The Office Button – The Ribbon – Solved Examples.

Unit III - MS-Excel 2007 – Start MS-Excel – Basics of Spreadsheet – MS-Excel Screen and its Components – The Office Button - The Ribbon – Solved Examples.

Unit IV - MS-PowerPoint 2007 – Basics of PowerPoint – Start MS - PowerPoint – MS-PowerPoint and its Components – The Office Button – The Ribbon – Solved Examples. MS-Access 2007 – Database Terminology – Start MS-Access – MS-Access Screen and its Components – The Office Button - The Ribbon – Solved Examples.

Unit V - Network and Internet Connections – Start Network Connections – Create a new connection – Manage a Network Connection – Network Setup – Windows Firewall – Sharing of Files- Wireless Network Setup – Connect using Virtual Private Network – Set Up a Wired Network – Automatic Wireless Network Connections – Setup Internet Properties – Internet Options – Choose an Internet Connection. The Internet and Internet Services - Internet Services – World Wide Web – Electronic Mail – File Transport Protocol – Uses of Internet.

Text Book:

1. Anita Goel, “Computer Fundamentals”, Pearson Education India, 2010, ISBN 978-81-317-3309-7.

Reference Books:

1. Reema Thareja, “Fundamentals of Computers”, Oxford Publishing , 2014, ISBN 978-01-994-5272-9.
2. E. Balagurusamy, “Fundamentals of Computers”, McGraw Hill Education, New Delhi, 2009, ISBN 978-00-701-4160-5.
3. P.K.Sinha, “Computer Fundamentals”, BPB Publications, New Delhi, 2004, ISBN 978-81-765-6752-7.
4. Sanjay Saxena, “A First Course in Computers (Based on Windows 8 and MS Office 2013)”, Vikas Publishing House, New Delhi, 2015, ISBN 978-93-5259-025-4.
5. Lonnie E. Moseley, David M. Boodey, “Mastering MS-OFFICE Professional for Windows 95”,BPB Publication.

17CA2045 OPERATING SYSTEM AND ITS SECURITY

Credits: 3:0:0

Course Objective:

- To understand operating system components
- To understand the functions of various operating system services.
- To understand relevant operating system security protection.

Course Outcome:

Students will be able to:

- Define the Operating System Structures
- Compare the OS Services
- Handle device driver and organize the data on the drive
- State process control block
- Install, upgrade, manage, and remote access of the Operating System.
- Define the terms OS security threat, attack and protection mechanism.

Unit I - Operating System - Introduction to Operating System – Operating System services – Operating System structures

Unit II - Input / Output management and Disk Scheduling – Device driver basics – I/O Procedure – I/O Scheduler – Device handler – Organize data on the CD ROM , DVD ROM

Unit III - Process Management – Introduction to process – Process states – Process Control block – Process hierarchy - CPU scheduling – Synchronization – Deadlock - Message passing

Unit IV - Memory Management – Relocation and Address translation – Contiguous memory allocation - Swapping - Paging – Segmentation – Virtual Memory - File Organization

Unit V - Operating System Security and Protection – Security threats – attacks on security – Authentication - Protection mechanism

Text Books:

- Achyut Godbole, Atul Kahate, “Operating Sytems” 3rd Edition, McGraw Hill Education, , ISBN-10: 0070702039, ISBN-13: 978-0070702035
- Silberschatz, Galvin, Gagne, “ Operating System Concepts” John Wiley; 9 edition, ISBN-10: 8126554274, ISBN-13: 978-8126554270

- Michael Palmer, “Guide to Operating Systems Security”, Paperback – Import, Course Technology Inc, ISBN-10: 0619160403, ISBN-13: 978-0619160401

Reference Books:

- William Stallings, “Operating Systems: Internals and Design Principles”, Pearson Education, New Delhi.
- Charles P Pfleeger and Shari Lawrence Pfleeger, “Security in Computing”, Prentice Hall, New Delhi
- Deitel H M, “Operating System”, Pearson Education, New Delhi.

17CA2046 OPERATING SYSTEM AND ITS SECURITY LAB

Credits: 0:0:2

Co-requisite: 17CA2045 Operating System and Its Security

Course Objective:

- To use the device driver and organize the data on the drive
- To Install, upgrade, manage, and remote access of the Operating System
- To Identify OS security threat, attack and protection mechanism

Course Outcome:

At the end of the course students will be able to

- Understand the structure and services of the Operating System
- Use the device driver and organize the data on the drive
- Install, upgrade, manage, and remote access of the Operating System
- Use of Memory Management device
- Understand CPU scheduling
- Identify OS security threat, attack and protection mechanism

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2047 FORMS OF CYBER CRIMES AND FRAUDS

Credits: 3:0:0

Course Objective:

- To understand various forms of cyber crimes and frauds
- To understand the fraud detection techniques
- To understand fraud detection tools

Course Outcome:

Students will be able to:

- Define the frauds and related concepts
- Define fraud triangle
- Understand forms of frauds
- Understand the fraud types
- State fraudulent behavior
- Understand fraud detection techniques

Unit I - Fraud definition: Definition of Frauds and related concepts - Various forms of cyber crimes – Definition, nature & Modus Operandi

Unit II - Cyber crimes and Forms of Frauds: Definition of cyber crimes and related concepts - Fraud Triangle - Major Forms of Frauds: Telecom Frauds - ATM Frauds - Bank Frauds - Credit Card Frauds - Mobile Frauds

Unit III - Types of Frauds and Evolution of Cyber fraud techniques: Understanding fraudulent behaviour - Types of Frauds – Internal Vs. External - Phishing – Pharming – Driven by pharming – trojans and tool kits – insider treats - database timing attacks – pump ad Dump

Unit IV - Cyber Frauds: Cyber fraud model – obtaining financial information: Phishing – network intrusion – Trojan horses – Real world theft - buying/ selling stolen financial information: Carding forums – Dumps vendors – non carding related forums – notable carders

Unit V - Fraud Detection Techniques and Analysis: Fraud detection techniques – through statistical analysis, pattern and relationship analysis, vagueness in fraud detection & signatures in fraud detection - Fraud Detection using Data Mining, Digit Analysis & Fraud detection tools - Building a Fraud Analysis Model – 7 Stages

Text Books:

1. Rick Howard, “Cyber Fraud: Tactics, Techniques and Procedures”, Auerbach Publications; 1st edition.
2. Vasu Deva, “Cyber Crimes and Law Enforcement”, Commonwealth Publishers, New Delhi.

Reference Books:

1. Albert J. Marcellaa and Robert S. Greenfiled (Ed), “Cyber Forensics, A Field Manual for collecting, examining and preserving evidence of computer crimes”, Auerbach publications.

17CA2048 COMPUTER FORENSICS

Credits: 3:0:0

Course Objective:

- To provide technical skills and competencies in the field of forensic computing
- To utilize the computer forensic technology and tools to digital data collection, recovery, preservation
- It provide hands on experience on various forensic tools
- To gain insight into the legal measures for different types of misuse

Course Outcome:

Students will be able to:

- Understand the fundamentals of computer forensics
- Explore Forensic software
- Familiar with Forensic tools
- Understand the file systems
- Understand the different software packages windows and artifacts
- State legal measures

Unit I - Computer Crimes: Introduction to Traditional Computer Crime - Traditional problems associated with Computer Crime - Introduction to Identity Theft & Identity Fraud -Understanding the computer components - Digital Media - Hard disk basics

Unit II - File Systems and Bookmarking: Windows file systems - FAT32 – NTFS - Forensic file images - Bookmarking and Searching: Creating basic search queries - Hex, Decimal, and Binary – ASCII – Unicode

Unit III - Computer Forensics and Investigations: Preparation of Investigation, Procedures, Understanding data recovery, Data Acquisition, Processing crime scene and investigation

Unit IV - Forensic software: Forensic hardware - Hardware write/blockers - Hard drive acquisitions - Processing the scene - Overview of different software packages – EnCase - Other Windows Artifacts: Common windows artifacts - Recycle bin - My Documents - Recent files - Installed programs

Unit V - Legal Measures: Computer Misuse, Criminal damage, Software Piracy, Forgery, Investigative powers

Text Books:

1. Davis, Philipp, and Cowen, “Hacking Exposed: Computer Forensics”, Second Edition, McGraw-Hill Education, ISBN-10: 0071626778
2. Cory Altheide and Harlan Carvey, “Digital Forensics with Open Source Tools”, Elsevier publication, ISBN:978-1-59749-586-8,
3. Marjie T. Britz, “Computer Forensics and Cyber Crime: An Introduction”, 3rd Edition, Prentice Hall.

Reference Books:

1. Brian Carrier, “File System Forensic Analysis”, Addison- Wesley Professional.
2. Nelson, Phillips Enfinger, Stuart, “Computer Forensics and Investigations”, Cengage Learning
3. NIST Computer Forensic Tool Testing Program (www.cfft.nist.gov)

17CA2049 FUNDAMENTALS OF INFORMATION SECURITY

Credits: 3:0:0

Course Objective:

- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the Security Threats and Vulnerabilities

- To acquire knowledge Security Domains

Course Outcome:

Students will be able to:

- State the basic concepts in information security, including security policies, security models, and various security mechanisms
- Understand the fundamentals of information security risk assessments.
- Identify and Analyze the vulnerabilities in any computing system
- Identify and classify the assets as per asset classification policy
- Understand retention and disposal of information assets
- Explore Security Domains

Unit I - Basic Security Concepts: Confidentiality, integrity, availability - Security policies, security mechanisms, assurance.

Unit II - Security Threats and Vulnerabilities - Threats – Frauds – Thefts - Malicious Hackers - Malicious Code, Denial-of-Services Attacks and Social Engineering, Vulnerability types, an introduction to risk

Unit III - Information Asset Classification – Information system Asset inventory, Asset Classification criteria, roles and responsibilities – Methodology - Declassification or Reclassification - Retention and Disposal of Information Assets - Provide Authorization for Access.

Unit IV - Risk Management – Need for the Risk Assessment, Risk Assessment Methodology, Risk Assessment Components, Risk Mitigation Techniques.

Unit V - Introduction to Security Domains – Application Security, Legal & Compliance, Business Continuity Management, Cryptography, Physical & Environmental Security and Security Operations

Text Books:

1. Mark Ciampa, “CompTIA Security + Guide to network Security Fundamentals”, 5th edition, Cengage Learning Publication.
2. David Kim and Michael G Solomon “Fundamentals of Information Systems Security”, Second Edition, Jones and Barlett Publication.
3. Ronald L. Krutz, Russel Dean Vines “The CISSP Prep Guide: Gold Edition”, Gold Edition, Wiley Publication.
4. Ed Tittel, Mike Chapple, James Michael Stewart “Certified Information Systems Security Professional, Study Guide”, 6th Edition, Sybex Publication.

Reference Books:

1. Steve G Watkins “An introduction to Information Security and ISO27001:2013, A pocket guide”, 2nd Edition, IT Governance Publishing.
2. Dr. Timothy Shimeall & Jonathan Spring “Introduction to Information Security - A Strategic based approach”, 1st Edition, Syngress Publication.

17CA2050 SECURITY OF WEB APPLICATIONS

Credits: 3:0:0

Course Objective:

- To acquire knowledge on web server architecture, common vulnerabilities
- To understand the authentication and authorization mechanism
- To acquire knowledge on web attack and trends

Course Outcome:

Students will be able to:

- Understand the fundamentals of web server architecture and security
- Exploring common vulnerabilities
- Understand the denial of service attacks
- Familiar with authentication and authorization mechanism
- Analyse the web attack and trends
- State brute force mechanism

Unit I - Introduction to Web Applications and Security - Web Application Architecture: HTML-Transport: HTTP- The Web Client - The Web Server - The Web Application - The Database - Web Hacking methodology

Unit II - Hacking Web Servers: Common Vulnerabilities: Apache - Microsoft Internet Information Server (IIS) - Other Web Server Vulnerabilities - Automated Vulnerability Scanning Software - Denial of Service against Web Servers

Unit III - Web Authentication: Authentication Mechanisms - Password Guessing - Session ID Prediction and Brute Forcing - Subverting Cookies - Bypassing SQL-Backed Login Forms

Unit IV - Web Authorization: Role Matrix Attacks - POST Data - Query String - Hidden Tags – URI - HTTP Headers – Cookies

Unit V - Web Attacks & Trend - Introduction to Web Attacks & Trends - URL Interpretation attacks - Input Validation attacks - SQL Injection attacks, Impersonation attacks & Buffer Overflow attacks

Text Books:

- Scambray, Shema, Caleb Sima, “Hacking Exposed Web Applications”, McGraw Hill Osborne, 2nd edition, ISBN: 0-07-226299-0
- Bryan Sullivan, Vincent Llu, “Hacking Exposed Web Application” McGraw Hill Education; 1st edition.

Reference Books:

- Microsoft, “Improving Web Application Security - Threats and Countermeasures”, Microsoft Press US; 1st edition, ISBN-10: 0735618429
- Mike, “Hack Notes: Web Security Portable Reference”, ISBN-10: 0070532877

17CA2051 MALWARE ANALYSIS AND SECURITY

Credits: 3:0:0

Course Objective:

- To provide knowledge malware evolution
- To provide knowledge on virus design and malware design
- To provide awareness to secure the eco system

Course Outcome:

Students will be able to:

- Understand the malware and its evolution
- Differentiate malware and a virus
- Understand the virus components
- Understand the testing used in virus codes
- Analyze and design the famous virus and worms.
- Discuss malware awareness

Unit I- Introduction: Malware – Malware Evolution - Difference between malware and a virus – potentially unwanted programs – Detecting presence of malware – USB drive

Unit II - Virus design: Virus components- Function of replicator, concealer and dispatcher- Trigger Mechanisms- Testing virus codes- Brute force logical bomb.

Unit III - Malware design: Computer Virus in Interpreted programming language- Designing Shell bash virus under Linux- Fighting over infection- Anti-viral fighting – Polymorphism

Unit IV - Virus and Worm analysis: Klez Virus- Clone Virus- Doom Virus- Black wolf worm- Sassar worm- Happy worm 99.

Unit V - Securing the eco system: Awareness – Risk management – Anti malware roles and responsibilities

TEXT BOOKS:

1. ErciFiliol, “Computer Viruses: from theory to applications”, Springer, 1st edition, ISBN 10: 2-287-23939-1, 2005.

REFERENCE BOOKS:

1. Mark.A .Ludwig, “The Giant black book of computer viruses, Create Space Independent Publishing Platform”, 2nd edition, ISBN 10:144140712X.

17CA2052 MALWARE ANALYSIS AND SECURITY LAB

Credits: 0:0:2

Co-requisite: 17CA2051 Malware Analysis and Security

Course Objective:

- To provide knowledge malware evolution
- To provide knowledge on virus design and malware design
- To provide awareness to secure the eco system

Course Outcome:

At the end of the course students will be able to

- Identify the potentially unwanted programs
- Detect presence of malware
- Identify the computer virus in interpreted programming language
- Test virus codes
- Analyze Virus and Worm
- Understand anti malware roles and responsibilities

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2053 FUNDAMENTALS OF GENERAL FORENSIC SCIENCE

Credits: 3:0:0

Course Objective:

- To understand the history of the forensic sciences
- To understand the roles of different types of professionals involved in evaluating a crime scene and the collected evidence
- To understand the methodology of collecting & interpreting data, avoiding contamination, and preservation of chain of custody
- To present evidence in a professional (courtroom) setting

Course Outcome:

Students will be able to:

- Understand the history of the forensic sciences
- Define the roles of different types of professionals involved in evaluating a crime scene and collecting the evidence
- Understand the aspects of the justice system followed.
- Learn the methodology of collecting & interpreting data, avoiding contamination, and preservation of chain of custody
- Define the importance pertaining to forensic examination
- Present evidence in a professional (courtroom) setting

Unit I - Introduction to the Forensic Sciences: History and Development of Forensic Science - Deductive Reasoning - Functions of the Forensic Scientist - Principles of tracing cybercrime evidence - Other Forensic Science Services- Role of forensic expert in the court of law - Aspects of the Justice System - Aspects of Trials

Unit II - Crime Scene Investigation: Concepts – Nature and type of crime scene – Crime scene search methods: Recovery and packaging of evidences – Crime scene documentation - Preservation of evidences – National and International scenario on crime scene investigation – Physical evidences

Unit III - Crime Scene Reconstruction (CSR): Nature and importance of CSR– Basic principles and stages involved – Types and classification of reconstruction – Pattern evidence and shooting scene reconstruction – Manual and computer -assisted reconstruction of BPA – Role of logic in CSR – Writing a reconstruction report – Correlation of crime scene analysis with behavioural analysis – Cases of special importance pertaining to forensic examination

Unit IV - Emerging Crime and Typology of Cyber crime – Cyber terrorism – Cyber defamation – Crime related to Intellectual Property Rights – Exposure to Information Technology Act, 2000 – Voice identification – Forensic Psychology - Narco - analysis – Brain fingerprinting – Criminal profiling and its legal status in India

Unit V - Computer Forensics: How Does the Computer Work - How Data Is Stored -Processing the Electronic Crime Scene - Evidentiary Data

- Case Study 1. Computer Forensic Analysis
- Case Study 2. Counterfeiting and Fraud: A Forensic Computer Investigation

Text Books:

1. Corporate Author, “Computer forensics: Investigating data and image files”, 2nd edition, Course Technology
2. Ellen David, Stephen P. Day, “The scientific examination of documents methods and techniques”, CRC Press; 3 edition

Reference Books:

1. Gardner, R., & Bevel, T, “Practical crime scene analysis and reconstruction”, Boca Raton, Florida: CRC Press.
2. James, S, “Forensic science: An introduction to scientific and investigative techniques”, 2nd edition, Boca Raton, Florida: CRC Press.

17CA2054 DATABASE SECURITY FUNDAMENTALS

Credits: 3:0:0

Course Objective:

- To acquire knowledge on Database & DBMS Architecture
- To understand the Database Interface Languages
- To acquire knowledge on Data Warehousing concepts & Database Security

Course Outcome:

Students will be able to:

- Understand the Database & DBMS Architecture
- Understand the fundamentals of Database Interface Languages
- Familiar with accessing databases through the Internet
- Define data warehousing
- Explore database security
- Learn database auditing

Unit I - The Database and DBMS Architecture: Introduction to Database & DBMS Architecture - Hierarchical Database Management Systems - Network Database Management Systems - Relational Database Management System - Object-Oriented Database Management Systems - End-User Database Management Systems – Spreadsheets

Unit II - Database Interface Languages: Introduction to Database Interface Languages - Concepts of Database Interface Languages - Open Database Connectivity (ODBC) and Object Linking and Embedding Database (OLE DB)

Unit III - Accessing Databases through the Internet: Introduction to Accessing Databases through the Internet - Concept of Accessing Databases through the Internet - the three tier approach - ActiveX Data Objects (ADO)

Unit IV - Data Warehousing: Introduction to Data Warehousing concepts - the concept of Data Warehousing - Metadata and Online Analytical Processing (OLAP) Data mining - Database Vulnerabilities and threats.

Unit V - Database Security: Overview of Database - Database application security models - Database auditing models - Application data auditing - Practices of database auditing

Text Books:

1. Michael Gertz and Sushil Jajodia, “Handbook of Database Security: Applications Trends”, 1st edition (3 December 2007), Springer US
2. Hassan A. Afyouni, “Database Security and Auditing”, Course Technology Inc, ISBN-10: 0619215593

Reference Books:

1. Castano, “Database Security”, Second edition, Pearson Education
2. Alfred basta, Melissa zgola, “Database security” CENGAGE learning

17CA2055 OSI LAYERS AND SECURITY PROTOCOLS

Credits: 3:0:0

Course Objective:

- To acquire knowledge on OSI model
- To understand the Security Protocols

Course Outcome:

Students will be able to:

- Familiar with concept of the OSI model
- Understand the protocol concepts and its types
- State transport Layer,
- Compare IPv4 versus IPv6
- Define Internet Protocol Security, Internet control message protocol & Internet group management protocol
- Define data link layer and the protocols used

Unit I - Open Systems Interconnection (OSI) Model: Introduction to OSI model - concept of the OSI model - the Application Layer - the Presentation Layer - the Session Layer - the Transport Layer - the Network Layer - the Data Link Layer & the Physical layer

Unit II - Security Protocols: Introduction to Protocol concepts - Border Gateway Protocol (BGP) - Dynamic Host Configuration Protocol (DHCP) - Domain Name System (DNS) - File Transfer Protocol (FTP) - Hyper Text Transfer Protocol (HTTP) - Lightweight Directory Access Protocol (LDAP) - Media Gateway Control Protocol (MGCP) - Network News Transfer Protocol (NNTP) - Network Time Protocol (NTP) - Post Office Protocol (POP) - Internet Message Access Protocol (IMAP) - Routing Information Protocol (RIP) - Remote Procedure Call (RPC) - Real Time Streaming Protocol (RTSP) - Session Initiation Protocol (SIP) - Simple Mail Transport Protocol (SMTP) - Simple Network Management Protocol (SNMP) - SOCKet Secure (SOCKS) - Secure Shell (SSH) - Remote Terminal Control Protocol (Telnet) - Transport Layer Security/Secure Sockets Layer (TLS/SSL) - eXtensible Messaging & Presence Protocol (XMPP) - Wireless Application Protocol (WAP) & Internet Relay Chat (IRC)

Unit III - Transport Layer: Introduction to Transport Layer - TCP/IP - User Datagram Protocol (UDP) - Real-time Transport Protocol (RTP) - Datagram Congestion Control Protocol (DCCP) - Stream Control Transmission Protocol (SCTP) - Resource reSerVation Protocol (RSVP) & Explicit Congestion Notification (ECN)

Unit IV - Network Layer: Introduction to Network Layer - Internet Protocol Version 4 (IP4) - Internet Protocol Version 6 (IP6) - Internet Protocol SEcurity (IPSEC) - Internet Control Message Protocol (ICMP) & Internet Group Management Protocol (IGMP)

Unit V - Data Link Layer: Introduction to Data Link Layer - the Address Resolution Protocol (ARP) - the Open Shortest Path First (OSPF) - the Neighbour Discovery Protocol (NDP) - the Tunneling Protocol (Tunnels) & the Point to Point Protocol (PPP)

Text Books:

1. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 5th Edition
2. Uyless D. Black "Internet security protocols: protecting IP traffic", Pub: Prentice Hall PTR; 1st edition

Reference Books:

1. Vivek Acharya, "TCP/IP Distributed System", Pub: Firewall Media / Laxmi Publications.
2. Charles M. Kozierok "TCP/IP Guide – A Comprehensive, Illustrated Internet Protocols Reference", No Starch Press; 1st edition, ISBN-10: 159327047X

17CA2056 SECURITY ASSESSMENT OF INFORMATION SYSTEMS THROUGH ETHICAL HACKING

Credits: 3:0:0

Course Objective:

- To acquire knowledge on ethical hacking methodology
- To understand the foot printing and social engineering
- To acquire knowledge on port scanning, hacking web servers, hacking wireless network

Course Outcome:

Students will be able to:

- Understand the hacking methodology
- Familiar with foot printing and social engineering

- Explore port scanning.
- Learn web application and its vulnerabilities
- Learn wireless authentication technology
- Define web servers hacking, wireless network hacking

Unit I - Ethical Hacking Overview: Introduction - Certified Ethical Hackers – Hacking Methodology - Process of Malicious Hacking - Legal Issues and Law Enforcement.

Unit II - Foot printing and Social Engineering: Foot printing Tools – Conducting Competitive Intelligence - DNS Zone Transfers – Introduction to Social Engineering

Unit III - Port Scanning: Introduction to Port Scanning – Types of Port Scan – Port Scanning Tools - Conducting Ping Sweeps

Unit IV - Web Servers Hacking: Web application and its vulnerabilities - Tools for web attackers and security testers - Hacking wireless network: Technology - Standards - Authentication - Wardriving - Wireless hacking - Protecting networks with security devices.

Unit V - Hacking Operating Systems: Windows: Vulnerabilities - Choosing tools - Information gathering - RPC - Null sessions - Share permissions - Hardcore vulnerability exploitation, Linux: Vulnerabilities - Information gathering - Unconnected services - .rhosts and hosts.equiv files - NFS - File permissions - Buffer overflow.

Text Books:

1. **Michael T. Simpson**, Kent Backman, James Corley, “Hands-On Ethical Hacking and Network Defense”, Delmar Cengage Learning, ISBN-10: 1133935613
2. Kevin Beaver, “Hacking for Dummies”, Wiley Publication, India.
3. Ankit Fadia, “Unofficial Guide to Ethical Hacking”, Macmillan Company, New Delhi.

Reference Books:

1. Ankit Fadia and Manu Zacharia, “Network Intrusion Alert: An Ethical Hacking Guide to Intrusion Detection”, Thomson Course Technology, USA.
2. EC-Council, “Ethical Hacking and Countermeasures: Threats and Defense Mechanisms”, Cengage Learning, USA.

17CA2057 SECURITY ASSESSMENT OF INFORMATION SYSTEMS THROUGH ETHICAL HACKING LAB

Credits: 0:0:2

Co-requisite: 17CA2056 Security Assessment of Information Systems Through Ethical Hacking

Course Objective:

- To use the Foot printing Tools
- To use the Port Scanning Tools
- To use the Tools for Web Attackers

Course Outcome:

At the end of the course students will be able to

- Handle Foot printing Tools
- Handle Port Scanning Tools
- Handle Windows and Linux Enumerations
- Hack web applications
- Hack web servers
- Hack Networks
- Hack Database
- Use Forensic tools
- Use Data recovery tools

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2058 CYBER CRIMES AND CYBER LAW

Credits: 3:0:0

Course Objective:

- To acquire knowledge in the field of computers
- To acquire knowledge in cyber crimes and intellectual property rights
- To acquire cyber crime investigation and laws related to cyber crimes

Course Outcome:

Students will be able to:

- Understand the history of computers and internet
- Develop an appreciation for the developments in the field of computers
- Understand the situation of cyber crimes and intellectual property rights
- Acquire knowledge on tools used for investigation
- Acquire knowledge on evidence collection and evidence preservation
- Understand cyber crime investigation and evaluate various laws related to cyber crimes

Unit I - Computer and Internet basics - Computer Hardware & Networks: The BIOS and Boot Process - Computer Memory - Hard Disks, Floppy Disks, CD ROMs and DVDs - Networks and Communications - Understanding the Internet - Email Concepts -World Wide Web concepts

Unit II - Cyber Crimes & Legal Framework - Cyber Crimes against Individuals - Institution and State – Hacking - Digital Forgery - Cyber Stalking/Harassment - Cyber Pornography - Identity Theft & Fraud - Cyber terrorism - Cyber Defamation - Different offences under IT Act, 2000

Unit III - Cyber Crimes and Cyber Law - Introduction to IT laws & Cyber Crimes – Internet, Hacking – Cracking – Viruses - Virus Attacks – Pornography - Software Piracy - Intellectual property - Legal System of Information Technology - Mail Bombs - Bug Exploits and Cyber Security

Unit IV - Cyber Forensics Investigation:

Introduction to Cyber Forensic Investigation - Investigation Tools – eDiscovery - Digital Evidence Collection - Evidence Preservation - E-Mail Investigation - E-Mail Tracking - IP Tracking - E-Mail Recovery - Encryption and Decryption methods - Search and Seizure of Computers - Recovering deleted evidences - Password Cracking

Unit V - Intellectual property rights: Intellectual Property Issues and Cyberspace – The Indian Perspective: Overview of Intellectual Property related Legislation in India, Copyright law & Cyberspace - Trademark law & Cyberspace - Digital Delivery of Intellectual Property Services

Text Books:

1. Albert J. Marcellaa and Robert S. Greenfiled (Ed), “Cyber Forensics, A Field Manual for collecting, examining and preserving evidence of computer crimes”, Auerbach publications.
2. Hossein Bidgoli, “Information Warfare; Social, Legal, and International Issues; and Security Foundations”, Hoboken, NJ: John Wiley & Sons.

Reference Books:

1. Derek Atkins et. al., “Internet Security: Professional Reference”, Techmedia, Daryaganj, New Delhi
2. Vasu Deva, “Cyber Crimes and Law Enforcement”, Commonwealth Publishers, New Delhi.

17CA2059 BIOMETRIC SECURITY

Credits: 3:0:0

Course Objective:

- To acquire knowledge in the field of biometrics
- To acquire knowledge on leading technologies
- To acquire privacy and standards in biometrics

Course Outcome:

Students will be able to:

- Understand the fundamentals of biometric system
- Differentiate biometrics Vs traditional techniques
- Understand the leading technologies on biometric system
- Define behavioural biometrics
- State biometric applications

- To gain insight into privacy and standards in biometrics

Unit I - Introduction: Biometric fundamentals – Biometric technologies – Biometrics Vs traditional techniques – Characteristics of a good biometric system – Benefits of biometrics

Unit II - Physiological Biometrics: Leading technologies: Finger-scan – Facial-scan – Iris-scan – Voice-scan – components, working principles, competing technologies, strengths and weaknesses – Other physiological biometrics

Unit III - Automated Biometric system and Behavioural Biometrics: Automated fingerprint identification systems - Leading technologies: Signature-scan – Keystroke scan – components, working principles, strengths and weaknesses

Unit IV - Biometric Applications: Categorizing biometric applications – application areas: criminal and citizen identification, surveillance, PC/network access, ecommerce and retail/ATM – costs to deploy – other issues in deployment

Unit V - Privacy and standards in Biometrics: Assessing the Privacy Risks of Biometrics – Designing Privacy-Sympathetic Biometric Systems – Need for standards – different biometric standards.

Text Books:

1. Samir Nanavati, Michael Thieme, Raj Nanavati, “Biometrics – Identity”
2. Paul Reid, “Biometrics for Network Security”, Pearson Education, New Delhi.

Reference Books:

1. John R Vacca, “Biometric Technologies and Verification Systems”, Elsevier Inc.
2. Anil K Jain, Patrick Flynn, Arun A Ross, “Handbook of Biometrics”, Springer.

17CA2060 BIOMETRIC SECURITY LAB

Credits: 0:0:2

Co-requisite: Biometric Security

Course Objective:

- To learn the physiological biometrics
- To learn the behavioural biometrics
- To use the leading technologies

Course Outcome:

At the end of the course students will be able to

- Identify fingerprint recognition
- Identify face recognition
- Identify iris recognition
- Identify palm print recognition
- Identify and vein recognition
- Identify voice recognition

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2061 VIGILANCE AND SECURITY MANAGEMENT

Credits: 3:0:0

Course Objective:

- To understand the basics of investigation
- To acquire knowledge on vigilance information and intelligence
- To understand the basics of disaster management

Course Outcome:

Students will be able to:

- Understand the fundamentals of investigation and its types
- Understand the fundamentals of asset classification
- Define physical security
- State security and safety practices

- Learn security ethics
- Understand the types of disasters

Unit I - Investigation: Definitions - Key concepts - Private investigation - Historical background of private security - Security threats - Types of investigation - Espionage - Surveillance - Survey - Verification - First aid - Security survey/audit - Private Security Agencies (Regulation) Act, 2005

Unit II - Vigilance Information and Intelligence: Collection, collation and timely reporting - Confidential enquiries - Classifying assets - Official Secrets Act, 1923

Unit III - Physical Security Devices: Access control system - Computer security systems - Security alarm systems - Fire Exposure - Water Damage - Air conditioning - Electric - Emergency preparedness plan - Security guards - Segregation of Duties and responsibilities -

Unit IV - Security and safety practices: Financial institutions - Industrial organizations and commercial establishments - Dealing with trespass/intrusion - Terrorists movement and hideouts - Emergency procedures - Security Ethics

Unit V - Disaster Management: Definitions - Types of disasters: Man-Made Disasters: Fires - Bombings/Explosions - Acts of Terrorism - Power Outages - Other Utility and Infrastructure Failures - Hardware/Software Failures - Strikes - Theft/Vandalism - Natural disasters: Earthquakes - Floods - Storms - Fires - Other Regional Events

Text Books:

1. Shon Harris and Fernando Maymi "CISSP All-in-One Exam Guide", 7th Edition, McGraw-Hill Education.
2. Copeland, W. D. (2001), "Private investigation: How to be successful", Phoenix, AZ: Absolutely Zero Loss Inc.

Reference Books:

1. Sinha, R. K, "Crimes affecting state security- problems and recent trends", New Delhi: Deep & Deep Publications.
2. Woodhull, A, "Private investigation: Strategies and techniques", Texas: Thomas Investigations Publications.

17CA2062 INFORMATION SECURITY MANAGEMENT SYSTEM STANDARDS

Credits: 3:0:0

Course Objective:

- To provide knowledge information security risks, Security and legal framework
- To provide information security awareness
- To gain insight into ISMS standards and procedures

Course Outcome:

Students will be able to:

- Understand the information security risks
- Understand Security and legal framework
- Learn security standards and procedures
- Provide information security awareness
- Acquire knowledge on user access control
- Acquire knowledge to perform audit and reviewing the systems

Unit I - Information Security Management Principles and Information Risk: Concepts and Definitions - the need for - and the benefits of Information Security Threats and vulnerabilities of Information System Risk Management

Unit II - Information Security Framework: Organization and Responsibilities - Security Organizational Policy - Standards and Procedures - Information Security Governance - Information Security - Implementation Security Information Management - Legal Framework - Security Standards and Procedures

Unit III - Procedural / People Security Controls: People - User Access Controls - Communication - Training and Awareness

Unit IV - Technical Security Controls - Protection from Malicious Software - Networks and Communications - External Services - Cloud Computing - IT Infrastructure

Unit V - Software Development and Lifecycle: Testing - Audit and Review Systems - Development and Support - Physical and Environmental Security Controls - Disaster Recovery and Business Continuity Management - Other Technical Aspects - Investigations and Forensics - Role of Cryptography

Text Books:

1. W. KragBrotby, "Information Security Governance: Guidance for Information Security Managers", 1st Edition, Wiley Publication.
2. W. KragBrotby "Information Security Governance: Guidance for Boards of Directors and Executive Management", 2nd Edition, ISACA Publication.

Reference Books:

1. Fred Cohen, "Security Governance Checklists: Business Operations, Security Governance, Risk Management, and Enterprise Security Architecture", Large Print Edition, Fred Cohen & Associates Publication.
2. Shon Harris and Fernando Maymi, "CISSP All-in-One Exam Guide", 7th Edition, McGraw-Hill Education.
3. James J., IV DeLuccia, "IT Compliance and Controls: Best Practices for Implementation", Illustrated Edition, Wiley Publication.

17CA2063 MOBILE COMPUTING

Credits: 3:0:0

Course Objective:

- To know about the basics of mobile security.
- To be familiar with mobile application security techniques.
- To acquire knowledge on current trends

Course Outcome:

Students will be able to:

- Understand the fundamentals of mobile devices
- Learn the evolution of mobile device
- Learn the multiple access techniques like frequency division multiple access, time division multiple access, code division multiple access, space division multiple access
- Understand the Global System for Mobile Communications
- Familiar with mobile application security models
- Discuss the security issues in real time mobile communication

Unit I - Handheld Devices/Communications: Introduction of handheld devices - History of mobile devices - Evolution of mobile device – Carriers – Spectrum -Communication Topology

Unit II - Mobile fundamentals and channels: Multiple access techniques like Frequency division multiple access (FDMA) - Time division multiple access (TDMA) - Code division multiple access (CDMA) - Space division multiple access (SDMA).

Unit III - Global System for Mobile Communications: GSM Architecture - Network Aspects in GSM - GSM Frequency Allocation - Authentication and Security- Mobile Computing over Short Message (SMS) - GPRS

Unit IV - Mobile application security: Mobile Malware and App Security - Android Security Model - IOS Security Model -Security Model of the Windows Phone

Unit V - Recent Trends: Introduction to Wi-Fi –WiMAX - ZigBee Networks - Software Defined Radio - UWB Radio - Wireless Adhoc - Network and Mobile Portability - Security issues and challenges in a Wireless network.

Text Books:

1. Mazliza Othman, "Principles of Mobile Computing & Communications", SPD publications.
2. Rajkamal, "Mobile Computing, 2/e", Oxford University Press.
3. Raksha Shende, "Mobile Computing for beginners", SPD publications.
4. V.Jeyasri Arokiamary, "Mobile Computing", Technical Publications.
5. Kumkum Garg, "Mobile Computing: Theory and Practice", Pearson Education India.

Reference Books:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing: Technology, Applications and Service Creation", 2nd edition, Tata McGraw Hill.
2. Nouredine Boudriga, "Security of Mobile Communications", CRC Press.

3. Himanshu Dwivedi, Chris Clark and David Thiel, "Mobile Application Security", McGraw-Hill, 1st Edition.

17CA2064 MOBILE COMPUTING LAB

Credits: 0:0:2

Co-requisite: 17CA2063 Mobile Computing

Course Objective:

- To know about the basics of mobile security.
- To be familiar with mobile application security techniques.
- To acquire knowledge on current trends

Course Outcome:

At the end of the course students will be able to

- Workout the Communication Topology
- Learn the multiple access techniques like frequency division multiple access, time division multiple access, code division multiple access, space division multiple access
- Analyze the frequency allocation
- Understand Mobile application security
- Explore recent Trends
- Understand the security issues in real time mobile communication

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2065 ADVANCED COMPUTER FORENSICS

Credits: 3:0:0

Course Objective:

- To know about the basics of computer forensics.
- To be familiar with forensics techniques
- It provide hands on experience on handling digital evidence
- To gain insight into the cyber law

Course Outcome:

Students will be able to:

- Understand the fundamentals computer forensics
- Learn the forms of cyber crime
- Understand the data recovery methods
- Discuss the forensics techniques
- Define cyber law
- State the role of Digital Evidence

Unit I - Computer Forensics - Introduction to Computer Forensics - Forms of Cyber Crime - First Responder Procedure- Non-technical staff - Technical Staff - Forensics Expert and Computer Investigation procedure

Unit II - Storage Devices & Data Recover Methods - Storage Devices- Magnetic Medium - Non-magnetic medium and Optical Medium - Working of Storage devices-Platter - Head assembly- spindle motor - Data Acquisition - Data deletion and data recovery method and techniques

Unit III - Forensics Techniques - Windows forensic - Linux Forensics - Mobile Forensics – Steganography - Application Password cracking - Brute force -Dictionary attack - Rainbow attack - Email Tacking – Header option of SMTP, POP3, IMAP

Unit IV - Cyber Law - Corporate espionage - Evidence handling procedure - Chain of custody - Main features of Indian IT Act 2008 (Amendment)

Unit V - Role of Digital Evidence - Digital Evidence – Authentication of Evidence - Importance of digital evidences in investigation and in court of law – Capabilities of a digital forensic investigator

Text Books:

1. B. Nelson, "Guide to Computer Forensics and Investigations", 3rd Edition, Cengage.

2. Marie-Helen Maras, "Computer Forensics: Cyber Criminals, Laws and Evidence", 1st edition, Jones and Bartlett Publishers.
3. John.R.Vacca, "Computer Forensics, Computer Crime Scene Investigation", 2nd Edition, Charles River Media Publication.
4. Aaron Philipp, David Cowen, Chris Davis "Hacking Exposed Computer Forensics", Pub: McGraw Hill.

Reference Books

1. Albert Marcella, Jr., Doug Menendez "Cyber Forensics: A field manual for collecting, Examining, preserving evidence of computer crimes", Second Edition, CRC Press.
2. Bill Nelson, Amelia Phillips, Christopher Steuart, "Guide to Computer Forensics and Investigations, Processing Digital Evidence", 4th edition, Delmar Cengage Learning.
3. Larry Daniel, Lars Daniel, "Digital Forensics for Legal Professionals - Understanding Digital Evidence from the Warrant to the Courtroom", 1st edition, Syngress.

17CA2066 ADVANCED COMPUTER FORENSICS LAB

Credits: 0:0:2

Co-requisite: 17CA2065 Advanced Computer Forensics

Course Objective:

- To Handle electronic evidence
- To dismantle and re-build PCs
- To examine of File systems of Windows, Linux and Mac

Course Outcome:

At the end of the course students will be able to

- Handle electronic evidence using forensic standards
- Dismantling and re-building PCs in order to access the storage media safely
- Boot sequence and Power On Self-Test mode analysis
- Examine of File systems of Windows, Linux and Mac
- Analyze Word processing and Graphic file format
- Handle Network data sniffing

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA2067 CYBER SECURITY GOVERNANCE

Credits: 3:0:0

Course Objective:

- To know about the basics of cyber security evolution
- To be familiar with cyber security objectives
- To gain insight into the cyber governance and cyber management issues

Course Outcome:

Students will be able to:

- Understand the basics of cyber security
- Understand the cyber security evolution
- Discuss the cyber security metrics
- Learn the security policy objectives
- Define cyber governance issues
- Define cyber management issues

Unit I - Introduction: Cyber Security – Cyber Security policy – Domain of Cyber Security Policy

Unit II - Cyber Security Evolution: Productivity – Internet – E commerce – Counter Measures - Challenges.

Unit III - Cyber Security Objectives: Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks – Security Policy Objectives

Unit IV - Cyber Governance Issues: Net Neutrality – Internet Names and Numbers – Copyright and Trademarks – Email and Messaging – Cyber User Issues: Malvertising - Impersonation –

Appropriate Use – Cyber Crime – Geo location – Privacy - Cyber Conflict Issues: Intellectual property Theft – Cyber Espionage – Cyber Sabotage – Cyber Welfare

Unit V - Cyber management Issues: Fiduciary Responsibility – Risk Management – Professional Certification – Supply Chain – Security Principles – Research and Development – Cyber Infrastructure Issue – Banking and finance – Health care – Industrial Control systems.

Text Books:

1. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs, Jeffrey Schmidt, Joseph Weiss “Cyber Security Policy Guidebook” John Wiley & Sons.
2. Rick Howard, “Cyber Security Essentials” Auerbach Publications.

Reference Books

1. Richard A. Clarke, Robert Knake “Cyberwar: The Next Threat to National Security & What to Do About It”.
2. Dan Shoemaker “Cyber security The Essential Body Of Knowledge”, 1st ed. Cengage Learning.

17CA2068 CLOUD SECURITY

Credits: 3:0:0

Course Objective:

- To know about the fundamentals of cloud computing
- To be familiar with cloud computing architecture
- To gain insight into the cloud computing risk issues and challenges

Course Outcome:

Students will be able to:

- Understand the basics of cloud computing
- Understand the cloud computing architecture
- Discuss the cloud computing risk issues
- Understand the basics of business continuity planning/ disaster recovery
- State the cloud computing security architecture and challenges
- Discuss the cloud computing life cycle issues

Unit I - Cloud computing fundamentals: Cloud computing – Essential characteristics – Architectural influences – Technological influences – Operational influences

Unit II - Cloud Computing Architecture and Software Security: Cloud Delivery models – Cloud deployment models – Cloud Security Services – Cloud Computing and Business Continuity planning/ Disaster recovery

Unit III - Cloud Computing risk issues: CIA Triad – Privacy and compliance risks – Threats to infrastructure, data and access control – cloud service risk provider

Unit IV - Cloud Computing security architecture and challenges: Architectural consideration – Identity Management and access control – Automatic security – Security Policy implementation – Virtualization security management

Unit V - Cloud Computing Life cycle issues: Standards – Incident Response – Encryption and Key management – retirement

Text Books:

1. Ronald L Krutz and Russel Dean Vines, “Cloud Security: A Comprehensive Guide to Secure Cloud Computing”, 1 edition, Wiley India, New Delhi.
2. Rajkumar Buyya, James Broberg and Andrzej Goscinski, “Cloud Computing: Principles and Paradigms”, John Wiley and Sons, New Jersey.
3. Danielle Ruest and Nelson Ruest, “Virtualization: A Beginners Guide”, Tata McGraw Hill, New Delhi.
4. Tim Mather, Subra Kumaraswamy and Shahed Latif, “Cloud Security and Privacy”, O’Reilly Publishers, USA.

Reference Books

1. John W Rittinghouse and James F Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, Boca Raton.
2. Ben Halpert, “Auditing Cloud Computing – A Security and Privacy Guide”, John Wiley and Sons, New Jersey.

17CA2069 SECURITY THREAT MANAGEMENT

Credits: 3:0:0

Course Objective:

- To be familiar with security and network threats
- To know about the fundamentals of threat management
- To be familiar with security elements
- To gain insight into the cloud computing risk issues and challenges

Course Outcome:

Students will be able to:

- Identify and analyze the threats and vulnerabilities
- Discuss threat awareness
- Understand the risk assessment
- Learn to use vulnerability assessment tools
- Discuss security policies and procedures
- Define access control procedures

Unit I - Security threats: Sources of security threats - Motives - Target Assets and vulnerabilities

– Consequences of threats- E-mail threats - Web-threats: Intruders and Hackers - Insider threats - Cyber crimes.

Unit II - Network threats: Active/ Passive – Interference – Interception – Impersonation – Worms – Virus – Spam’s – Ad ware - Spyware – Trojans and covert channels – Backdoors – Bots - IP Spoofing - ARP spoofing - Session Hijacking - Sabotage-Internal threats- Environmental threats - Threats to Server security.

Unit III - Security threat management: Risk Assessment - Forensic Analysis - Security threat correlation – Threat awareness - Vulnerability sources and assessment- Vulnerability assessment tools - Threat identification - Threat Analysis

Unit IV - Security elements: Authorization and Authentication - types, policies and techniques – Security certification - Security monitoring and Auditing - Security Requirements Specifications - Security Policies and Procedures, Firewalls, IDS, Log Files, Honey Pots

Unit V - Access control: Access control - Trusted Computing and multilevel security - Security models - Trusted Systems - Software security issues - Physical and infrastructure security - Human factors: Security awareness – training - Email and Internet use policies

Text Books:

1. Joseph M Kizza, “Computer Network Security”, Springer Verlag.
2. William Stallings and Lawrie Brown, “Computer Security: Principles and Practice”, Prentice Hall.

Reference Books

1. Thomas Calabres and Tom Calabrese, “Information Security Intelligence: Cryptographic Principles & Application”, Thomson Delmar Learning.
2. Swiderski, Frank and Syndex, “Threat Modeling”, Microsoft Press.

17CA3001 CYBER CRIMINOLOGY AND CRIMINAL JUSTICE ADMINISTRATION

Credits: 3:0:0

Course Objective:

- To understand principles and concepts of cyber criminology
- To understand the Contemporary Forms of Crimes
- To understand Cyber Crime – Sociological and Criminological Perspectives

Course Outcome:

Students will be able to:

- Understand concepts of cyber criminology
- Compare conventional crimes vs cyber Crimes
- Understand the contemporary forms of crimes
- Understand cyber criminals psychology
- Understand cyber crime – sociological and criminological perspectives
- State the role of criminal justice administration

Unit I - Principles and Concepts of Cyber Criminology: Crime, Tort, Misdemeanour, Cyber Space, Cyber Crime, Cyber Criminology, Information Security, Penetration Testing, Incident Response, GRC, etc.- Conventional crimes vs Cyber Crimes.

Unit II - Contemporary Forms of Crimes: White Collar Crimes, Economic Offences, Organized Crimes, Terrorism, Crime and Media and other contemporary forms of crimes.

Unit III - Psychology of Cyber Criminals: Types of Cyber Criminals – Modus Operandi of Cyber Criminals – Profiling of Cyber Criminals - Tools and Techniques adopted by Cyber Criminals – Psychological theories relating to cyber criminals.

Unit IV - Cyber Crime – Sociological and Criminological Perspectives: Causes of Cyber Crimes - Criminological Theories and Cyber Crime – Routine Activity Theory, Social Learning Theory, Differential Association Theory, Differential Opportunity Theory, Media and Crime and latest theories and other related theories.

Unit V - The Role of Criminal Justice Administration and Cyber Crimes: Police: Organizational structure of Police in India – Different wings in the States and Districts and their functions - Police & Law Enforcement – F.I.R. – cognizable and non-cognizable offences, bailable and non-bailable offences – arrest , search, seizure – Interrogation of suspects and witnesses – charge sheet – Cyber crime cells – structure & investigation of cyber crime cases – Judiciary: Different types of courts – Cyber Appellate Court / Tribunals / Powers – Proceedings in the court before trial, after trial, plea of guilty, sentencing - the role of N.G.O.s in the prevention of Cyber Crimes - the Role of Victims of Cyber Crimes in the Criminal Justice Administration

Text Books:

1. Burke, Roger Hopkins, “Introduction to Criminological Theory”, Willan Publishing; 2nd New edition.
2. Srivastava S S, “Criminology and Criminal Administration”, Central Law Agency, New Delhi.
3. Williams, Katherine S, “Textbook on Criminology“, Oxford University Press; 7th edition

Reference Book:

1. Victor Jupp, Pamela Daries, Peter Francis, “Doing Criminological Research”, SAGE Publications Ltd; Second edition

17CA3002 CYBER CRIMES AND FRAUDS

Credits: 3:0:0

Course Objective:

- To understand basics of cyber crimes
- To understand the basics of cyber law
- To understand cyber frauds and evolution of cyber fraud techniques

Course Outcome:

Students will be able to:

- Define cyber security fundamentals
- Understand cyber security control frameworks
- State the future of cyber security
- Handle cyber crimes and cyber Law
- State cyber frauds
- Understand evolution of cyber fraud techniques

Unit I - Cyber crime: Threats to key sectors – cyber security fundamentals – cyber attack fundamentals – organized cyber attacks – cloud risks – we risks – cyber security threat actors – common vulnerabilities

Unit II - Cyber Security response: Cyber security control frameworks – Cyber security – digital intelligence – future of cyber security

Unit III - Cyber Crimes and Cyber Law: Introduction to IT laws & Cyber Crimes – Internet, Hacking – Cracking – Viruses - Virus Attacks – Pornography - Software Piracy - Intellectual property - Legal System of Information Technology - Mail Bombs - Bug Exploits and Cyber Security

Unit IV - Cyber frauds: Cyber fraud model – obtaining financial information: Phishing – network intrusion – Trojan horses – Real world theft - buying/ selling stolen financial information: Carding forums – Dumps vendors – non carding related forums – notable carders

Unit V - Evolution of Cyber fraud techniques: Phishing – Pharming – Driven by pharming – trojans and tool kits – insider treats - database timing attacks – pump and Dump

Text Books:

1. Rick Howard, "Cyber Fraud: Tactics, Techniques and Procedures", Auerbach Publications; 1st edition.
2. Vasu Deva, "Cyber Crimes and Law Enforcement", Commonwealth Publishers, New Delhi.

Reference Books:

1. Albert J. Marcellaa and Robert S. Greenfiled (Ed), "Cyber Forensics, A Field Manual for collecting, examining and preserving evidence of computer crimes", Auerbach publications.
2. Hossein Bidgoli, "Information Warfare; Social, Legal, and International Issues; and Security Foundations", John Wiley & Sons; Volume 2 edition

17CA3003 FUNDAMENTALS OF NETWORK SECURITY**Credits: 3:0:0****Course Objective:**

- To understand principles of network
- To understand the basics of Cabling, Topology and Ethernet
- To understand basics TCP/IP applications

Course Outcome:

Students will be able to:

- Define the TCP/IP model
- Understand Cabling, Topology and Ethernet basics
- Learn to troubleshoot hubs and switches
- Handle router configuration and router problems
- State TCP/IP security standards
- Understand TCP/IP applications

Unit I - Network models: TCP/IP model: link layer – internet layer – transport layer – application layer – frames, packets and segments**Unit II - Cabling, Topology and Ethernet basics:** Topology: bus and ring – star – hybrids – mesh and point to multipoint – point to point – parameters of a topology, Cabling: Coaxial cable – Twisted pair – fibre optic – other cables – fire ratings, networking industry standards IEEE: ethernet topology – organizing the data: ethernet frames – ethernet networks – extending and enhancing ethernet networks: Connecting ethernet segments – Switched Ethernet – troubleshooting hubs and switches**Unit III - Routing:** Routing tables – Dynamic routing: routing metrics – distance vector – link state – EIRP – Dynamic routing – Working with routers: Connecting to routers – basic router configuration – router problems**Unit IV - TCP/IP applications:** Transport and network layer protocols – Test specific: TCP – UDP – ICMP – IMP – the power of port numbers: registered ports – connection status – rules for determining good vs bad communications – Common TCP/IP applications: the world wide web – Telnet – Email – FTP – Internet applications**Unit V - Securing TCP/IP:** Secure TCP/ IP: Encryption – non repudiation – authentication – authorization – TCP/IP security standards: TTPS – SCP – SFTP – SMP – LDAP – TP**Text Books:**

1. Mike Meyers , "CompTIA Network+ Certification All-in-One Exam Guide", McGraw Hill Education; 5th edition , ISBN-10: 1259025535
2. Dr. William Stallings, "Cryptography and Network Security", 6th Edition, Pearson Education Publication.

Reference Books:

1. Todd Lammle, "Comptia Network+ Study Guide, Wiley"; Third edition, ISBN-10: 8126556412
2. Erwin Haas, "CompTIA Network+: Beginner's guide on how to pass your CompTIA exam", Kindle Edition

17CA3004 FUNDAMENTALS OF NETWORK SECURITY LAB**Credits: 0:0:2****Co-requisite: 17CA3003 Fundamentals of Network Security****Course Objective:**

- To understand basics of Cabling,
- To understand basics of Topology and Ethernet

- To understand basics of TCP/IP applications

Course Outcome:

At the end of the course students will be able to

- Understand types of Network Topologies
- Handle Cables
- Configure routing tables
- Understand basic router configuration
- Understand world wide web
- Use Secure TCP/ IP

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester

17CA3005 INFORMATION SECURITY

Credits: 3:0:0

Course Objective:

- To understand principles of information security
- To understand the relevant information security framework
- To understand relevant physical and environmental Security

Course Outcome:

Students will be able to:

- Define the information security, information risk
- Understand information security governance
- Learn people security controls
- Handle malicious software, Cloud Computing
- Learn software development and lifecycle
- Understand physical and environmental Security

Unit I - Information Security Principle: Concepts and Definitions – the need and benefits of Information Security – Information Risk: Threats to and vulnerabilities of information systems – Risk Management

Unit II - Information Security Framework: Organization and responsibilities – Organizational policy standards and procedures – Information security governance – Information security implementation – Security incident management- Legal framework – Security standards and procedures

Unit III - Technical Security Controls: Protection from malicious software – Networks and communications – External services – Cloud Computing – IT infrastructure - Procedural and people security controls: People – User access controls – Training and awareness

Unit IV - Software Development and lifecycle: Testing, audit and review – system development and support

Unit V - Physical and environmental Security: Physical Security – Technical Security – Procedural Security – Protection Equipment – Processes to handle intruder alerts – Clear screen and clear desk policy – Moving property on and offsite – Procedures for secure disposal

Text Books:

1. David Alexander, Amanda Finch, David Sutton, Andy Taylor, “Information Security Management Principles”, BCS, The Chartered Institute for IT; 2nd Revised edition, ISBN-10: 1780171757
2. Charles Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, “Security in Computing”, 5th edition, Prentice Hall Publication.
3. Mark Ciampa, “CompTIA Security + Guide to network Security Fundamentals”, 5th edition, Cengage Learning Publication.

Reference Books:

1. Ronald L. Krutz, Russel Dean Vines, “The CISSP Prep Guide: Gold Edition”, Gold Edition, Wiley Publication.
2. Ed Tittel, Mike Chapple, James Michael Stewart, “Certified Information Systems Security Professional, Study Guide”, 6th Edition, Sybex Publication.

17CA3006 DIGITAL FORENSICS

Credits: 3:0:0

Course Objective:

- To understand digital forensics
- To understand the operating system
- To gain insight evidence creation and interpretation

Course Outcome:

Students will be able to:

- Understand digital forensics
- Learn partitioning and disk layouts
- Handle operating system
- Handle devices
- Learn evidence creation and interpretation

Unit I - Digital Forensics concepts: Digital Forensics – uses of digital forensics – bits, bytes and numbering systems – file extension and file signatures – storage and memory – allocated and unallocated space – data types – file systems

Unit II - Operating System Forensics: Windows System Forensics - Linux System Forensics - MAC system forensics - Mobile Phone OS Forensics: Android, BADA, IOS, Windows OS, BlackBerry, Symbian, Network Forensics

Unit III - Device handling and examination principles: Seizure issues – device identification – networked devices – previewing imaging – continuity and hashing – evidence location

Unit IV - Evidence Creation and interpretation: seven element security model – digital systems developmental model – knowing – unknowing – audit and logs – data content – data context

Unit V - Internet Activity: ISO/OSI model – internet protocol suite – DS – internet applications

Text Books:

1. Angus McKenzie Marshall, Digital Forensics: Digital Evidence in Criminal Investigations, Wiley-Blackwell; 1 edition (21 November 2008), ISBN-10: 0470517743
2. Cory Altheide, Harlan Carvey “Digital Forensics with Open Source Tools: Using Open Source Platform Tools for Performing Computer Forensics on Target Systems: Windows, Mac, Linux, Unix, etc”, Syngress; 1st edition.
3. John Sammons, “The basics of Digital Forensics”, 2nd Edition, Elsevier Publication.
4. Harlan Carvey, “Windows Forensics Analysis Tool kit”, 3rd Edition, Syngress Publication.

Reference Books:

1. Kevin Mandia, Chris Prosise, Matt Pepe, “Incident Response and Computer Forensics“, Tata McGraw - Hill, New Delhi.
2. ”Understanding Forensics in IT “, NIIT Ltd.

17CA3007 DIGITAL FORENSICS LAB

Credits: 0:0:2

Co-requisite: 17CA3006 Digital Forensics

Course Objective:

- To understand bits, bytes and numbering systems
- To understand the Seizure issues
- To gain insight into evidence creation and interpretation

Course Outcome:

At the end of the course students will be able to

- Understand Forensic Software tools
- Understand bits, bytes and numbering systems
- Use the Windows System, Linux System, Mobile Phone OS
- Handle Seizure issues
- Understand continuity and hashing
- Identify evidence location
- Understand evidence creation and interpretation

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA3008 INFORMATION TECHNOLOGY ACT

Credits: 3:0:0

Course Objective:

- To understand cyber law and IT Act
- To understand the cyber jurisprudence
- To gain insight into E- Governance and E – Commerce

Course Outcome:

Students will be able to:

- Define cyber law and IT Act
- Understand the advantages of cyber law
- Understand cyber security and threats
- Define buffer overflow attacks
- Learn practices in cyber jurisprudence
- Learn E- Governance and E – Commerce

Unit I - Cyber law: Definition – common law – advantages of cyber law – Cyber law in India: cyber forensics – need of cyber forensics – importance of cyber law

Unit II Cyber Security and benefits: Cyber security and threats – slow court system – buffer overflow attacks

Unit III - IT Act 2000: Enhance and adhere to the cyber law violations: Acceptance terms- responsibilities and registration violations – privacy policy – registration and password – third party services – indemnification – site editors service – conduct – submission of content in the website – disclaimer of warranties – limitation of liability – reservation of rights – notification of copyright and infringement – applicable law – miscellaneous information

Unit IV - Practices in Cyber Jurisprudence – Regional and Global - Important Case Laws in India and other countries – Need for International cooperation for cybercrime investigation and enforcement-Need for separate cyber court - cyber laws in other countries

Unit V - E- Governance and E – Commerce: Electronic Governance: Procedures in India - Essentials & System of Digital Signatures - The Role and Function of Certifying Authorities - Digital contracts – Validity of Electronic Contract-Types of Electronic Contract - UNCITRAL Model law on Electronic Commerce - Cryptography – Encryption and decryption –Legal Issues In E banking transactions.

Text Books:

1. Anupa P. Kumar, “Cyber Law”, Volume 1, Createspace Independent Publishing Platform.
2. Nandan kamath, “Cyber law”, Fifth Edition, Universal law Publication.

Reference Books:

1. S.K.Verma, “Legal dimensions of cyber space”, Volume 1, Ashgate Publication.

17CA3009 ADVANCED DIGITAL FORENSICS

Credits: 3:0:0

Course Objective:

- To understand forensic software and hardware
- To understand the windows and linux file systems
- To gain insight data recovery tools

Course Outcome:

Students will be able to:

- Understand forensic technology and practices
- Learn partitioning and disk layouts
- State forensic imaging
- Handle windows and linux file systems
- Learn advanced tools
- Learn tools that are used for data recovery

Unit I - Digital Forensics: Forensic Software and Hardware - Analysis and Advanced Tools - Forensic Technology and Practices - Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis.

Unit II - Disk and file system analysis: Media analysis concepts – the sleuth kit – partitioning and disk layouts – special containers – hashing – carving – forensic imaging

Unit III - Windows systems artifacts: Windows file systems – Registry – event logs – prefetch files – shortcut files – windows executables

Unit IV - Linux systems artifacts: linux file systems – linux boot process and services – linux system organization and artifacts – user accounts – home directories – logs – scheduling tasks

Unit V - Overview of various Tools and Data Recovery – Overview of tools that are used for recovery of deleted files and deleted partitions – tools used in the industry and Best Practices

Text Books:

1. Cory Altheide, Harlan Carvey, “Digital Forensics with Open Source Tools: Using Open Source Platform Tools for Performing Computer Forensics on Target Systems: Windows, Mac, Linux, Unix, etc”, Syngress; 1st edition.
2. John Sammons, ”The basics of Digital Forensics”, 2nd Edition, Elsevier Publication.
3. Harlan Carvey, “Windows Forensics Analysis Tool kit”, 3rd Edition, Syngress Publication.

Reference Books:

1. Kevin Mandia, Chris Prosise, Matt Pepe, “Incident Response and Computer Forensics“, Tata McGraw - Hill, New Delhi.
2. ”Understanding Forensics in IT “, NIIT Ltd.

17CA3010 ADVANCED DIGITAL FORENSICS LAB

Credits: 0:0:2

Co-requisite: 17CA3009 Advanced Digital Forensics

Course Objective:

- To understand forensic software and hardware
- To understand the windows and linux file systems
- To gain insight data recovery tools

Course Outcome:

At the end of the course students will be able to

- Understand Forensic Software and Hardware devices
- Understand partitioning and disk layouts
- Use the Windows file systems – Registry – event logs – prefetch files – shortcut files – windows executables
- Use the linux file systems
- Use the linux boot process and services
- Handle tools used in the industry and Best Practices

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA3011 INFORMATION SECURITY MANAGEMENT

Credits: 3:0:0

Course Objective:

- To understand Change Control Management, Data Classification and Information Security Risk Assessment
- To understand Access Controls and Access Controls
- To provide Information Security awareness

Course Outcome:

Students will be able to:

- Define the information security governance
- Understand the basics of security management
- Understand change control management
- Learn data classification and information security risk assessment

- Learn data access controls
- Learn access control methodologies

Unit I - Security Management Concepts and Principles: Information Security Governance - Corporate Governance - IT Governance - Managing Security by the Standards - The Security Management

Unit II - Change Control Management and Data Classification: Patch Management - Security Patch Management - Configuration Management - Information Classification - Ownership and Custody of Data

Unit III - Risk Management: Information Security Risk Assessment - Developing and Conducting a Security Test and Evaluation - Enterprise Security Management Program - Roles and Responsibilities of the Information Systems Security Officer - Information Security Policies - Policy Development - Training Your Employees

Unit IV - Access Control Techniques: New Emerging Information Security Technologies and Solutions - Sensitive or Critical Data Access Controls - An Introduction to Role-Based Access Control - Smart Cards - A Guide to Evaluating Tokens - Controlling FTP: Providing Secured Data Transfers

Unit V - Access Control Methodologies and Implementation: Centralized Authentication Services (RADIUS, TACACS, DIAMETER) - An Introduction to Secure Remote Access

Text Books:

1. Harold, F Tipton, Micki Krause, "Information Security Management handbook", Sixth edition, Auerbach publications
2. Dr. Timothy Shimeall & Jonathan Spring, "Introduction to Information Security - A Strategic based approach", 1st Edition, Syngress Publication.

Reference Books:

1. Mark Ciampa, "CompTIA Security + Guide to network Security Fundamentals", 5th edition, Cengage Learning Publication.
2. David Kim and Michael G Solomon, "Fundamentals of Information Systems Security", Second Edition, Jones and Barlett Publication.

17CA3012 DATABASE SECURITY

Credits: 3:0:0

Course Objective:

- To understand basic concepts of database
- To understand database system architecture
- To understand database security and issues

Course Outcome:

Students will be able to:

- Learn the concepts of database
- Understand the basics of design issues
- Understand database system architecture
- State database system types
- Define Transaction concept
- Learn database security and issues

Unit I - Database Concepts: Data models - structure of relational databases - component of management system – DDL, DML, database languages, SQL standard, database users and administrators

Unit II - Database system architecture: Design issues - basic normal forms and additional normal forms - Transforming E-R diagram to relations - Integrity constraints - Query processing and optimization - Database system architecture: Schema – sub schema – instances –three level ASI – SPARC database architecture - types of database systems

Unit III - Transaction processing: Transaction concept, concurrent execution, isolation, testing for serializability, Concurrency control, lock based - time-stamp based - validation based protocols, multi-version schemes, deadlock handling.

Unit IV - Database security: Introduction to database security, security models, physical and logical security, security requirements, reliability and integrity, sensitive data, inference, multilevel databases and multilevel security, access control- mandatory and discretionary , security architecture, issues.

Unit V - Security Issues: Application access, security and authorization, authorization in SQL, encryption and authentication, secure replication mechanisms, Audit- logon/logoff, sources, usage and errors, changes, external audit system architecture, archive and secure auditing information

Text Books:

1. Shio Kumar Singh, "Database Systems: Concepts, Design and Applications", Pearson; 2 edition.
2. Abraham Silberschatz, Hanry F Korth, Sudarshan S, "Database Systems Concepts", McGraw Hill.
3. Ron Ben Natan, "Implementing database security and auditing", Elsevier publications.
4. Hassan A. Afyuni, "Database Security and Auditing", Course Technology – Cengage Learning, NewDelhi.

Reference Books:

1. Raghu Ramakrishnan, "Database Management Systems", McGraw Hill/ Third Edition.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database System" Addison Wesley, New Delhi/Fourth Edition.
3. M. Gertz, and S. Jajodia, "Handbook of Database Security- Application and Trends", Springer.

17CA3013 DATABASE SECURITY LAB

Credits: 0:0:2

Co-requisite: 17CA3012 Database Security

Course Objective:

- To creating a database for an application using DDL.
- To manipulate data using DML queries
- To create, delete and modify of users access rights

Course Outcome:

At the end of the course students will be able to

- Creating a database for an application using DDL.
- Setting up of integrity constraints.
- Data manipulation using DML queries.
- Use Rollback, commit, save point, grant and revoke commands.
- Creation, deletion and modification of users
- Implementing authentication mechanisms for different users.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA3014 GOVERNANCE, RISK & COMPLIANCE

Credits: 3:0:0

Course Objective:

- To understand Information Security Governance, Risk & Compliance
- To understand Policies and Procedures
- To provide Information Security on Security control frameworks

Course Outcome:

Students will be able to:

- Understand the basics of information security governance
- Define the information security policies and procedures
- Learn risk management
- State security control frameworks and standards
- Explain the roles and responsibilities
- Learn IT governance structure auditing

Unit I - Governance, Risk & Compliance GRC: Definitions – Governance, Risk, Compliance, Risk Threshold, Risk Modeling, Risk Appetite, Governance Standards

Unit II - Information Security Governance: Information Security Governance - Importance of Information Security Governance - Outcomes of Information Security Governance - Strategic alignment - Risk Management -

Performance Measurement - Information System Strategy - Strategic Planning - Steering Committee - Policies and Procedures

Unit III - Risk Management: Managing risk to an acceptable level: Qualitative vs Quantitative risk analysis – risk management process: risk analysis involvement – existing controls – risk mitigation options

Unit IV - Security compliance using control frameworks: Security control frameworks and standards – Health insurance portability and accountability act (HIPAA) – Federal Information Security Management Act 2002 (FISMA) – National Institute of Standards and Technology (NIST) - Federal Information system Controls Audit Manual (FISCAM) – ISO/IEC 27001:2005 – ISO/ IEC 27002:2005- Control Objectives for Information and Related Technology (COBIT) – Payment Card Industry Data Security Standards (PCI DSS) – Information Technology Infrastructure Library (ITIL) – National Security Agency (NSA)

Unit V - Information Security Management Practices: Personnel Management - Financial Management – Quality Management - Information Security Management - Performance Optimization - Roles and Responsibilities - Auditing IT Governance Structure - Evaluation Criteria & Benchmark - Assessment Tools - Case Study Analysis

Text Books:

1. Todd Fitzgerald, “Information Security Governance Simplified: From the Boardroom to the Keyboard”, CRC Press; 1st edition.
2. W. KragBrotby, “Information Security Governance: Guidance for Information Security Managers”, 1st Edition, Wiley Publication.
3. W. KragBrotby, “Information Security Governance: Guidance for Boards of Directors and Executive Management”, 2nd Edition, ISACA Publication.

Reference Books:

1. Fred Cohen, “Security Governance Checklists: Business Operations, Security Governance, Risk Management, and Enterprise Security Architecture”, Large Print Edition, Fred Cohen & Associates Publication.
2. James J, “IT Compliance and Controls: Best Practices for Implementation”, DeLuccia, Illustrated Edition, Wiley Publication.
3. Craig S. Wright, Brian Freedman, Dale Liu, “The IT Regulatory and Standards Compliance Handbook: How to Survive Information Systems Audit and Assessments”, 1st Edition, Syngress Publication.
4. Richard E. Cascarino, “Auditor's Guide to Information Systems Auditing”, 2nd Edition, Wiley Publication.
5. COBIT 4.1 – Available at www.isaca.org
6. www.sarbanes-oxley.com

17CA3015 BUSINESS CONTINUITY AND DISASTER RECOVERY PLANNING

Credits: 3:0:0

Course Objective:

- To understand basic difference between BCP and DRP
- To understand prime elements of BCP
- To understand types of disaster recovery plan

Course Outcome:

Students will be able to:

- Understand basic difference between BCP and DRP
- Learn the four prime elements of BCP
- State the steps in conducting a Business Impact Assessment (BIA)
- State the relationship between BIA and Risk Management
- Understand the steps in creating a disaster recovery plan
- Understand the types of disaster recovery plan

Unit I - Introduction: Introduction to Business Continuity Management (BCM) and Disaster Recovery (DR) - Terms and definitions - BCM principles - BCM lifecycle: Understanding the organization - Determining business continuity strategy - Developing and implementing a BCM response - BCM exercising - Maintaining and reviewing BCM arrangements - Embedding BCM in the organization's culture - BCM in business: Benefits and consequence - Contemporary landscape: Trends and directions

Unit II - Business Impact Analysis: BCM and DR – Relationship with Risk Management - Risk Management concepts and framework - Risk Management process - Business Impact Analysis (BIA) concept, benefits and responsibilities - BIA methodology - Relationship between BIA and Risk Management

Unit III - Business Continuity Strategy and Business Continuity Plan (BCP) Development: Business continuity strategy development framework - Cost-benefit assessment - Site assessment and selection - Selection of recovery options - Strategy considerations and selection - Linking strategy to plan - Coordinating with External Agencies - Business continuity plan contents - Information Systems aspects of BCP - Crisis Management - Emergency response plan and crisis communication plan - Awareness, training and communication - Plan activation - Business Continuity Planning Tools

Unit IV - Business Continuity Plan Testing and Maintenance: Test plan framework - Types of testing - Business Continuity Plan Testing - Plan maintenance requirements and parameters - Change management and control - Business Continuity Plan Audits

Unit V - Disaster Recovery: Definitions - Backup and recovery - Threat and risk assessment - Site assessment and selection - Disaster Recovery Roadmap - Disaster Recovery Plan (DRP) preparation - Vendor selection and implementation - Difference between BCP and DRP - Systems and communication security during recovery and repair

Text Books:

1. Ronald L. Krutz, “The CISSP Prep Guide: Gold Edition, Russel Dean Vines”, Gold Edition, Wiley Publication.
2. Ed Tittel, Mike Chapple, James Michael Stewart, “Certified Information Systems Security Professional, Study Guide”, 6th Edition, Sybex Publication.

Reference Books:

1. Kenneth L. Flumer, “Business Continuity Planning: A Step-by-Step Guide”, 3rd edition, Rothstein Associates Publication.
2. Julia Graham, David Kaye and Philip Jan Rothstein, “A Risk Management Approach to Business Continuity: Aligning Business Continuity with Corporate Governance”, Illustrated edition, Rothstein Associates Publication.
3. Ken Doughty, “Business Continuity Planning – Protecting Your Organization’s Life”, Illustrated edition, Taylor & Francis Publication.
4. Andrew Hiles, “The Definitive Handbook of Business Continuity Management”, 3rd Edition, John Wiley & Sons Publication.
5. BS25999-1:2006 (BSI)

17CA3016 INTELLECTUAL PROPERTY RIGHTS

Credits: 3:0:0

Course Objective:

- To understand basic Intellectual Property and the need for protection
- To understand Patents and Trade Mark
- To understand Copyright and Industrial Design

Course Outcome:

Students will be able to:

- Learn the concept of intellectual property and the need for protection
- Compare intellectual property vs physical property
- Understand salient features of patents and trade Mark
- Learn cyber squatting and trademark
- Learn copyright and recent amendments
- Learn industrial designs

Unit I - Intellectual Property and World Trade Organization (WTO): Intellectual Property: Intellectual Property vs physical property – importance of Intellectual Property – introduction of WTO – basic principles of trade system under WTO – Dispute Settlement – Trade policy reviews – Agreement on TRIPS.

Unit II - Patents: Patent – History of patent in India – Conditions for grant of patent – Inventions that are not patentable – process and product patent – procedure for grant of patent – e-filing of patent application – temporal and spatial aspect of patent – opposition to grant patent – rights of patentee - patent office and power of Controller – PCT patent - exclusive marketing rights – milestones in India patent law – transfer and infringement of patent rights

Unit III - Trade Marks: Trademark – Developing a trademark – Conditions for trademark registration – Register of trademarks – Trends in trademark applications – Procedure for trademark application in India – Term of trademark – Assignment and Transmission – Madrid system – Certification trademark – infringement of trademark – remedies against infringement of trademark - Appellate board – cyber squatting and trademark

Unit IV - Copyright: Copyright - meaning of copyright - ownership of copyright - rights of the owner - term of copyright - Registration of copyright - International copyright – infringement of copyright - remedies against infringement of copyright - copyright amendment act – internet and copyright issues

Unit V - Industrial Designs - Industrial Designs - registration of designs - copyright in registered designs – conditions for registration of Industrial Designs – procedure for Industrial Designs - terms of Industrial Designs - register of designs - piracy of registered designs - powers and duties of Controller - infringement of Industrial Designs - remedies against infringement of Industrial Designs – Hague agreement - integrated circuit layout – trade secrets

Text Books:

1. Neeraj Pandey, Khushdeep Dharni, “Intellectual Property Rights”, PHI Learning; 1st edition.
2. Dr. B.L. Wadehra, “Law relating to patents, trademarks, copyright, design and geographical indications”, 5th edition, Universal law Publication.
3. Dr. S.R. Myneni, “Law of Intellectual Property”, 6th Edition, Asia Law House Publication.

Reference Books:

1. David I. Bainbridge, “International Property”, 9th Edition, Pearson Education Publication.
2. W.R. Cornish, D Llewelyn, “Intellectual Property, Patents, Copyright, trademarks and allied rights”, sweet and Maxwell Publication.

17CA3017 INCIDENT RESPONSE AND COMPUTER FORENSICS

Credits: 3:0:0

Course Objective:

- To understand basic Incident response methodology
- To understand tools used for forensic duplication
- To understand ethical issues, investigating hacker tools

Course Outcome:

Students will be able to:

- Learn the basic incident response methodology
- Learn the activities in Initial Response
- Understand initial response & volatile data collection
- Learn the tools used for forensic duplication
- State ethical issues
- Understand investigating hacker tools

Unit I - Incident and Incident Response: Introduction to Incident - Incident Response Methodology – Steps - Activities in Initial Response - Phase after detection of an incident

Unit II - Initial Response: Initial Response & Volatile Data Collection from Windows system - Initial Response & Volatile Data Collection from UNIX system.

Unit III - Forensic Duplication: Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic Duplicate/Qualified Forensic Duplicate of a Hard Drive

Unit IV - Storage and Evidence Handling: File Systems: FAT, NTFS - Forensic Analysis of File Systems - Storage Fundamentals: Storage Layer, Hard Drives - Evidence Handling: Types of Evidence, Challenges in evidence handling, Overview of evidence handling procedure

Unit V - Systems Investigation and Ethical Issues: Data Analysis Techniques - Investigating Live Systems (Windows & Unix) - Investigating Hacker Tools - Ethical Issues - Cybercrime

Text Books:

1. Kevin Mandia, Chris Proise, “Incident Response and computer forensics”, TataMcGrawHill.
2. Peter Stephenson, "Investigating Computer Crime: A Handbook for Corporate Investigations".
3. Eoghan Casey, "Handbook Computer Crime Investigation's Forensic Tools and Technology", Academic Press, 1st Edition.

Reference Books:

1. Skoudis. E., Perlman. R, "Counter Hack: A Step-by-Step Guide to Computer Attacks and Effective Defenses", Prentice Hall Professional Technical Reference.
2. Norbert Zaenglein, "Disk Detective: Secret You Must Know to Recover Information From a Computer", Paladin Press.
3. Bill Nelson, Amelia Philips and Christopher Steuart, "Guide to computer forensics and investigations: course technology", 4th edition, ISBN: 1-435-49883-6

17CA3018 SECURITY IN THE CLOUD**Credits: 3:0:0****Course Objective:**

- To introduce the broad perspective of cloud architecture and model
- To understand the concept of Virtualization
- To be familiar with the lead players in cloud.

Course Outcome:

Students will be able to:

- Compare the strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Choose the appropriate cloud player
- Design Cloud Services
- Set a private cloud

Unit I - Cloud Architecture and model: Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture - Cloud Models: Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud – Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

Unit II - Virtualization: Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

Unit III - Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

Unit IV - Programming model: Parallel and Distributed Programming Paradigms – MapReduce, Twister and Iterative Map Reduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

Unit V - Security in the cloud: Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

Text Books:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers.
2. John W. Rittinghouse and James F. Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press.
4. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH.

Reference Books:

1. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly
2. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann.
3. Katarina Stanojevska-Slabeva, Thomas Wozniak, Santi Ristol, "Grid and Cloud Computing – A Business Perspective on Technology and Applications", Springer.

4. Ronald L. Krutz, Russell Dean Vines, “Cloud Security – A comprehensive Guide to Secure Cloud Computing”, Wiley – India.
5. Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi, ‘Mastering Cloud Computing’, TMGH.

17CA3019 SECURITY IN THE CLOUD LAB

Credits: 0:0:2

Co-requisite: 17CA3018 Security in the Cloud

Course Objective:

- To understand broad perceptive of cloud architecture and model
- To understand the design of cloud Services.
- To gain insight into trusted cloud Computing system

Course Outcome:

At the end of the course students will be able to

- Introduce the broad perceptive of cloud architecture and model
- Understand the concept of Virtualization
- Familiar with the lead players in cloud.
- Understand the features of cloud simulator
- Apply different cloud programming model as per need.
- Able to set up a private cloud.
- Understand the design of cloud Services.
- Learn to design the trusted cloud Computing system

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

17CA3020 INTRUSION DETECTION AND PREVENTION SYSTEM

Credits: 3:0:0

Course Objective:

- To understand basic Intrusion Detection System (IDS) and Intrusion Prevention System (IPS)
- To be familiar with the tool selection and acquisition.
- To be familiar with the legal issues and organizations standards

Course Outcome:

Students will be able to:

- Compare IDS and IPS
- State fuzzy logic
- Understand taxonomy of detection
- Understand tiered architecture
- Learn tool selection and acquisition.
- Learn legal issues and organizations standards

Unit I - Detection and Prevention basics – IDS and IPS analysis schemes, Attacks, Detection approaches –Misuse detection – anomaly detection – specification based detection – hybrid detection

Unit II - Taxonomy of Detection: Taxonomy of anomaly detection system – fuzzy logic – Bayes theory – Artificial Neural networks – Support vector machine – Evolutionary computation – Association rules – Clustering

Unit III - Architecture and Implementation: Centralized – Distributed – Cooperative Intrusion Detection - Tiered architecture.

Unit IV - Intrusion Detection: Intrusion detection insecurity – Threat Briefing – Quantifying risk – Return on Investment (ROI) - Application and Tools: Tool Selection and Acquisition -Process - Bro Intrusion Detection – Prelude Intrusion Detection - Cisco Security IDS - Snorts Intrusion Detection – NFR security.

Unit V - Legal Issues and Organizations Standards: Law Enforcement / Criminal Prosecutions – Standard of Due Care – Evidentiary Issues, Organizations and Standardizations.

Text Books:

1. Ali A. Ghorbani, Wei Lu, "Network Intrusion Detection and Prevention: Concepts and Techniques", Springer.
2. Carl Enrolf, Eugene Schultz, Jim Mellander, "Intrusion detection and Prevention", McGraw Hill.
3. Paul E. Proctor, "The Practical Intrusion Detection Handbook", Prentice Hall.

Reference Books:

1. Ankit Fadia and Mnu Zacharia, "Intrusion Alert", Vikas Publishing house Pvt., Ltd.
2. Earl Carter, Jonathan Hogue, "Intrusion Prevention Fundamentals", Pearson Education.

LIST OF COURSES

S.No.	Course Code	Name of the Course	Credit
1	16CA2001	Principles of Web Programming	3:0:0
2	16CA2002	Introduction to Information Technology	3:0:0
3	16CA2003	Computer Organization and Architecture	3:0:0
4	16CA2004	Programming in C	3:0:0
5	16CA2005	Principles of Data Communication	3:1:0
6	16CA2006	Database Management Systems	3:0:0
7	16CA2007	Object Oriented Principles using C++	3:0:0
8	16CA2008	Operating System Concepts	3:0:0
9	16CA2009	Essentials of Software Engineering	3:0:0
10	16CA2010	Data Structures and Applications	3:0:0
11	16CA2011	Programming in Java	3:0:0
12	16CA2012	Network Fundamentals	3:1:0
13	16CA2013	Visual Programming	3:0:0
14	16CA2014	Principles of Computer Graphics	3:0:0
15	16CA2015	System Administration	3:0:0
16	16CA2016	Business Analytics	3:1:0
17	16CA2017	Object Oriented Analysis and Design	3:0:0
18	16CA2018	Web Technology	3:0:0
19	16CA2019	Programming in Python	3:0:0
20	16CA2020	.Net Programming Using C#	3:0:0
21	16CA2021	Software Testing and Quality Assurance	3:0:0
22	16CA2022	System Software	3:1:0
23	16CA2023	Elements of E-Commerce	3:0:0
24	16CA2024	Network Security	3:1:0
25	16CA2025	Network Components and Troubleshooting	3:0:0
26	16CA2026	Professional Ethics	3:0:0
27	16CA2027	General Aptitude	3:0:0
28	16CA2028	Web Programming lab	0:0:2
29	16CA2029	Programming in C Lab	0:0:2
30	16CA2030	MS-Office Lab	0:0:2
31	16CA2031	Hardware Troubleshooting Lab	0:0:2
32	16CA2032	Programming in C++ Lab	0:0:2
33	16CA2033	Database Management Systems Lab	0:0:2
34	16CA2034	Programming in Java Lab	0:0:2
35	16CA2035	Data Structures Lab	0:0:2
36	16CA2036	Visual Programming Lab	0:0:2
37	16CA2037	Computer Graphics Lab	0:0:2
38	16CA2038	System Administration Lab	0:0:2

39	16CA2039	Web Technology Lab	0:0:2
40	16CA2040	Python Lab	0:0:2
41	16CA2041	.Net Programming Using C# Lab	0:0:2
42	16CA2042	Software Quality Testing Lab	0:0:2
43	16CA2043	Network Components and Troubleshooting Lab	0:0:2

16CA2001 PRINCIPLES OF WEB PROGRAMMING

Credits 3:0:0

Course Objective:

- To study about the Basic web concept.
- To learn about HTML tags.
- To learn about CSS.

Course Outcome:

Upon successful completion of this Course, the student will

- Apply the design principles, techniques and technologies in web designing.
- Design static web pages using HTML and CSS
- Construct web sites that conforms to the web standards.

Web site design principles - Planning the site - Fundamentals of HTML - Formatting text – Links- Tables – Images – Forms - Creating web page using HTML- Introducing CSS - Fonts and Text Styles - Backgrounds and Color Gradients in CSS- Creating Boxes and Column - List –Tables - Outlines - Positioning with CSS - Effects, Frames and Controls in CSS..

Reference Books:

1. Joel Sklar, “Principles of Web Design: The Web Warrior Series”, Cengage Learning, Sixth Edition, 2014, ISBN: 81-315-0961-3.
2. Thomas Powell, “Web Design: The Complete Reference Second Edition”, Tata McGraw Hill Education Private Limited, Fifteenth reprint 2013, ISBN: 978-0-07-058252-1.
3. Kogent Learning Solutions Inc., “HTML 5 Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP & jQuery Black Book”, Kogent Learning Solutions Inc., 2013, ISBN: 978-93-5004-095-9.
4. Jon Duckett, “Beginning Web Programming with HTML, XHTML and CSS”, 2nd Edition, Wiley India Pvt. Ltd, 2011, ISBN: 978-81-265-1697-1.
5. Kris Jamas, Konrad King, Andy Anderson, “HTML and Web Design: Tips and Techniques”, Tata Mcgraw-Hill, 12th Reprint 2010, ISBN: 978-0-07-049921-8.
6. Elisabeth Robson and Eric Freeman, “Head First HTML and CSS”, O’Reilly Media Inc., 2012, ISBN: 9780596159900.

16CA2002 INTRODUCTION TO INFORMATION TECHNOLOGY

Credits: 3:0:0

Course Objective:

- Understand the fundamentals of Information Technology.
- Learn more concepts of computing and modern systems.
- Learn more about upcoming IT technologies.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Understand about the Digital domain and Information Technology.

- Creating Multimedia content for an effective visualization.
- Investigate on networking domain.

Introduction to Information Technology – Understanding the Digital Domain – Representing Numbers and Text in Binary – Fundamentals of Computers – Creating Digital Multimedia – Transmission of Information – Introduction to Computer Networking – Telephony and Wireless Multimedia.

Reference Books:

1. Pelin Akshoy, Laura DeNardis, “Information Technology in Theory”, Thomson Course Technology, 2008, ISBN: 978-1-4239-0140-2.
2. V. Rajaraman, “Introduction to Information Technology”, PHI learning private limited, 2013, ISBN: 978-81-203-4731-1.
3. Charles Hargis Davis, Debora Shaw, “Introduction to Information Science and Technology”, American Society for Information Science and Technology, 2011, ISBN: 157387423X, 9781573874236.
4. Rainer & Cegielski, “Introduction to Information Systems”, 3rd Edition, John Wiley & Sons, Inc. 2007, ISBN: 978-0470-47352-8.
5. David Bawden, Lyn Robinson, “An Introduction to Information Science”, Facet Publications, 2012, ISBN: 1856048101, 9781856048101.

16CA2003 COMPUTER ORGANIZATION AND ARCHITECTURE

Credits: 3:0:0

Course Objective:

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study the different ways of communicating with I/O Devices and standard I/O interfaces.
- To study the hierarchical memory system including Cache Memories and virtual memory.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Explain the basic structure of a Digital Computer.
- Illustrate the arithmetic operations.
- Model the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.

Basic Computer Organization and Design – Instruction Codes - Computer Registers – Computer Instructions – Memory-Reference Instructions - Input-Output and Interrupt - Central Processing Unit – General Register Organization - Stack Organization – Instruction Formats – Addressing Modes - Data Transfer and Manipulation - Program Control- Computer Arithmetic – Addition and Subtraction – Multiplication Algorithm- Division Algorithm- Floating Point Arithmetic Operations - Input-Output Organization- Peripheral devices – Input-Output Interface – Asynchronous Data Transform- Modes of Transfer – Direct Memory Transfer- Memory Organization – Memory Hierarchy – Main Memory – Auxiliary Memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management Hardware.

Reference Books:

1. M. Morris Mano, “Computer System Architecture”, Pearson Education, Third Edition, 2007, ISBN: 978-81-317-0070-9.

2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Pearson Education, Seventh Edition, 2008, ISBN: 978-81-7758-993-1.
3. Nicholas Carter, "Schaum's outline of Computer Architecture", Tata McGraw Hill, First Edition, 2006, ISBN: 0-07-13627-X.
4. John L. Hennessy and David A Patterson, "Computer Architecture - A quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fourth Edition, 2007, ISBN: 978-0-12-370490-0.
5. Andrew S. Tanenbaum, Todd Austin, "Structured Computer Organization", Prentice Hall, Sixth Edition, 2013, ISBN-10: 0132916525, ISBN-13: 9780132916523.
6. Alka Vishwa, "Computer Organization and Architecture", I.K. International Publishing House, First Edition, 2013, ISBN: 978-93-82332-47-3.
7. Douglas E. Comer, "Essentials of Computer Architecture", Pearson education, First Edition, 2011, ISBN: 9780133002089.

16CA2004 PROGRAMMING IN C

Credits: 3:0:0

Course Objective:

- To understand the concepts of programming.
- To know the logics of problem solving.
- To gain experience in structured programming.
- To solve problems using programming in C language.

Course Outcome:

Students will be able to

- Understand the programming constructs.
- Learn the logics of problem solving using structured programming.
- Develop, execute and document computerized solutions for various problems using the features of C language.

Introduction to C programming – Character Set – Tokens – Variables – Constants – Data Types – Algorithms – Flowcharts – I/O Functions – Operators – Decision Control Structures – Loop Control Structures – Functions – Recursion – Call by value vs Call by reference – Storage Classes - Arrays – 2D arrays – Strings – Pointers – User Defined data types – File Handling.

Reference Books:

1. Yeshwant Kanetkar, "Let us C", Thirteenth Revised and Updated Edition, BPB Publication 2013, ISBN: 978-8183331630.
2. Byron Gotfried, "Programming with C", Schaum's Outlines, Third Edition, 2011, Tata Mc Graw Hill Publishing Company Limited, ISBN: 978-0-07-014590.
3. K R Venugopal, S R Prasad, "Mastering C", Tata McGraw Hill Publishing Company Limited, 2015, ISBN: 978-93-329-0127-8.
4. Greg Perry, Dean Miller, "C Programming – Absolute Beginner's Guide", Third Edition, Que Publishing, 2013, ISBN: 978-0789751980.
5. Mike Mcgrath, "C Programming in Easy Steps", In Easy Steps Limited, Fourth Edition, 2012, ISBN: 978-1840785449.
6. Zed A. Shaw, "Learn C the Hard Way", First Edition, Addison Wesley Professional, 2015, ISBN: 978-0321884923.

16CA2005 PRINCIPLES OF DATA COMMUNICATION

Credits: 3:1:0

Course Objectives:

- Develop an understanding of data communication techniques.
- Understand the necessity of signal encoding techniques.
- Learning the Routing in switched networks and Congestion control in Data networks.

Course Outcomes:

After completing this Course, the student should be able to:

- Evaluate the communication Protocol architecture.
- Demonstrate the optimization of Routing in switched networks.

Basics of AM, FM and PM Block Diagram, Concepts of AM, FM modulators and demodulators - Pulse modulation systems - Pulse amplitude modulation - Sampling, Quantisation, Quantisation Error. Discrete Messages - Concepts of entropy and information rate - Shannon's theorem - channel capacity - Orthogonal signals and their use - Introduction to coding - Coding and Decoding - Algebraic codes, burst error correction codes - Convolution coding and decoding. Concepts and Terminology- Analog and Digital transmission, Transmission impairments - Transmission media - Synchronous/Asynchronous transmission - Line Configurations - interfacing. Digital data Digital signals - Variations of NRZ and biphase - Digital data Analog signals - ASK, FSK, PSK, QPSK - Analog Data Digital signals - PCM, and DM. Flow control, Error control - HDLC, Multiplexing.

References Books:

1. Taub and Schilling, "Principles of Communication Systems", Tata Mc Graw Hill Pub. Co., New Delhi, 2002 ISBN: 978-0-07-064811-1.
2. William Stallings, "Data and Computer Communication", Eight Editions, Pearson Prentice Hall, 2009, ISBN: 978-81-317-1536-9.
3. William Stallings, "Data and Computer Communication", Eight Editions, Pearson Prentice Hall, 2009, ISBN: 0135071399, 9780135071397.
4. Prakash C. Gupta, "Data Communications", Prentice-Hall of India Private Limited, 1996.
5. William Schweber, "Data Communications", McGraw-Hill Inc, 1988.
6. Fitzgerald and Dennis, "Business Data Communications and Networking", 5th edition, John Wiley and Sons Inc, 1996.

16CA2006 DATABASE MANAGEMENT SYSTEMS

Credits: 3:0:0

Course Objective:

- Understand the role of a database management system in an organization.
- Understand basic database concepts, including the structure and operation of the relational data model.
- Construct simple and moderately advanced database queries using Structured Query Language (SQL).
- Understand and successfully apply logical database design principles, including E-R diagrams and database normalization.

Course Outcome:

- Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.

- Define the terminology, features, classifications, and characteristics embodied in database systems.
- Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.

An overview of Database Management – Database System Architecture – An Introduction to Relational Databases – An Introduction to SQL. Relational Model – Types – Relations – Relational Algebra – Relational Calculus – Views. Database Design – Functional Dependencies – Further Normalization I – Semantic Modeling – Transaction Management – Recovery – Concurrency.

Reference Books:

1. C. J. Date, A. Kannan, Swamynathan, “An Introduction to Database System”, 8th Edition, Pearson Education, Fourteenth Impression, 2013, ISBN: 9780321197849.
2. Thomas Connolly and Carolyn Begg, “Database Systems A Practical Approach to Design, Implementation and Management”, 6th Edition, Pearson Education, 2015, ISBN: 978-0-13-294326-0.
3. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, “Database System Concepts”, 6th Edition, McGraw Hill Education, Thrid Reprint 2014, ISBN: 978-0-07-352332-3.
4. Ivan N. Bayross, “Database Concepts and Systems for Students”, 3rd Edition, Shroff Publishers and Distributors, 2009, ISBN: 8184046693.
5. R. Panneerselvam, “Database Management Systems”, Second Edition, PHI, 2011, ISBN: 8120342771.

16CA2007 OBJECT ORIENTED PRINCIPLES USING C++

Credits: 3:0:0

Course Objective:

- To understand the object oriented programming concepts.
- To solve problems using object oriented programming.
- To develop applications in C++.

Course Outcome:

Students will be able to

- Understand the object oriented programming constructs.
- Implement object oriented model to problem solving.
- Develop applications in C++.

Data Types – Operators – Decision making constructs – Iteration constructs – Input and Output using C++ Streams – Functions - Introduction to Object Oriented Programming – Features - Objects and Classes – Arrays and Strings – Inheritance – Polymorphism – Operator Overloading Pointers – Virtual Functions – Streams and Files.

Reference Books:

1. Robert Lafore, “Object Oriented Programming in C++”, Fourth Edition, Sixth Impression, Pearson Education, Sams Publishing, 2011, ISBN: 978-81-317-2282-4.
2. K.R. Venugopal, Rajkumar Buyya, “Mastering C++”, McGraw Hill Education (India) Private Limited, 2013, ISBN : 978-1259029943.
3. Stanley B. Lippman, Josee Lajoie, Barbara Moo, “C++ Primer”, Fifth Edition, 2012, Addison Wesley Professional, ISBN: 978-0321714114.
4. Bjarne Stroustrup, “The C++ Programming Language”, Fourth Edition, Addison Wesley Publishers, Fourth Printing, 2015, ISBN: 978-0-321-56384-2.

5. Herbert Schildt, “C++ The Complete Reference”, Fifth Edition, Tata McGraw – Hill, 2012, ISBN: 0071634800.
6. E. Balagurusamy, “Object Oriented Programming with C++”, Sixth Edition, McGraw Hill Education (India) Private Limited, 2013, ISBN: 978-1259029936.
7. Sourav Sahay, “Object Oriented Programming with C++”, Second Edition, Oxford University Press India, 2012, ISBN: 978-0198065302.

16CA2008 OPERATING SYSTEM CONCEPTS

Credits: 3:0:0

Course Objective:

- Build an understanding Operating System Services.
- Familiarize with Process Management Techniques.
- Familiarize with Memory Management Techniques.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Understand and explain Operating System Components.
- Identify the different types of Operating System Services.
- Methods of troubleshooting.

Introduction - Types of operating systems - Operating System Services - Process Management - Process Concepts - Process Scheduling - Inter Process Communication - CPU scheduling algorithms – Deadlocks - Memory Management - Single and multiple partitioned allocation – paging and segmentation - Virtual Memory Management - Replacement Algorithms - File concept - Access methods - Directory structure - Disk scheduling.

Reference Books:

1. Abraham Silberschatz, Galvin and Gagne, “Operating System Concepts”, Ninth Edition, 2012, Wiley. ISBN: 9781118063330.
2. A.M. Lister and R.D. Eager, “Fundamentals of Operating Systems”, Fifth Edition, Springer, 2013, ISBN: 1475722524 (Print) 978-1-4757-2252-9 (Online).
3. William Stallings, “Operating Systems Internals and Design Principles”, Sixth Edition, 2009, Pearson Prentice Hall, ISBN: 0-13-600632-9.
4. Andrew S Tanenbaum and Albert S Woodhull, “Operating Systems Design and Implementation”, 3rd Edition, 2009, Prentice Hall Software Series, ISBN: ISBN-13: 978-0131429383.
5. Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, “Operating Systems”, 3rd Edition, 2004, Pearson/Prentice Hall, ISBN-13: 978-0131828278.

16CA2009 ESSENTIALS OF SOFTWARE ENGINEERING

Credits: 3:0:0

Course Objective:

- To Understand the software life cycle models.
- To Understand the importance of the software development process.
- Understand the importance of modelling and modelling languages.
- Design and develop correct and robust software products.

Course Outcome:

Students will be able to

- make effective project management plans, manage time and physical resources.
- analyze, design and develop any application.

- design test cases and effective testing procedures.
- design human-computer interfaces.

Process Models – Agile Development – Understanding Requirements- Design Concepts - Architectural Design - Component Level Design – User Interface Design - Software Quality –System Testing- Testing Conventional Applications- Estimation for Software Projects - Project Scheduling - Risk Management.

Reference Books:

1. Roger S. Pressman, “Software Engineering: A Practitioner's Approach”, Tata McGraw Hill, Seventh Edition, 2010, ISBN-13: 978-0-07-337597-7.
2. Ian Sommerville, “Software Engineering”, Pearson Education, Ninth Edition, 2015, ISBN: 978-93-325-4243-3.
3. James F Peters and Witold Pedrycz, “Software Engineering - An Engineering Approach”, John Wiley, Second Edition, 2007, ISBN: 9788126511884.
4. P. Fleeger, “Software Engineering”, Pearson Prentice Hall, Third Edition, 2009, ISBN: 978-81-317-2098.
5. Suraiya Hussain, “Software Engineering”, I. K. International Publishing House, First Edition, 2012, ISBN: 978-93-81141-74-8.
6. Rajib Mall, “Fundamentals of Software Engineering”, Prentice Hall, Fourth Edition, 2014, ISBN: 8120348982.
7. Frank Tsui, Orlando Karam, Barbara Bernal, “Essentials of Software Engineering”, Jones & Bartlett Publishers, 2013, ISBN: 9781449691998.

16CA2010 DATA STRUCTURES AND APPLICATIONS

Credits: 3:0:0

Course Objective:

- To learn the systematic way of solving problems.
- To understand the different methods of organizing large amounts of data.
- To efficiently implement the different data structures.
- To efficiently implement solutions for specific problem Prerequisites.

Course Outcome:

Students will be able to

- Construct and make effective algorithms plans, manage time.
- Implement and use the data structures in developing application.
- Design testing procedures.

Introduction to Data Structures- Arrays and Structures- Stacks-Evaluation of Expression-Queues-Static and Dynamic Representation-Operation-Priority Queue-Circular Queue-Application of Queue- Linked List-Representation- Singly Linked list-Doubly Linked list- Trees- Binary tree- Binary Search Tree- Sorting- Graphs.

Reference Books:

1. D.S. Malik, “Data Structures Using C++”, Second Edition, Cengage Learning, 2010, ISBN-13-978-0-324-78201-1.
2. Frank M.Carrano, “Data Structures and Abstractions with Java”, Pearson educationl, 2014, ISBN: 9780133750362.
3. Mark A.Weiss, “Data Structures and Algorithm Analysis in C++”, Fourth Edition, Pearson Education, 2013, ISBN: 0-321-44146-X.

4. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Computer Algorithms C++”, 2011, ISBN: 978-0-929306-42-1.
5. Reema Thareja, “Data Structures Using C”, Second Edition. Oxford University Press, 2014, ISBN: 9780198099307.

16CA2011 PROGRAMMING IN JAVA

Credits: 3:0:0

Course Objective:

- To learn basic programming structures in java.
- To learn about fundamental concepts in java.
- To learn about graphics programming in java.
- To solve problems using Object Oriented Paradigm.

Course Outcome:

Students will be able to

- Develop applications using Object Oriented Programming concepts.
- Implement and use Exception Handling and Multithreading.
- Develop GUI Applications.

Overview of Java- Fundamentals of Programming structures in Java – Data Types –Variables –Operators- Control Flow –Arrays—Objects and Classes-Packages-Inheritance –Interfaces- Exception Handling – Multithreading - Managing Input and Output- Applet Programming –Graphics Programming.

Reference Books:

1. Herbert Schildt, “Java™: The Complete Reference”, Ninth Edition, McGraw – Hill Edition, 2014, ISBN 978-9339212094.
2. Cay S. Horstmann and Garry Cornell, “Core Java 2 Volume I Fundamentals”, Prentice Hall, Ninth Edition, 2012, ISBN 978-0137081899.
3. James Gosling, Bill Joy, Guy L. Steele Jr., Gilad Bracha and Alex Buckley, “The Java Language Specification, Java SE 8 Edition”, Addison-Wesley Professional, 2014, ISBN: 0133900797.
4. Deitel H. M and Deital P. J, “Java How to Program”, Prentice Hall India, Tenth Edition, 2014, ISBN: 0131483986.
5. K. Rajkumar, “Java Programming”, Pearson, First Impression 2013, ISBN: 978-81-317-9909-3.
6. Pravin M Jain, “The class of Java”, Pearson, Third Impression 2011, ISBN: 978-81-317-5544-0.
7. E. Balagurusamy, “Programming with Java –a Primer”, Fourth edition 2010, ISBN: 978-0-07-014169-8.

16CA2012 NETWORK FUNDAMENTALS

Credits: 3:1:0

Course Objective:

- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparing the student for entry Advanced Courses in computer networking.
- Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Outcome:

Upon completion of this module, students will be able to:

- Have a good understanding of the OSI Reference Model and in particular have a good knowledge of Layers 1-3.
- Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies.
- Recognize the different internetworking devices and their functions.
- Explain the role of protocols in networking.

Introduction – The Physical layer – Data Link layer – Error Detection and Correction Techniques – Ethernet - The Medium Access Control Sublayer – The Network Layer – The Internet Protocol (IP) – Routing Algorithms - The Transport layer – Multiplexing and Demultiplexing – Connectionless Transport : UDP – Connection Oriented Transport: TCP - The Application layer – The Web and HTTP – FTP – Electronic Mail and in the Internet.

Reference Books:

1. Andrew S. Tanenbaum and David J. Wetherall, “Computer Networks”, 5th Edition, Pearsons Education, 2014, ISBN: 9780132126953.
2. Behrouz A Forouzan and Firouz Mosharraf, “Computer Networks A Top-Down Approach”, Third Reprint 2013, McGraw Hill Education, ISBN: 978-1-25-900156-7.
3. Vilas S. Bagad and Iresh A. Dhotre, “Computer Networks”, Technical Publications, 2010, ISBN: 9788184312591.
4. James F. Kurose, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson Education, Sixth edition, 2012. ISBN: 9780132856201.
5. Prakash C. Gupta, “Data Communications And Computer Networks”, 2nd Edition, PHI, 2013, ISBN: 1587201011.

16CA2013 VISUAL PROGRAMMING

Credits: 3:0:0

Course Objective:

- To understand the concepts of visual programming.
- To know the importance of controls and file handling.
- To understand the process involved in developing any application.

Course Outcome:

Students will be able to

- make effective project management plans.
- analyze, design and develop any application.
- design human-computer interfaces.

Introduction - Using VB to develop object oriented solutions- Windows forms, variables, classes, objects, loops, collections, string-handling, error detection and handling, events and event-handling, .NET controls, drawing- Usage of common classes and techniques with the .NET framework.

Customizing a Form - Writing Simple Programs - Toolbox - Creating Controls - Grid - Editing Tools - Variables - Data Types - String – Numbers - Displaying Information - Determinate Loops - Indeterminate Loops - Conditionals - Built-in Functions - Functions and Procedures- Lists - Arrays - Sorting and Searching - Records - Control Arrays - VB Objects - Dialog Boxes - Common Controls - Menus - MDI Forms - Testing, Monitoring Mouse activity .- File Handling - File System Controls – Database.

Reference Books:

1. Thearon Willis, Jonathan Crossland, Richard D. Blair, “Beginning VB.NET”, Wiley Publications, First Edition, 2008. ISBN: 81-265-0508-7.
2. Paul Vick, “Visual Basic .NET Programming”, Pearson Education, 2004. ISBN-10: 0134569555.
3. Jeremy Shapiro, “Visual Basic.Net. Complete Reference”, McGrawHill Education, 2002, ISBN-10: 0070495114, ISBN-13: 978-0070495111
4. David Schnieder, “An Introduction to Programming with Visual Basic.NET ”, Pearson Education, Fifth Edition, 2002, ISBN-10: 0130306576, ISBN-13: 978-0130306579
5. Schneider, “Introduction to Visual Basic 6.0,” Prentice Hall, First Edition, 2001, ISBN-10: 0130268135; ISBN-13: 9780130268136.
6. Michael Halvorson, “Microsoft Visual Basic 2013 Step by Step,” Microsoft Press, 2014, ISBN-10: 0735667047 • ISBN-13: 9780735667044
7. Paul Deitel, Harvey Deitel and Abbey Deitel, “Visual Basic 2012 How to Program”, 6th Edition, Pearson Education, 2013, ISBN-13: 978-0133406955, ISBN-10: 0133406954.

16CA2014 PRINCIPLES OF COMPUTER GRAPHICS**Credits: 3:0:0****Course Objective:**

- To understand the principles of computer graphics.
- To study the algorithms for 2D and 3D operations.
- To learn how to produce realistic illustrations.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability on:

- Principles of Computer Graphics.
- Transformational Geometry.
- Ray-tracing and Animation Techniques.

Introduction of computer Graphics and its applications - Video display devices, Video controller, Raster and Random scan display, colour CRT, Flat panel display, Interactive input devices, Graphics software, Coordinates representations, Graphics functions. Line drawing algorithms, Circle generating, Mid-point circle algorithm, Ellipse generating, Polynomials, Scan-line polygon fill, Boundary fill. Basic transformation's, Translation, Rotation, Scaling, Matrix representation's & homogeneous co-ordinates, Composite transformation's, Reflection, Two dimensional viewing, Two dimensional clipping, Line, Polygon, Curve, Text-3D-transformation, Projection, Viewing, Clipping, Spline representation. Fractal's geometry, Fractal generation procedure, Classification of Fractal, Fractal dimension, Fractal construction methods. Color models, XYZ, RGB, YIQ, CMY & HSV, Shading algorithms, shading model.

Reference Books:

1. Donald Hearn and M. Pauline Baker, “Computer Graphics, C Version”, Prentice Hall, 1997, Digitized 2007, ISBN: 013-5309247, 978-013-5309247.
2. Andries van Dam, F. Hughes John, James D. Foley and Steven K. Feiner, “Computer Graphics Principles and Practice in C”, Pearson, Second Edition, 2007, ISBN:13: 978-8131705056.
3. Donald D. Hearn and M. Pauline Baker, “Computer Graphics with Open GL”, Prentice Hall, Fourth Edition, 2010, ISBN-13: 978-0136053583.
4. David F. Rogers and J. Alan Adams, “Mathematical Elements for Computer Graphics”, McGraw-Hill, Second Edition, 2007(Digitised), ISBN-13: 978-0070535305.
5. David F. Rogers, “Procedural Elements for Computer Graphics”, McGraw Hill, 2010, ISBN-13: 9780070473713.

6. Edward Angele and Dave Shreiner, “Interactive Computer Graphics, A top-down Approach with OpenGL”, Addison Wesley, Sixth Edition, 2011, ISBN-13: 978-0132545235.
7. G Farin, “Curves and Surfaces for Computer Aided Geometric Design”, Third Edition, Elsevier, 2014, ISBN-13: 978-1558607378.

16CA2015 SYSTEM ADMINISTRATION

Credit 3:0:0

Course Objective:

- Understand the role and responsibilities of a system administrator
- Understand the structure of the Linux file system and how to work in the file system.
- Describe the system boot process
- Setup and manage user accounts and groups
- Configure and manage simple network services on a Linux system
- Learn how to manage software with RPM.
- Configure the Linux operating system
- Manage the resources and security of a computer running Linux
- Make effective use of Unix utilities, and scripting languages

Course Outcome:

The student will be able to

- gain in-depth knowledge on the working of Linux systems
- work on Linux system and to locate additional utilities, configurations and maintenance.
- demonstrate a working knowledge of networking terms and concepts pertaining to system administration.

Introduction to Linux – GNOME desktop environment – locate and use help resources – Manage the Linux file system – File operation with Nautilus - Linux shell and Command line interface – Boot process- Software Maintenance (RPM, Yum) – administer users, groups and permissions – Manage software for Linux - Linux installation – manage system initialization –Automate tasks - Administer Linux processes and services –Linux file system administration LVM & RAID – manage hardware - Configure the network – Monitor Linux system – manage backup and recovery – administer user access and system security

Reference Books:

1. Nicholas Wells, “The Complete Guide to LINUX System Administration”, Indian Edition, Cengage Learning, 2005, ISBN: 0619216166.
2. Suse Linux, Novell Inc., USA.
3. Evi Nemeth, Garth Snyder and Trent R. Hein , “Linux administration Handbook”, Second Edition, Pearson Education, 2007, ISBN 0-13-148004-9.
4. Tom Adelstein and Bill Lubanovic, “Linux System Administration”, O’Reilly Media Inc., First Edition, 2007, ISBN -13:978-0-596-00952-6.
5. Evi Nemeth, Garth Snyder, Trent R. Hein and Ben Whaley, “Unix and Linux System Administration Handbook”, Fourth Edition 2010, Pearson Education, ISBN 0132117363.

16CA2016 BUSINESS ANALYTICS

Credits: 3:1:0

Course Objective:

- To understand the fundamental knowledge of business intelligence.
- To analyze business data in a wide range with different tools available into the current market.
- To understand BI terminologies and framework, basics of data integration (Extraction Transformation Loading), multi-dimensional data modeling.

Course Outcomes:

Upon completion of the Course, graduates will be able to:

- Construct an end-to-end data warehousing solution for business intelligence involving various data sources, ETL, multi-dimensional modeling, OLAP, reporting and analytics.
- Differentiate between Transaction Processing and Analytical applications and describe the need for Business Intelligence.
- Demonstrate understanding of technology and processes associated with Business Intelligence framework.
- Given a business scenario, identify the metrics, indicators and make recommendations to achieve the business goal.

Introduction to Business Intelligence - Types of digital data - BI Framework - Basics of Data Integration (Extraction Transformation Loading) - Introduction to data quality, data profiling concepts and applications - Introduction to Multi-Dimensional Data Modeling - Data Warehouse and OLAP Technology – Introduction to data and dimension modeling, multidimensional data model - business metrics and KPIs.

Reference Books:

1. R N Prasad and Seema Acharya, “Fundamentals of Business Analytics”, Wiley-India, 2011.
2. Brain and Larson, “Delivering Business Intelligence with Microsoft SQL server 2008”, 2nd Edition, McGraw Hill, 2009, ISBN-13: 858-0001276991.
3. David Loshin, “Business Intelligence -The Savvy Manager's Guide”, Morgan Kaufmann Publishers 2012, ISBN: 978-0-12-385889-4.
4. Galit Shmueli, Nitin R. Patel and Peter C. Bruce, “Data Mining for Business Intelligence”, John Wiley and Sons, 2011, ISBN: 9781118126042.
5. Cindi Howson, “Successful Business Intelligence: Secrets to making Killer BI Applications”, Tata McGraw Hill, 2nd Edition, 2014, ISBN: 9780071809191.
6. William H. Inmon, “Building the Data Warehouse”, Wiley India Ltd., Reprint 2010.

16CA2017 OBJECT ORIENTED ANALYSIS AND DESIGN

Credits: 3:0:0

Course Objective:

- To understand the importance of Object Oriented Analysis Processes.
- To learn the concept of object oriented analysis and design to software development process.
- To get acquainted with UML Diagram and its notations.

Course Outcome:

Students will be able to:

- Show the importance of system analysis and design in software development.
- Construct various UML models.

- Apply object oriented methodologies in developing software projects.

Object Basics - Object-Oriented Systems Development Life Cycle - Object-Oriented Methodologies - Unified Modeling Language - Object-Oriented Analysis Process - Object Analysis: Classification - The Object-Oriented Design Process and Design Axioms.

Reference Books:

1. Ali Bahrami, “Object Oriented Systems Development using the Unified Modeling Language”, McGraw Hill, Reprint 2009, ISBN: 9780071160902.
2. Simon Bennett, Steve McRobb and Ray Farmer, “Object-Oriented Systems Analysis and Design: Using UML, 4/e”, McGraw Hill, Reprint 2011, ISBN: 9780077125363.
3. Bernd Oestereich, “Developing Software with UML, Object-Oriented Analysis and Design in Practice”, Addison-Wesley, Second Edition, 2002, ISBN-10: 020175603X, ISBN-13: 978-0201756036.
4. James Rumbaugh, Ivar Jacobson and Grady Booch, “The Unified Modeling Language Reference Manual”, Addison Wesley, Second Edition, 2005, ISBN: 020130998X.
5. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen and Kelli A. Houston, “Object Oriented Analysis and Design with Applications”, Addison-Wesley, Third Edition, 2009, ISBN:0-201-89551-X.
6. Noushin Ashrafi and Hessam Ashrafi, “Object Oriented Systems Analysis and Design”, Prentice Hall, First Edition, 2013, ISBN: 1292051752.
7. Jim Arlow and Ila Neustadt, “UML2 and the Unified Process: Practical Object-Oriented Analysis and Design”, Addison-Wesley, Second Edition, 2005, ISBN-10: 0321321278, ISBN-13: 9780321321275.

16CA2018 WEB TECHNOLOGY

Credits 3:0:0

Course Objective:

- To understand how to develop dynamic web pages using PHP.
- To familiarize web application development using PHP.
- To use MySQL in developing web application using PHP.

Course Outcome:

After the completion of the Course, students will be able to

- Include format and personalize the web pages.
- Use PHP to build dynamic web pages.
- To develop web application with database.

PHP basics - Functions - Object-oriented PHP - Application Development to validate the HTML form using PHP - Strings and Regular Expressions - Application Development to validate the HTML using Regular Expression – Handling File Uploads - Session Handlers – MySQL Datatypes and Attributes - PHP’s MySQLi Extension - Stored Routines - Importing and Exporting Data.

Reference Books:

1. Jason Gilmore, “Beginning PHP and MySQL, From Novice to Professional”, Apress, Fourth Edition, 2010, ISBN: 978-1-4302-3115-8.
2. Kogent Learning Solutions Inc., “HTML 5 Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and jQuery Black Book”, Dreamtech Press, Reprint 2013, ISBN: 978-93-5004-095-9.
3. Chris Bates, “Web Programming: Building Internet Applications”, Wiley DreamTech India (P) Ltd., Third Edition, 2009, ISBN: 978-81-265-1290-4.

4. Tim Converse and Joyce Park with Clark Morgan, “PHP 5 and MySQL Bible”, Wiley India Pvt.Ltd., 2008, ISBN: 10:81-265-0521-4.
5. Steven Holzner, “PHP: The Complete Reference”, McGraw Hill, 2008, ISBN: 0071508546.
6. Robert Sheldon and Geoff Moes, “MySQL”, WILEY, First Edition, 2005, ISBN: 81-265-0592-3.
7. Steve Suehring, Tim Coverse and Joyce Park, “PHP6 and MySQL Bible”, John Wiley, 2009, ISBN: 9788126520220.

16CA2019 PROGRAMMING IN PYTHON

Credits: 3:0:0

Course Objective:

- Build an understanding of the Python Programming.
- Familiarize with the basic terminology of the Python Programming.
- To gain expertise in specific areas of Database Support in Python Programming.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Understand and explain Python Programming.
- Apply various string manipulations in python. .
- Develop the different applications in Python Programming.

Instant Hacking: The Basics- Lists and Tuples-Working with Strings- Conditionals, Loops and Some Other Statements- Abstraction – Exceptions- Methods, Properties and Iterators- Files and Stuff- Graphical User Interfaces – Database Support – Network Programming –Python and the Web- Extending Python –Packaging Your Programs –Instant Markup –XML for all occasions.

Reference Books:

1. Magnus Lie Hetland, “Beginning Python- From Novice to Professional”, Apress Publishers, 2005, ISBN: 1-59059-519-X.
2. Mark Lutz, “Learning Python”, O’ Reilly, 2007, ISBN: 978-0-596-15806-4.
3. David Beazley and Brain K Jones “Python Cookbook”, O, Reilly, Third edition, 2013. ISBN: 978-1449340377.
4. Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython”, O’Reilly, First Edition, 2013, ISBN: 978-1449319793.
5. David M Beazley, “Python Essential Reference”, Developer’s Library, Fourth Edition, 2013, ISBN: 075-2063329788.
6. Alex Martelli, “Python in a Nutshell”, O’Reilly, Second Edition, 2013, ISBN: 978-0596100469.
7. John Zelle, “Python Programming: An Introduction to Computer Science”, Second Edition, 2013, ISBN: 860-1200643879.

16CA2020 .NET PROGRAMMING USING C#

Credits: 3:0:0

Course Objective:

- To get a clear understanding of the .NET framework.
- To understand the object oriented programming concepts of C#.
- To develop standalone applications using C#.

Course Outcome:

After completing this Course, the student will be able to

- Apply the concepts of .NET framework in programming.
- Develop applications using object oriented programming approach.
- Develop applications in C#.

The Philosophy of .NET – Core C# Programming Constructs - Encapsulation – Inheritance and Polymorphism – Structured Exception Handling - Interfaces – Collections and Generics – Delegates – Windows Forms - ADO.NET Part I: The Connected Layer – ADO.NET Part II: The Disconnected Layer – ADO.NET Part III: The Entity Framework.

Reference Books:

1. Andrew Troelsen, “Pro C# 5.0 and the .NET 4.5 Framework”, Apress, Sixth Edition, 2012, ASIN: B0090PY4IA.
2. Christian Nagel, Jay Glynn, Morgan Skinne, “Professional C# 5.0 and .Net 4.5.1”, Wiley, 2014, ISBN: 978-8126548538.
3. Ben Albahari, “C# 5.0 In a Nutshell”, Shroff, Fifth Edition, 2012, ISBN: 978-9350237625.
4. Sharp John, “Microsoft Visual C# 2013, Step by Step”, Microsoft Press, 2014, ISBN: 978-8120349551.
5. Mohammad Rahman, “Expert C# 5.0: with the .NET 4.5 Framework”, Apress, 2012, ASIN: B00ACC6BK4.
6. Vidya Vrat Agarwal, “Beginning C# 5.0 Databases”, Apress, 2nd Edition, 2012, ISBN: 978-1430242604.

16CA2021 SOFTWARE TESTING AND QUALITY ASSURANCE

Credits: 3:0:0

Course Objective:

- To learn fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To apply software testing knowledge and methods in testing software projects.
- To learn the techniques and skills on how to use modern software testing tools.

Course Outcome:

Students will be able to

- Summarize different types of testing.
- Create test plan for software application.
- Create, execute and perform complex maintenance related operations.
- Decide software testing methods and modern software testing tools for testing software systems.

Principles of Testing - Software Development Life Cycle Models - Case study to demonstrate the usage of various Model - White Box Testing - Black Box Testing - Equivalence Partitioning, boundary value analysis, decision tables - Integration Testing - System and Acceptance Testing - Performance Testing - Regression Testing - Test Planning, Management.

Reference Books:

1. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing Principle and Practices”, Sixth Impression, 2008, ISBN: 978 – 81 – 7758 – 121 – 8.
2. William E Perry, “Effective Methods for Software Testing”, John Wiley & Sons, Second Edition, 2005, ISBN: 9971–51–345–5.
3. Sandeep Desai and Abhishek Srivastava, “Software Testing a Practical Approach”, PHI Learning, 2012, ISBN: 978-81-2034-534-8.

4. S.A. Kelkar, "Software Quality and Testing - A Concise Study", PHI Learning Private Limited, 2012, ISBN: 978-81-203-4628-4.
5. Dorothy Graham, Erik van Veenendaal, Isabel Evans and Rex Black, "Foundations of Software Testing ISTQB Certification", Cengage Learning India Private Limited, 2007, ISBN-13: 978-81-315-0218-1.
6. Jason Germi, "Developing Secure Software", Cengage Learning India Private Limited, 2008, ISBN 13: 978-81-315-0888-6.
7. Illene Burnstien, "Practical Software Testing", Springer International Edition, First Edition, 2004, ISBN: 81-8128-0 89-X.

16CA2022 SYSTEM SOFTWARE

Credits: 3:1:0

Course Objective:

- To understand the relationship between system software and machine architecture.
- To know the design and implementation of assemblers linkers and loaders.
- To have an understanding of system software tools.

Course Outcome:

Students will be able to:

- Explain system softwares.
- Distinguish between various system softwares and their functionalities.
- Apply the principles of design in building system softwares.

System software and Machine Architecture – The Simplified Instructional Computer (SIC) – Traditional (CISC) Machines – RISC Machines – Assemblers – Machine-Dependent and Independent Assemblers – Assembler design options – Loaders and Linkers – Machine Dependent and Independent Loader features – Loader design features - Macro Processors – Machine-Independent Macro Processors – Macro Processor Design options - Compilers – Other System Software.

Reference Books:

1. Leland L. Beck and D. Manjula, "System Software: An Introduction to Systems Programming", Pearson Education, Third Edition, 2012, ISBN- 978-81-317-6460-2.
2. Santanu Chattopadhyay, "System Software", Prentice-Hall India, 2007, ISBN: 978-81-20330511.
3. Alfred V. Aho, Monica S. Lam, Ravi Sethi and Jeffrey D. Ullman, "Compilers: Principles, Techniques, and Tools", Pearson Education Asia, Second Edition, 2011, ISBN: 0133002144.
4. D. M. Dhamdhare, "Systems Programming", Tata McGraw-Hill, 2011, ISBN: 071333118.
5. M. Joseph, "System Software", Laxmi Publications, 2007, ISBN: 978-813-1800362.

16CA2023 ELEMENTS OF E-COMMERCE

Credits: 3:0:0

Course Objective:

- To understand the scope of ecommerce in the realm of modern business.
- To know the technologies used to develop and deliver e-commerce applications.
- To know the marketing methods used in e-commerce.
- To learn the security and implementation aspects of internet marketing.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Summarize contemporary e-commerce concepts and terminology.
- Apply the processes and management decisions that are involved in launching, operating and managing business activity on the World Wide Web.
- To model technologies used to deliver e-commerce applications.

Components – Framework – Classification – Anatomy of applications – advantages and disadvantages – driving force of e-commerce – models – traditional commerce vs e-commerce – e-Payment Systems – Security Issues in e-Commerce-Planning for e-Commerce - E-Strategies and Tactics – Building E – Presence – Internet Marketing – Managerial and Customer Related Issues – Going Online.

Reference Books:

1. Elias M. Awad, “Electronic Commerce: From Vision to Fulfillment”, Prentice-Hall of India, Third Edition. 2007, ISBN: 978-81-203-3027-6.
2. Bharat Bhasker, “Electronic Commerce: Framework, Technologies and Applications”, Tata McGraw – Hill, 2007, ISBN: 0-07-060095-3.
3. Kenneth C. Laudon and Carol Guercio Traver, “E-Commerce – Business, Technology, Society”, Addison Wesley, Third Edition, 2007, ISBN: 0-13-173516-0.
4. Gray P. Schneider, “Electronic Commerce”, Cengage Learning, 8th Edition 2008, ISBN: 9781423903055.
5. Sanjay Mohapatra, “E-Commerce Strategy: Text and Cases”, Springer Science & Business Media, 2012, ISBN: 9781461441427.

16CA2024 NETWORK SECURITY

Credits: 3:1:0

Course Objective:

- To understand security concepts and ethics.
- To understand security threats and mechanisms to counter them.
- To understand relevant cryptographic techniques.

Course Outcome:

Students will be able to:

- Identify security threats and determine efforts to counter it.
- Develop security algorithms in the network.
- Determine firewall requirements.

Introduction – Cryptography: Symmetric Encryption and Message confidentiality – Public-Key Cryptography and Message Authentication – Network Security Applications: Key Distribution and User Authentication – Transport Level Security – Electronic Mail Security – System Security: Intruders – Malicious Software – Firewalls.

Reference Books:

1. Willam Stallings, “Network Security Essentials Applications and Standards”, 4th Edition, Pearson Education, 2011, ISBN: 978-0-13-610805-9.
2. Mark Ciampa, “Security+ Guide to network Security Fundamentals”, Fourth Edition, Cengage Learning, 2011, ISBN: 1111640122.
3. Chris Brenton and Cameron Hunt, “Mastering Network Security”, Second Edition, Sybex inc. Publishing, 2006, ISBN: 0782151485.
4. Eric Cole, Ronald Krutz and James W. Conley, “Network Security Bible”, 2nd Edition, Wiley India, 2011, ISBN: 0470570008.

5. Roberta Bragg, Mark Rhodes-Ousley and Keith Strassberg, "Network security: The complete reference", McGraw-Hill, Ninth reprint, 2008, ISBN: 0072226978.

16CA2025 NETWORK COMPONENTS AND TROUBLESHOOTING

Credits: 3:0:0

Course Objective:

- To provide an understanding of the Networking Components.
- To familiarize with the basic taxonomy and terminology of the computer networks.
- To give exposure in specific areas of networking such as the design and troubleshoot of individual networks.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Explain data communications system and its components.
- Identify the different types of network topologies and protocols.
- Identify the different types of network devices and their functions within a network.
- Solve network related problem.

Network Components - Topologies - A case study on network topologies - Add on Cards, Cables & Connectors - Case study on network components and cables - Network Design - LAN and WAN network design - Troubleshooting - Trouble shooting applications - A case study on different trouble shooting techniques - A study on LAN network architecture design.

Reference Books:

1. McCabe James, "Network Analysis, Architecture, and Design", Morgan Kaufmann Publishers, Third Edition, 2010, ISBN: 008054875X.
2. Vilas S. Bagad and Iresh A. Dhotre, "Computer Networks", Technical Publications, 2010, ISBN: 9788184312591.
3. James F. Kurose, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education, Sixth edition, 2012. ISBN: 9780132856201.
4. Odom, "Computer Networks First Step", Cisco Press, First Edition, 2004, ISBN: 1587201011.
5. Jeffrey S. Beasley and Piyasat Nilkaew, "Practical Guide to Advanced Networking", Pearson Education, Third Edition, 2013, ISBN: 1439832234.
6. Patrick Ciccarelli and Christina Faulkner, "Networking Foundation - Technology Fundamentals for IT Success", John Wiley, First Edition, 2006, ISBN: 0782151140.
7. Uyless Black, "Sams Teach Yourself Network Troubleshooting", Sam Techmedia, Fourth Edition, 2009, ISBN: 0768686504.

16CA2026 PROFESSIONAL ETHICS

Credits: 3:0:0

Course Objective:

- Understand about Professional life.
- Learn more about Psychology and Philosophy of Ethics.
- Learn more about Code of Ethics for Scientists and Engineering.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Understand the Ethical Framework in Professional Life.
- Understand the Integrity in Research.

- Understand the Enforcement of Code of Ethics.

Ethics – Introduction – Impact – Framework – Professional Life – Scientists and Engineers – The Psychology and Philosophy of Ethics – Education of Scientists and Engineers – Scientific and Engineering Societies – Codes of Ethics and Ethical Standards – Integrity in Research – Publication and Communication – Enforcement of Codes and Ethics.

Reference Books:

1. James G. Speight, Russell Foote, “Ethics in Science and Engineering”, Wiley, 2011, ISBN: 978-0-470-62602-3.
2. Mike Martin and Roland Schinzinger, “Introduction to Engineering Ethics”, McGraw Hill, New York, 2010, ISBN: 0071267905, 9780071267908.
3. Robert Elliott Allinson, “Saving Human Lives Lessons in Management Ethics”, Springer, 2005, ISBN: 978 -1-4020-2905-9 (HB), 978-1-4020-2980-6.
4. Charles E Harris, Michael S Pritchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Thompson Learning, 2000.
5. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, New Mexico, 1999.
6. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, 2003.

16CA2027 GENERAL APTITUDE

Credits: 3:0:0

Course Objective:

- To solve problems on aptitude and reasoning.
- To apply concepts to solve real life problems.
- To develop comprehensive ability.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to

- Solve problems on general aptitude and reasoning.
- Build verbal ability.
- Interpret problems and solve them.

Data Interpretation & Data Sufficiency - Logical Reasoning - Quantitative Aptitude: - Number Systems, Number Theory, Problems on Ages, Algebra, Clocks and Calendars, Profit, Loss & Discounts, Partnerships, Theoretical Geometry and Races and Games, Average, Time & Distance, Time & Work, Mensuration, Percentages, Permutation and Combination, Probability, Ratio, Proportion, Solutions and Mixtures, Simple Interest and Compound Interest, Sets and Simple Quadratic equations - Verbal English: - Basic Grammar, Synonyms and Antonyms, Reading Comprehension, Error Spotting.

Reference Books:

1. R.S. Agarwal, “Quantitative Aptitude for Competitive Examinations”, Paperback, S Chand, 20th edition, 2013, ISBN -13: 978-8121924986.
2. R.S. Aggarwal, “A Modern Approach to Logical Reasoning”, Paperback, S. Chand, 2007, ISBN-13: 978-8121919050.
3. Anantha Ashisha, “Accredited Guide to Data Interpretation and Data Sufficiency Paperback, Arihant; 2012 edition, ISBN-13: 978-9350942123.
4. Jaikishan and Premkishan, “How to Crack Test of Reasoning: In All Competitive Exam”, Paperback, 2014, Arihant; Single Edition, ISBN-13: 978-9351762225.

5. Ashok Gupta, “A Comprehensive Study of Data Interpretation Analysis and Sufficiency”, Paperback, 2012, Upkar, ISBN-13: 978-9350131640.

16CA2028 WEB PROGRAMMING LAB

Credits: 0:0:2

Co-requisite: 16CA2001 Principle of Web Programming

Course Objective:

- To design websites using markup languages.
- To design and develop website using Style Sheets.
- To develop online applications using HTML and CSS.

Course Outcome:

Students will be able to

- Design and develop static web pages using markup languages.
- Design and develop webpages using Style Sheets.
- Develop online applications using HTML and CSS.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2029 PROGRAMMING IN C LAB

Credits: 0:0:2

Co-requisite: 16CA2004 Programming in C

Course Objective:

- To make the students to understand the concepts of C Language and motivate them to develop the Coding.
- To solve problem using arrays and functions.
- To solve problems using data files.

Course Outcome:

The students will be able to develop C programs

- that are non-trivial with efficiency, readability and modularity.
- utilizing various features like arrays pointers structures.
- using data files.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2030 MS-OFFICE LAB

Credits: 0:0:2

Course Objective:

- To study the features of MS-Word
- To learn to make power point presentation with effects and animations
- To study the various features of MS- Excel
- To learn to use MS-Access

Course Outcome:

By learning the course, the students will be able to

- perform documentation
- to perform presentation skills
- to perform accounting operations

Reference Books:

1. Guy Hart-Davis, “Beginning Microsoft Office 2010”, Apress, 2010, ISBN: 974-1-4302-2950-G
2. Ed Bott, Woody Leonhard, “Using Microsoft Office 2007”, Pearson Education Asia, ISBN: 978-81-317-1354-9
3. Ed Bott, Carl Siechert, “Microsoft Office Inside Out: 2013 Edition”, Microsoft, 2013, ISBN: 9780-7356-6906-2
4. Vikas Gupta, “Comdex Information Technology course tool kit”, WILEY Dreamtech, 2005

16CA2031 HARDWARE TROUBLESHOOTING LAB

Credits: 0:0:2

Course Objective:

- To enable the students to get a detailed knowledge of all the hardware components.
- To understand the different interfaces required for connecting these hardware devices.
- To understand system related problems and methods of troubleshooting.

Course Outcome:

After completing this Course the student must demonstrate the knowledge and ability to:

- Identify the components on the motherboard.
- Demonstrate system administration task.
- Solve system related problems.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

Reference Books:

1. Scott Mueller, “Upgrading and Repairing PCs”, Que Publishing, 22nd Edition, 2015, ISBN: 0789756102.
2. Mike Meyers, “Managing and Troubleshooting PCs”, 4th Edition, Tata McGraw Hill, 2012, 007179591X.
3. Craig Zacker and John Rourke, “The complete reference: PC hardware”, Tata McGraw Hill, New Delhi, 2001.
4. Ron Gilster, “PC Hardware: A Beginners Guide”, Tata McGraw Hill, 2008, ISBN: 978-0-07-044736-3.
5. Hans Peter Messmer, “The Indispensable PC Hardware Book”, Addison-Wesley, 4th Edition, 2002, ISBN: 9780201596168.
6. B. Govindarajulu, “IBM PC and Clones Hardware Troubleshooting and Maintenance”, Tata McGraw-Hill, New Delhi, 2002.

16CA2032 PROGRAMMING IN C++ LAB

Credits: 0:0:2

Co-requisite: 16CA2007 Object Oriented Principles Using C++

Course Objective:

- To implement the object oriented concepts to solve problems.
- To develop an application using object oriented concepts.
- To develop applications using files and structures.

Course Outcome:

Students will be able to

- Implement object oriented concepts to solve problems.
- Develop applications using object oriented concepts.
- Develop applications using files and structures.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2033 DATABASE MANAGEMENT SYSTEMS LAB

Credits: 0:0:2

Co-requisite: 16CA2006 Database Management Systems

Course Objective:

- To impart students with the knowledge of database system by using DDL and DML statements.
- To facilitate students to understand the concept of sub queries, multiple sub queries.
- To facilitate students to understand the concept of triggers.

Course Outcome:

Students will be able to

- classify DDL and DML statements.
- apply normalisation to the tables.
- develop queries consisting of sub queries and multiple sub queries.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2034 PROGRAMMING IN JAVA LAB

Credits: 0:0:2

Co-requisite: 16CA2011 Programming in Java

Course Objective:

- To apply the object-oriented paradigm features of Java.
- To implement java concepts like interface, packages, multithreading etc.
- To develop graphic applications in applet and using AWT.

Course Outcome:

Students will be able to

- show competence in the use of Java programming.
- develop small to medium sized application programs of professional standards.
- demonstrate their understanding of multithreaded and event driven programming.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2035 DATA STRUCTURES LAB

Credits: 0:0:2

Co-requisite: 16CA2010 Data Structures and Applications

Course Objective:

- To develop skills to design and analyze simple linear and non-linear data structures.
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem.
- To Gain knowledge in practical applications of data structures.

Course Outcome:

At the end of this lab session, the student will

- be able to design and analyze the time and space efficiency of the data structure.
- be capable to identify the appropriate data structure for given problem.
- have practical knowledge on the application of data structures.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2036 VISUAL PROGRAMMING LAB

Credits: 0:0:2

Co-requisite: 16CA2013 Visual Programming

Course Objective:

- To interact with the mouse and keyboard using forms.
- To understand the concepts of event-driven programming using data types, variants, and arrays etc.
- To familiarize with the file system controls and database controls.

Course Outcome:

After completing the Course, the student must demonstrate the knowledge and ability to:

- Select appropriate controls required for the application.
- Develop event driven programs.
- Create applications with database connectivity.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2037 COMPUTER GRAPHICS LAB

Credits: 0:0:2

Co-requisite: 16CA2014 Principles of Computer Graphics

Course Objective:

- To measure the students' understanding of the Computer Graphics techniques concepts and algorithm.
- To implement of line drawing, circle drawing, polygon drawing, transformation of objects, scaling, viewing, and curve designing and modeling algorithm practically for graphics.
- To motivate students to think critically and creatively in order to come with an alternate solution for an existing problem with computer graphics.

Course Outcome:

At the end of the Course students will be able to

- Understand practical fundamental of line drawing, circle drawing, polygon drawing and curve drawing.
- Understand the concepts of different type of geometric transformation of objects in 2D and 3D.
- Understand the practical implementation of modeling, rendering, viewing of objects in 2D and 3D.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2038 SYSTEM ADMINISTRATION LAB**Credit 0:0:2****Co-requisite:** 16CA2015 System Administration**Objective:**

- To learn about SUSE Linux Enterprise.
- To manage system initialization.
- To administer Linux processes and services.
- To administer storage.
- To configure the network.
- To manage hardware.
- To configure remote access.
- To monitor SUSE Linux Enterprise system.

Outcome:

The student will be able to efficiently use of SUSE Linux in productive environment

- do SUSE Linux Networking.
- work with Linux shell and command line interface.
- administer Linux with LBM,RAID.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2039 WEB TECHNOLOGY LAB**Credits: 0:0:2****Co-requisite:** 16CA2018 Web Technology**Course Objective:**

- To develop application development skills in PHP.
- To familiarize in array, object oriented programming using PHP.
- To develop web applications using cookies and session.

Course Outcome:

- Students will have the proficiency to develop web based applications using PHP.
- Students will be able to implement user interface validation procedures.
- Students will be able to design and develop interactive, executable web applications.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2040 PYTHON LAB

Credits: 0:0:2

Co-requisite: 16CA2019 Programming in Python

Course Objective:

- To write basic programs using conditionals and iterations.
- To develop programs using object oriented programming Concepts.
- To develop programs using files and functions.

Course Outcome:

Students will be able to

- Solve problems with well documented programs.
- Solve problems in Python language including use of logical constructs.
- Demonstrate significant experience with Python program development environment.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2041 .NET PROGRAMMING USING C# LAB

Credits: 0:0:2

Co-requisite: 16CA2020 .Net Programming using C#

Course Objective:

- To develop applications using object oriented concepts in C#.
- To develop applications using delegates, interface, collections and generics.
- To develop applications using database connectivity.

Course Outcome:

- Student will develop an application using object oriented concepts in C#.
- Students will develop applications using delegates, interfaces, collections and generics.
- Students will develop applications using database connectivity.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2042 SOFTWARE QUALITY TESTING LAB

Credits: 0:0:2

Co-requisite: 16CA2021 Software Testing and Quality Assurance

Course Objective:

- To identify and document test cases for a given user interface design.
- To identify and document test cases for a given functionality.
- To understand how to test the software.

Course Outcome:

Students will be able to

- Outline test plans.
- Construct test cases.
- Test software projects.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

16CA2043 NETWORK COMPONENTS AND TROUBLESHOOTING LAB

Credits: 0:0:2

Co-requisite: 16CA2025 Network Components and Troubleshooting

Course Objective:

- To understand network concepts and components.
- To learn about Network hardware, Media Types (cables, Wireless), Categories of UTP, Connectors, and Network interface card.
- To learn connecting hosts, Peer to Peer Networks.

Course Outcome:

At the end of the Course students will be able to

- Show practical base in computer network issues.
- Make use of Networking Devices (Layer 1, Layer 2).
- Support network Troubleshooting.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

LIST OF SUBJECTS

Sl. No	Sub. Code	Name of the Subject	Credits
1	15CA3001	Problem Solving and Programming	3:0:0
2	15CA3002	Software Engineering Practices	3:0:0
3	15CA3003	Database Management System	3:0:0
4	15CA3004	Data and File Structures	3:0:0
5	15CA3005	Object Oriented System Development	3:0:0
6	15CA3006	Operating System Concepts	3:0:0
7	15CA3007	Problem Solving and Programming Lab	0:0:2
8	15CA3008	Database Management System Lab	0:0:2
9	15CA3009	Data and File Structures Lab	0:0:2
10	15CA3010	Software Engineering Lab	0:0:2
11	15CA3011	Data Mining Techniques	3:0:0
12	15CA3012	Data Warehousing Fundamentals	3:0:0
13	15CA3013	Database Design and Tuning	3:0:0
14	15CA3014	Business Intelligence in Data Mining	3:0:0
15	15CA3015	Practices in Database Administration	3:0:0
16	15CA3016	Big Data and Hadoop Programming	3:0:0
17	15CA3017	Data Mining Techniques Lab	0:0:2
18	15CA3018	Business Intelligence Lab	0:0:2
19	15CA3019	Database Administration Lab	0:0:2
20	15CA3020	Big Data Analytics Lab	0:0:2
21	15CA3021	Essentials of Software Project Management	3:0:0
22	15CA3022	Software Architecture and Design	3:0:0
23	15CA3023	Software Quality Assurance	3:0:0
24	15CA3024	Foundations of Software Testing	3:0:0
25	15CA3025	Enterprise Resource Planning Fundamentals	3:0:0
26	15CA3026	Human Computer Interaction	3:0:0
27	15CA3027	Software Architecture Lab	0:0:2
28	15CA3028	Software Quality Testing Lab	0:0:2
29	15CA3029	Electronic Commerce Development	3:0:0
30	15CA3030	Security Approaches in Computing Systems	3:0:0
31	15CA3031	Programming with ASP.Net Using C#	3:0:0
32	15CA3032	C# Programming	3:0:0
33	15CA3033	AJAX programming using ASP.Net	3:0:0
34	15CA3034	XML Technologies	3:0:0
35	15CA3035	Cluster Computing	3:0:0
36	15CA3036	Internet Programming	3:0:0
37	15CA3037	Web Service Development	3:0:0
38	15CA3038	Software Design Patterns	3:0:0
39	15CA3039	Semantic Web Concepts	3:0:0
40	15CA3040	Information Storage Networks	3:0:0
41	15CA3041	Data Visualization Techniques	3:0:0
42	15CA3042	Information Retrieval	3:0:0

43	15CA3043	Machine Learning	3:0:0	
44	15CA3044	Scripting Using Python	3:0:0	
45	15CA3045	Web Service Lab	0:0:2	
46	15CA3046	C# Programming Lab	0:0:2	
47	15CA3047	ASP.NET using C# Programming Lab	0:0:2	
48	15CA3048	Professional Skills	0:0:2	
49	15CA3049	Multimedia Lab	0:0:2	
50	15CA3050	XML Technologies Lab	0:0:2	
51	15CA3051	Internet Programming Lab	0:0:2	
52	15CA3052	Computer Organization and Architecture	3:0:0	
53	15CA3053	Programming in C	3:0:0	
54	15CA3054	Programming in C++	3:0:0	
55	15CA3055	Compiler Design	3:0:0	
56	15CA3056	Web Designing	3:0:0	
57	15CA3057	Information Technology and its Applications	3:0:0	
58	15CA3058	Concepts of Programming Languages	3:0:0	
59	15CA3059	Principles of Computer Graphics	3:0:0	
60	15CA3060	Information Technology for Business and Management	3:0:0	
61	15CA3061	Programming in C Lab	0:0:2	
62	15CA3062	Web Designing Lab	0:0:2	
63	15CA3063	Programming in C++ Lab	0:0:2	
64	15CA3064	Scripting Using Python Lab	0:0:2	
REVISED VERSION SUBJECTS				
Sl.No.	Sub. Code	Version	Name of the Subject	Credits
1	14CA3003	1.1	Network Components and Troubleshooting	3:0:0
2	14CA3008	1.1	Cloud Computing Technologies	3:0:0

15CA3001 PROBLEM SOLVING AND PROGRAMMING

Credits: 3:0:0

Course Objective:

- To understand the logics of problem solving
- To understand the basic programming concepts
- To get a clear understanding about structured programming
- To learn object oriented programming

Course Outcome:

Student will be able to

- Understand the logics of problem solving
- Solve problems using programming
- Understand the structured programming model
- Understand object oriented programming

Programming and Problem Solving – Variables and Assignments – Input and Output – Data Types and Expressions – Simple Flow of Control – Program Style – Multiway Branches – Loop Statements – Designing Loops - Top-down Design – Programmer Defined Functions – Scope and Local Variables – void Functions – Call by reference Parameters – Recursive Functions – Overloading Function Names - Introduction to Arrays – Arrays in Functions – Structures – Classes – Abstract Data Types.

Reference Books:

1. Walter Savitch, “Problem Solving with C++, The Object of Programming”, Pearson Education, 2012, ISBN: 9780132162739.
2. V. Anton Spraul, “Think Like a Programmer - An Introduction to Creative Problem Solving, No Starch Press, 2012, ISBN: 978-1593274245.
3. Mike Mcgrath, “C Programming in Easy Steps”, In Easy Steps Limited, 2012, ISBN: 978-1840785449.
4. Paul Vickers, “How to Think like a Programmer”, Cengage Learning, 2008, ISBN: 978-1844809004.
5. Felleisen Matthias, Findler Robert Bruce, Flatt Matthew, Shriram Krishnamurthy, “How to Design Programs, An Introduction to Programming and Computing”, Prentice Hall India, 2004, ISBN: 978-8120324619.
6. Peter Van Roy, Seif Haridi, “Concepts, Techniques, and Models of Computer Programming”, Prentice Hall India, 2004, 978-8120326859.
7. Steven G. Krantz, “Techniques of Problem Solving”, American Mathematical Society, 1996, ISBN: 978-0821806197.

15CA3002 SOFTWARE ENGINEERING PRACTICES

Credits: 3:0:0

Course Objective:

- To understand the concepts of software products and software processes.
- To know the importance of software engineering and professional responsibilities.
- To understand the process involved to develop quality product and increase the productivity.

Course Outcome:

Students will be able to

- make effective project management plans, manage time and physical resources.
- analyze, design and develop any application.
- design test cases and effective testing procedures.
- design human-computer interfaces.

Process Models - An Agile View of Process - System Engineering - Requirements Engineering - Illustrate system study and analysis for an application - Design Engineering - Creating an Architectural Design - Modelling Component Level Design - Apply Design Engineering Concepts for an application- Performing User Interface Design-Testing Strategies -Testing Tactics - Apply Testing Tactics for an application project- Estimation - Project Scheduling - Risk Management - Quality Management.

Reference Books:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", Tata McGraw Hill, Sixth Edition, 2005, ISBN-13: 978-0-07-070113-7
2. Sommerville, "Software Engineering", Addison Wesley, Eighth Edition, 2007, ISBN: 032 - 131379-8.
3. James F Peters, Witold Pedrycz, "Software Engineering - An Engineering Approach", John Witold Pedrycz, Second Edition, 2004, ISBN: 997-1513099.
4. P. Fleeger, "Software Engineering", Pearson Prentice Hall, Third Edition, 2009, ISBN: 978-81-317-2098.
5. Suraiya Hussain, "Software Engineering", I. K. International Publishing House, First x Edition, 2012, ISBN: 978-93-81141-74-8.
6. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, "Fundamentals of Software Engineering", Prentice Hall, Second Edition, 2003, ISBN-13: 9780133056990.
7. K. K. Aggarwal, Yogesh Singh, "Software Engineering", New Age International Publishers, Second Edition, 2005, ISBN: 81-224-1638-1.

15CA3003 DATABASE MANAGEMENT SYSTEM

Credits: 3:0:0

Course Objective:

- To provide knowledge to understand the database design process.
- To emphasize the fundamentals of relational systems including data models, database architectures, and database manipulations.
- To provide a convenient and effective method of defining, storing and retrieving the data in the database.
- To provide an understanding of new developments and trends such as Internet database environment and data warehousing.

Course Outcome:

The student will be able to

- be familiarized with database design.
- understand the basics of data management and administration.
- create database designs with E-R diagrams.
- retrieve data using SQL.
- normalize tables and check for functional dependencies.
- work as a valuable member of a database design and implementation team.

Introduction to Database Management Systems - E-R model, Relational model - Database System Architecture - Query Languages – SQL, Advanced, Embedded and Dynamic SQL - Database Design and E-R Model - Designing database for practical applications - Relational Database Design - Integrity constraints - Applying Integrity constraints on tables - Normal forms – Studying the impact of different normalization forms for practical applications – Application design and development using triggers - Storage and File Structure - Sequential files, indexing, B and B+ trees - Different file Transactions and concurrency control - Case Study: Development of a Database Application.

Reference Books:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, “Database System Concepts”, Fifth Edition, McGraw-Hill International, 2006, ISBN 007-124476-X.
2. Ramez Elmasri, Durvasula V. L. N. Somayajulu, Shamkant B. Navathi and Shyam K. Gupta, “Fundamentals of Database Systems”, Pearson Education, 2006, ISBN 81-7758-476-6.
3. Ramez Elmasri and Shamkant B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education, 2006, ISBN 0-321-36957-2.
4. Carlos Coronel , Steven Morris, Peter Rob, “Database Systems: Design, Implementation, and Management” Tenth Edition, Cengage Learning, 2012, ISBN-10: 1111969604
5. Nikolay V. Kovalev, “Database Management Systems Study Book”, National Book Store Inc., ISBN: 9710871633.

15CA3004 DATA AND FILE STRUCTURES

Credits: 3:0:0

Course Objective:

- To get clear understanding about the basic data structures and their operations.
- To understand the concepts of algorithms.
- To apply and implement learned algorithm design techniques and data structures to solve problems.

Course Outcome:

Students will be able to

- understand the basics of data structures.
- understand basic search and sort algorithms.
- choose appropriate data structure and algorithm to solve a problem.

Arrays - Stack - Queue - Applications using stack and queue - Linked Lists: Singly Linked List Doubly Linked Lists - Applications using Linked List - Trees - Applications using Trees - Graphs - Case Study on Graph Data Structure - Searching – Internal Sorting – External Sorting - Files - Comparative case study on different file organisation.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, “Fundamentals of Data Structures in C”, 2nd Edition, 2007, ISBN: 0-929306-40-6.
2. Ellis Horowitz, Sartaj Sahni, Rajasekaran, “Fundamentals of Computer Algorithms”, 2nd Edition, Computer Science Press, 2007, ISBN: 0-929306-41-4.
3. Jean-Paul Tremblay, Paul G. Sorenson, “An Introduction to Data structures with Applications”, Tata McGraw-Hill Company, Second Edition, ISBN: 007065157.
4. Robert Sedgewick, “Algorithms in C”, Addison Wesley, Third Edition, ISBN: 0-20-131452-5.
5. Jean-Paul Tremblay, Paul G. Sorenson and P.G. Sorenson, “An Introduction of Data Structures with Applications”, McGraw Hill Computer Science Series, 2nd Edition, 2001, ISBN-10: 0074624717.
6. Balagurusamy E, “C Programming and Data Structures”, Tata McGraw-Hill Publishing Company Limited, Fourth Edition, 2006, ISBN: 0-07-060644-7.
7. Seymour Lipschutz, “Data Structures: Including 457 Solved Problems”, McGraw-Hill, Seventh Reprint, 2007, ISBN: 0-07-039001-5.

15CA3005 OBJECT ORIENTED SYSTEM DEVELOPMENT

Prerequisite: 15CA3002 Software Engineering Practices

Credits: 3:0:0

Course Objective:

- To learn the concept of Object Oriented Software Development Process.
- To get acquainted with UML Diagrams.
- To understand Object Oriented Analysis Processes.

Course Outcome:

Students will be able to

- Understand Object Oriented Software Development Process.
- Gain exposure to Object Oriented Methodologies & UML Diagrams.
- Apply Object Oriented Analysis Processes for projects.

Object Basics - Object-Oriented Systems Development Life Cycle - Object-Oriented Methodologies - Unified Modeling Language - Using Dynamic Modelling draw the diagrams for an application - Object-Oriented Analysis Process - Object Analysis: Classification - Implement classification in an application - The Object-Oriented Design Process and Design Axioms - Designing Classes.

Reference Books:

1. Ali Bahrami, "Object Oriented Systems Development using the Unified Modeling Language", McGraw Hill, Reprint 2009, ISBN: 9780071160902.
2. Simon Bennett, Steve McRobb, Ray Farmer, "Object-Oriented Systems Analysis and Design: Using UML, 4/e", McGraw Hill, Reprint 2011, ISBN: 9780077125363.
3. Bernd Oestereich, "Developing Software with UML, Object-Oriented Analysis and Design in Practice", Addison-Wesley, Second Edition, 2002, ISBN-10: 020175603X, ISBN-13: 978-0201756036.
4. James Rumbaugh, Ivar Jacobson, Grady Booch, "The Unified Modeling Language Reference Manual", Addison Wesley, Second Edition, 2005, ISBN: 020130998X.
5. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, "Object Oriented Analysis and Design with Applications", Addison-Wesley, Third Edition, 2007, ISBN:0-201-89551-X.
6. Noushin Ashrafi, Hessam Ashrafi, "Object Oriented Systems Analysis and Design", Prentice Hall, First Edition, 2009, ISBN-10: 0131824082, ISBN-13: 9780131824089.
7. Jim Arlow, Ila Neustadt, "UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design", Addison-Wesley, Second Edition, 2005, ISBN-10: 0321321278, ISBN-13: 9780321321275.

15CA3006 OPERATING SYSTEM CONCEPTS

Credits: 3: 0: 0

Course Objective:

- To introduce concepts of Operating Systems.
- To describe process concept and its scheduling algorithms.
- To describe about file system, mass storage and I/O in a modern computer system.

Course Outcome:

Students will be able to

- familiarize with the concepts of the operating systems.
- gain knowledge about the fundamental concepts and algorithms used in existing commercial operating systems.
- gain knowledge on various process scheduling algorithms and IPC.

Introduction to Operating System and Services - Processes and Multithreaded Programming - Process Synchronization and Memory management - Virtual Memory and File System Implementation - Mass Storage Structure - Disk Structure – Disk Attachment - Disk Scheduling – Disk Management – Swap-Space Management – RAID Structure – Stable - Storage Implementation and I/O Systems - Case Study: Windows, Linux Operating System Architecture.

Reference Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, “Operating System Principles”, John Wiley & Sons, Eighth Edition, 2009, ISBN 978-0-470-12872-5.
2. Andrew S. Tanenbaum, Albert S. Woodhull, “Operating Systems: Design and Implementation”, Pearson Education, Third Edition, 2006, ISBN: 9780131429383.
3. H. M. Deitel, “Operating Systems”, Pearson Education Inc, Second Edition, 2002, ISBN: 81-7808-035-4.
4. Mukesh Singhal, Niranjana Shivaratri, “Advanced Concepts in Operating Systems”, McGraw-Hill Education, First Edition, 2001, ISBN: 978-0070472686.
5. Milen Milan Kovic, “Operating Systems Concepts and Design”, McGraw Hill ISE, Second Edition, 2001, ISBN: 0-07-463272-8.

15CA3007 PROBLEM SOLVING AND PROGRAMMING LAB

Co-requisite: 15CA3001 Problem Solving and Programming

Credits: 0:0:2

Course Objective:

- To make the students to understand the concepts of programming language and motivate them to develop the Coding.
- To solve problem using arrays and functions.
- To solve problems in object oriented way.

Course Outcome:

The students will be able to develop programs

- that are non-trivial with efficiency, readability and modularity.
- utilizing various features like arrays pointers structures.
- using object oriented programming.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3008 DATABASE MANAGEMENT SYSTEM LAB

Co-requisite: 15CA3003 Database Management System

Credits: 0:0:2

Course Objective:

- To impart students with the knowledge of database system by using DDL and DML statements.
- To facilitate students to understand the concept of sub queries, multiple sub queries.
- To facilitate students to understand the concept of triggers.

Course Outcome:

Students will be able to

- write queries in DDL and DML statements.
- have an understanding of sub queries and multiple sub queries.
- perform normalization for all tables which they store it in database.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3009 DATA AND FILE STRUCTURES LAB

Co-requisite: 15CA3004 Data and File Structures

Credits: 0:0:2

Course Objective:

- To develop skills to design and analyze simple linear and non-linear data structures.
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem.
- To Gain knowledge in practical applications of data structures.

Course Outcome:

At the end of this lab session, the student will

- be able to design and analyze the time and space efficiency of the data structure.
- be capable to identify the appropriate data structure for given problem.
- have practical knowledge on the application of data structures.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3010 SOFTWARE ENGINEERING LAB

Credits: 0:0:2

Course Objective:

- To provide an opportunity to get exposed to a CASE Tool.
- To understand the procedure of using a CASE Tool.
- To learn the steps involved in drawing UML Diagrams using a CASE Tool.
- To perform Forward & Reverse Engineering.

Course Outcome:

At the end of this lab, students will

- gain confidence in UML diagrams and their notations.
- get acquainted with a CASE tool for OOAD.
- will be able to design UML diagrams for a given requirement.
- be able to visualise the relationship and dependencies in UML Diagrams.
- be able to understand the significant role played by a CASE tool in Software Engineering.

Reference Books:

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach", Tata McGraw Hill, Sixth Edition, 2005, ISBN-13: 978-0-07-070113-7.
2. Ali Bahrami, "Object Oriented Systems Development using the Unified Modeling Language", McGraw Hill, Reprint 2009, ISBN: 9780071160902.

3. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, “Object Oriented Analysis and Design with Applications”, Addison-Wesley, Third Edition, 2007, ISBN:0-201-89551-X.

15CA3011 DATA MINING TECHNIQUES

Credits: 3:0:0

Course Objective:

- To introduce the basic concepts and techniques of Data Mining.
- To understand the application of data mining techniques for real world problem.
- To develop skills for solving practical problems using Data Mining algorithms.

Course Outcome:

Students will be able to

- develop data mining algorithm for various applications.
- build up data mining model for diverse applications.
- solve problems using data mining algorithms.

Data Mining - Architecture - Functionalities, Data Warehouse Architecture - Schema and Implementation - Future development of Data cube technology - Data preprocessing and Data Mining Primitives - Mining Association Rules in Large Databases - Classification - Bayesian decision tree and Prediction - Cluster Analysis – Partitioning – Hierarchies - Case Studies: Applications and Trends in Data Mining.

Reference Books:

1. Jiawei Han, Micheline Kamber, “Data Mining – Concepts and Techniques”, Morgan Kaufmann Publishers, First Edition, 2003. ISBN: 81-8147-049-4.
2. Gupta. G. K, “Introduction to Data Mining with Case Studies”, PHI; Second Edition, 2011, ISBN: 978-8120343269.
3. Michael J A Berry, Gordon S Linoff, “Data Mining Techniques”, Wiley Publishing Inc, Second Edition, 2004, ISBN: 81-265-0517-6.
4. Nitin R. Patel, Peter C. Bruce, “Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner”, John Wiley & Sons, Second Edition, 2010, ISBN: 9780470526828.
5. Vipin Kumar, Michael Steinbach, Pan-Ning Tan, “Introduction to Data Mining”, Pearson Education, First Edition, 2007, ISBN: 978-8131714720.

15CA3012 DATA WAREHOUSING FUNDAMENTALS

Prerequisite: 15CA3003 Database Management System

Credits: 3:0:0

Course Objective:

- To know about the architecture/technology of Data Warehousing.
- To know more about the operational and analytical environment of Data Warehousing.
- To know the need for Data Warehouse.

Course Outcome:

At the end of the course, the students will understand the

- need for Data Warehouse.
- working environment/architecture of a Data Warehouse.
- multiple levels of building a Data Warehouse.

Evolution of Decision Support System - Data Warehouse Environment and Design - Granularity in the Data Warehouse and Distributed Data Warehouse - Executive Information Systems and the Data Warehouse - Data Warehouse and the Web - Relational and the Multidimensional Models as a Basis for Database Design - Case studies: Design and Implementation of a Data Warehouse for any Commercial Application.

Reference Books:

1. William H Inmon, “Building the Data Warehouse”, Wiley India, 4th Edition, 2005, ISBN: 81-265-0645-8.
2. Sam Anahory and Dennis Murray, “Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems”, Pearson Education – Asia, Fourth Indian Reprint, 2002, ISBN: 81-7808-387-6.
3. Paulraj Ponniah, “Data Warehousing Fundamentals for IT Professionals”, John Wiley & Sons, 2nd Edition, 2010, ISBN: 978-0-470-46207-2.
4. Ralph Kimball, Margy Ross, Warren Thornthwaite, Joy Mundy, Bob Becker, “The DataWarehouse Lifecycle Toolkit”, John Wiley & Sons; 2nd Edition, 2008, ISBN: 978-0470149775.
5. Gordon S. Linoff, Michael J.A. Berry, “Data Mining Techniques: For Marketing, Sales and CRM”, Wiley India Pvt Ltd, Third Edition, 2012, ISBN: 978-8126534722.

15CA3013 DATABASE DESIGN AND TUNING

Prerequisite: 15CA3003 Database Management System

Credits: 3:0:0

Course Objective:

- To introduce the concepts of database design and tuning.
- To learn the effective Table Design Techniques.
- To develop the effective Application Design Skills and Techniques.

Course Outcome:

- Students are enabled to demonstrate the concepts of Database Design and Tuning.
- Familiarize and focus on identifying and fixing underlying flaws.
- Familiarize with typical objects that can be tuned.

Basic principles of Tuning - Locking and Concurrency Control - Logging and the Recovery Subsystem - Operating System Considerations - Index tuning - Tuning relational systems - Client - Server mechanisms - Objects, Applications tools and Performance - Tuning the Application Interface - Bulk Loading Data - Accessing Multiple Database - Applications tools and Performance - Tuning e-Commerce Applications - Case Studies.

Reference Books:

1. Dennis Shasha & Philippe Bonnet, "Database Tuning: Principles, Experiments, and Troubleshooting Techniques", Elsevier Publications - 2003, ISBN 81-8147-324-8.
2. Sam Alapati, Darl Kuhn & Bill Padfield, "Oracle Database 11g Performance Tuning Recipes: A Problem-solution Approach", APress, ISBN-10: 1430236620, ISBN-13: 978-1430236627.
3. Toby Teorey, Sam Lightstone, Tom Nadeau, "Database Modeling and Design", Elsevier Publication - 2006, ISBN 978-0-12-685352-0.
4. Sitansu S. Mitra, "Database performance Tuning and Optimization", Springer Publication, 2003, ISBN 0-387-95393-0.
5. Dennis Elliott Shasha, "Database Tuning: A Principled Approach", Prentice Hall; International edition edition, 1992, ISBN: 978-0132052467.

15CA3014 BUSINESS INTELLIGENCE IN DATA MINING

Credits: 3:0:0

Course Objective:

- To know the components of the decision making process.
- To understand the mathematical models and methods needed for incorporating business Intelligence.
- To have real-time experience on business intelligence applications using case studies.

Course Outcome:

The Students will be able to

- execute the mathematical models and methods needed for incorporating business Intelligence.
- evaluate various classification models and their existing problems.
- have real time experience on business intelligence applications.

Effective and timely decisions - The role of mathematical models - Business intelligence architectures - Decision support systems - Case study of types of decisions - Data warehouse architecture - Case study on schema - Mathematical models for decision making - Data mining process - Case study on Models - Data preparation - An example of application of principal component analysis - Regression - Classification problems - Evaluation of classification models - Classification trees - Association Rules - Clustering - Business Intelligence application on marketing models - Relational marketing - Sales force management - Logistic and Production model - Data Envelopment analysis.

Reference Books:

1. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making", John Wiley & Sons Ltd, 2009, ISBN: 9780470511381.
2. Colleen McCue, "Data Mining and Predictive Analysis", Elsevier, 2007, ISBN: 9780750677967.
3. Brain Larson, "Delivering Business Intelligence with Microsoft SQL server 2008", McGraw-Hill, 2008, ISBN: 978-0071549448.
4. Lynn Langit, "Foundations of SQL Server 2005 Business Intelligence", Apress 2007, ISBN 978-1590598344.
5. R. N. Prasad, Seema Acharya, "Fundamentals of Business Analytics", Wiley India Pvt Ltd, 2011, ISBN: 9788126532032.

15CA3015 PRACTICES IN DATABASE ADMINISTRATION

Prerequisite: 15CA3003 Database Management System

Credits: 3:0:0

Course Objective:

- To have a clear overview of the Oracle Database Architecture.
- To enable to create, monitor, configure the Database.
- To gain knowledge of how to backup and recovery process of a database.

Course Outcome:

Students will be able to

- create a database and configure it.
- manage User Accounts.
- perform a new installation, upgrade from previous versions, configure hardware and software for maximum efficiency, and employ bulletproof security.

Getting Started with Oracle Architecture - Planning and Managing Tablespaces - Working with Oracle Database and creating a database, Configuring it, Deleting the Database - Physical Database Layouts and Storage Management - Monitoring Space Usage - Working with default user accounts - Managing Transactions with Undo Tablespaces - Database Security and Auditing - Backup and Recovery Options.

Reference Books:

1. Bob Bryla, Kevin Loney, "Oracle Database 11g DBA Handbook", The McGraw-Hill Companies, First Edition, 2008, ISBN -0-07-159579-1.
2. Sam R Alapati, "Expert Oracle Database 11G Administration", Apress Publication, First Edition, 2009, ISBN-13 978-1-4302-1015-3.
3. Iggy Fernandez, "Beginning Oracle Database 11g Administration from Novice to Professional", First Edition, 2009, ISBN-978-81-8489-216-1.
4. Craig Mullins, "The Complete Guide to DBA Practices and Procedures", Second Edition, Addison Wesley, 2013, ISBN: 978-0-321-82294-9, ISBN: 0-321-82294-3.
5. Kognet, "Oracle 11g Administration in Simple Steps", Dream Tech Press, First Edition, 2008, ISBN 10-81-7722-854-4, ISBN: 13-978-81-7722-854-0.
6. Richard Niemiec, "Oracle Database 11g Release 2 Performance Tuning Tips & Techniques", The McGraw-Hill Companies, First Edition, 2012, ISBN:0071780270 / 9780071780278.
7. Michelle Malcher, "Oracle Database Administration for Microsoft SQL Server DBAs", The McGraw-Hill Companies, First Edition, 2010, ISBN: 0071744304 / 9780071744300.

15CA3016 BIG DATA AND HADOOP PROGRAMMING

Credits: 3:0:0

Course Objective:

- To survey the needs and importance of data analytics in various contexts
- To understand the challenges of managing big data
- To understand Map Reduce Concepts
- To get a clear understanding about mining unstructured data
- To analyze big datasets using Hadoop

Course Outcome:

Student will be able to

- Understand the basics of big data analytics
- Understand the concepts of Map Reduce
- Understand the mining of unstructured data
- Analyze big data sets using Hadoop

Map Reduce and the New Software Stack – Distributed File Systems – Map Reduce – Algorithms using Map Reduce – Extensions to Map Reduce – The Communication Cost Model – Complexity Theory for Map Reduce – Mining Data Streams - The Stream Data Model – Sampling Data in a Stream – Filtering Streams - Counting Distinct Elements in a Stream – Estimating Moments – Counting Ones in a Window – Decaying Windows – Hadoop, A Distributed Programming Framework – Hadoop in Action – Hadoop Gone Wild.

Reference Books:

1. Jure Leskovec, AnandRajaraman, Jeffrey D. Ullman, “Mining of Massive Datasets”, Second Edition, Cambridge University Press, 2013, ISBN: 978-1107015357.
2. Chuck Lam, “Hadoop in Action”, Dreamtech Press, 2011, ISBN: 978-8177228137.
3. Garry Turkington, “Hadoop Beginner’s Guide: Learn How to Crunch Big Data to Extract Meaning from the Data Avalanche”, Shroff/Packt Publishing, 2013, ISBN: 978-9351101109.
4. Viktor Mayer-Schonberger, Kenneth Cukier, “Big Data”, John Murray Publishers, 2013, ISBN: 978-1848547902.
5. Tom White, “Hadoop: The Definitive Guide”, O’Reilly Media, 2012, ISBN: 978-1449311520.
6. Jay Liebowitz, “Big Data and Business Analytics”, CRC Press, 2013, ISBN: 978-1-4665-6578-4.
7. David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, Morgan, Kaufmann Publishers, 2013, ISBN: 978-0124173194.

15CA3017 DATA MINING TECHNIQUES LAB

Co-requisite:15CA3011 Data Mining Techniques

Credits: 0:0:2

Course Objective:

- To know how to use a Data Mining Tool.
- To test the dataset with several Data Mining algorithms.
- To visualize the working mechanisms of different methods.

Course Outcome:

- The students will have proficiency to work on a data mining tool.
- The students know the different data mining algorithms and test them with dataset.
- The students will be able to visualize the working of different methods.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3018 BUSINESS INTELLIGENCE LAB

Credits: 0:0:2

Course Objective:

- To apply the principles of business intelligence and to draw conclusions from large datasets.
- To create and integrate data mart with values and derive intelligence from the data mart.
- To analyze the OLAP cube and create reports for decision making.

Course Outcome:

After completing this lab, students will be able to

- create Data Mart using Integration services they will populate the Data Mart with required values .
- deploy data mart using Analysis Services and Mine the Data Mart.
- mine the cube and create visual reports.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

Reference Books:

1. Brain Larson, “Delivering Business Intelligence with Microsoft SQL server 2008”, McGraw-Hill, 2008, ISBN: 978-0071549448.
2. Lynn Langit, “Foundations of SQL Server 2005 Business Intelligence”, Apress, 2007, ISBN 978-1590598344.
3. Carlo Vercellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, John Wiley & Sons Ltd, 2009, ISBN: 9780470511381.
4. Nitin R. Patel, Peter C. Bruce, “Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner”, John Wiley & Sons, Second Edition, 2010, ISBN: 9780470526828.
5. R. N. Prasad, Seema Acharya, “Fundamentals of Business Analytics”, Wiley India Pvt. Ltd, 2011, ISBN: 9788126532032.

15CA3019 DATABASE ADMINISTRATION LAB

Co-requisite: 15CA3015 Practices in Database Administration

Credits: 0:0:2

Course Objective:

- To create, maintain and manipulate an Oracle Database.
- To understand and apply database statistics in relation to performance and integrity of the database.
- To understand the application of user roles, privileges, and the security of the database.

Course Outcome:

After completing this lab, students will be able to

- create, maintain and manipulate an Oracle Database.
- apply database statistics in relation to performance and integrity of the database.
- create the application of user roles, privileges, and the security of the database.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3020 BIG DATA ANALYTICS LAB

Co-requisite: 15CA3016 Big Data and Hadoop Programming

Credits: 0:0:2

Course Objective:

- To know how to use a Hadoop.
- To set up a Hadoop environment
- To write and compile MapReduce Programs

Course Outcome:

- The students will have proficiency in Hadoop.
- The students will know to set up a Hadoop environment.
- The students will be able to write and compile MapReduce Programs

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3021 ESSENTIALS OF SOFTWARE PROJECT MANAGEMENT

Prerequisite: 15CA3002 Software Engineering Practices

Credits: 3:0:0

Course Objective:

- To discuss the various aspects of project management.
- To plan and execute software projects by means of activity planning, managing risk and allocating resources.
- To understand the tasks in software project management.
- To describe the requirements of a project plan.
- To identify the factors that influence people's behaviour in a project environment..

Course Outcome:

The learners will understand

- the overview of project planning.
- the need for careful planning, monitoring and control.
- to reduce risks by creating appropriate prototypes.
- to create an activity plan for a project.
- to manage people and organize team

Introduction to Software Project Management - Project Evaluation and Programme Management - An Overview of Project Planning - Selection of an Appropriate Project Approach - Software Effort Estimation - Case study on Planning a Project - Activity Planning – Development of Activity Plan for a Project - Risk Management - Resource Allocation - Monitoring and Control - Managing Contracts - Managing People in Software Environments – Working in Teams - Software Quality - Analysis on failure of small projects.

Reference Books:

1. Bob Hughes, Mike Cotterell, "Software Project Management", McGraw-Hill Publishing Company Limited, Fifth Edition, 2009. ISBN: 9780077122799.
2. Walker Royce, "Software Project Management", Addison-Wesley, 2004 ISBN: 0-20-1309580.
3. Murali K. Chemuturi, Thomas M. Cagley Jr., "Mastering Software Project Management: Best Practices, Tools and Techniques", J. Ross Publishing, 2010, ISBN: 9781604270341.
4. S.A. Kelkar, "Software Project Management: A Concise Study", Prentice Hall of India, Third Edition, 2013, ISBN: 978-8120347021.
5. Mohapatra S, "Software Project Management, Cengage Learning", 2011, ISBN: 978-8131514849.
6. Azath M, Channamallikarjuna Mattihalli, "Software Project Management", LAP Lambert Academic Publishing, 2012, ISBN: 978-3848494422.
7. Ashfaq Ahmed, "Software Project Management: A Process-Driven Approach", Auerbach Publications, 2012, ISBN: 978-1439846551.
8. Rajiv Chopra, "Software Project Management", S K Kataria & Sons, 2011, ISBN: 978-9380027364

15CA3022 SOFTWARE ARCHITECTURE AND DESIGN

Prerequisite: 15CA3002 Software Engineering Practices

Credits: 3:0:0

Course Objective:

- To know the basic concepts and technologies of software architecture.
- To know the concepts of reusing architectures.
- To impart the knowledge of software quality attributes.

Course Outcome:

Students will be able to

- develop a software project with appropriate data integration.
- describe and classify quality attributes for software architecture.
- describe and construct frameworks.

Introduction to Software Architecture - The Software Product Life Cycle - The Architecture Design Process - Software Architecture Concepts - Introduction to software design - Models and Knowledge Representation - Case study on Sick Health Insurance Application - Architecture Representation - Quality Models and Quality Attributes - Architectural Design Principles - Applying Architectural Styles and Patterns - Understanding Meta models - Creating Architectural Descriptions - Using Architecture Frameworks - Software Architecture Quality - An Architectural Analysis Case study Internet Information System.

Reference Books:

1. Albin, Stephen T, "The Art of Software Architecture: Design Methods and Techniques", Wiley, Second Edition, 2003, ISBN: 81-265-0387-4.
2. Len bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Pearson Education, ISBN: 81-7808-546-1.
3. Vasudeva Varma, "Software Architecture: A Case Based Approach", First Impression, 2009, ISBN: 978-81-317-0749-4.
4. Christine Hofmeister, Robert Nord, Deli Soni, "Applied Software Architecture", Addison Wesley Professional, 1999, 1st Edition, ISBN: 0-201-32571.
5. Frank Buschmann, Hans Rohnert, Kevin Henney, Douglas C. Schmidt, "Pattern-Oriented Software Architecture", Wiley, Volume 1, 2, 3, 4, 5, 1st Edition, ISBN: 9971-51-421-4.
6. Wolfgang Pree, "Design patterns for object Oriented Software Development", Addison Wesley, 1995, ISBN: 0-201-422948.
7. Jeff Garland, Richard Anthony, "Large Scale Software Architecture: A Practical Guide Using UML", Wiley Eastern Limited, First Edition 2003, ISBN: 81-265-0363-7.

15CA3023 SOFTWARE QUALITY ASSURANCE

Prerequisite: 15CA3002 Software Engineering Practices

Credits: 3:0:0

Course Objective:

- To create awareness about the importance of Software Quality Assurance.
- To know the metrics applicable for Software Quality Assurance.
- To discuss about the barriers in successful implementation of Quality Management System.
- To understand the role of Software Configuration Management in Quality Assurance.
- To get acquainted with the standards applicable for Software Quality Assurance.

Course Outcome:

Learners will

- Get introduced to the concepts related to Software Quality Assurance.
- Understand the role of metrics in Software Quality Assurance.
- Get motivated to adopt quality practices in their software development assignments.
- Understand the procedure involved in ensuring Quality.
- Be aware of the standards applicable for Software Quality Assurance.

Software quality in Business context - Managing Software Quality in an Organization - Planning for Software Quality Assurance - Product Quality and Process Quality - Software Measurement Metrics - Walkthroughs and Inspections - Case Study on Walkthroughs and Inspections - Software Configuration Management - Review of Open Source SCM Tools - Software Quality Assurance and Standardization - Discussion on SQA in ITIL - Case Study on Preparation for a Software Audit.

Reference Books:

1. Nina S Godbole, “Software Quality Assurance Principles and Practice”, Narosa Publishing House, 2011 reprint, ISBN: 81-7319-550-1.
2. Mordechai Ben – Menachem, Garry S. Marliss, “Software Quality Producing Practical, Consistent Software”, Thomson Learning, 2012 reprint, ISBN: 981-240-204-7.
3. Ronald A Radice, “Software Inspections. How to cut costs, Improve Quality and Shorten Time Cycles of Software Projects”, Tata McGraw Hill, Second Edition, 2003, ISBN: 0-07-048340-X.
4. Stephen H. Kan, “Metrics and Models in Software Quality Engineering”, Pearson Education, Second Edition, ISBN: 81-297-0175-8.
5. Jeff Tian, “Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement”, Wiley-IEEE Computer Society Press, 2005, ISBN: 978-0-471-71345-6.
6. Daniel Glain, “Software Quality Assurance - From theory to implementation”, Pearson Education, First Impression 2009, ISBN: 978-81-317-2395-1.
7. G. Gordon Schulmeyer, “Handbook of Software Quality Assurance”, Artech House, Fourth Edition, 2007, ISBN-10: 1596931868 | ISBN-13: 978-1596931862.

15CA3024 FOUNDATIONS OF SOFTWARE TESTING

Credits: 3:0:0

Course Objective:

- To learn fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To learn the fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To apply software testing knowledge and methods in testing software projects.
- To learn the techniques and skills on how to use modern software testing tools.

Course Outcome:

Students will be able to

- Create Test plan for software testing project.
- Create, execute and perform complex maintenance related operations and all the types of testing.
- Use software testing methods and modern software testing tools for their testing projects.

Principles of Testing - Software Development Life Cycle Models - Case study to demonstrate the usage of various Model - White Box Testing - Black Box Testing - Write test case using equivalence partitioning, boundary value analysis, decision tables - Integration Testing - System and Acceptance Testing - Performance Testing - Regression Testing - Test Planning, Management, Execution and Reporting - Case study to develop Test Plan for an Application.

Reference Books:

1. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing Principle and Practices”, Sixth Impression, 2008, ISBN: 978 – 81 – 7758 – 121 – 8.
2. William E Perry, “Effective Methods for Software Testing”, John Wiley & Sons, Second Edition, 2005, ISBN: 9971–51–345–5.
3. Sandeep Desai, Abhishek Srivastava, “Software Testing a Practical Approach”, PHI Learning, 2012, ISBN: 978-81-2034-534-8.
4. S.A. Kelkar, “Software Quality and Testing - A Concise Study”, PHI Learning Private Limited, 2012, ISBN: 978-81-203-4628-4.
5. Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black, “Foundations of Software Testing ISTQB Certification”, Cengage Learning India Private Limited, 2007, ISBN-13: 978-81-315-0218-1.
6. Jason Germbi, “Developing Secure Software”, Cengage Learning India Private Limited, 2008, ISBN 13: 978-81-315-0888-6.
7. Illene Burnstien, “Practical Software Testing”, Springer International Edition, First Edition, 2004, ISBN: 81-8128-0 89-X.

15CA3025 ENTERPRISE RESOURCE PLANNING FUNDAMENTALS

Credits: 3:0:0

Course Objective:

- To understand the basics of Enterprise-wide Information Systems.
- To learn the common modules of ERP.
- To learn the methods to implement and maintain ERP packages.
- To learn about the technology and managerial aspects involved in ERP implementation and maintenance.
- To create awareness about the ERP career path.

Course Outcome:

Learners will

- Understand the need for integrated Information Systems.
- Understand the basic concepts of ERP.
- Get acquainted with the common modules of a standard ERP package.
- Understand the technical and managerial issues involved in ERP.
- Receive awareness on planning their career path in ERP domain.

Introduction - Basic Concepts - ERP and Technology - ERP Implementation – Organizing the implementation - ERP in Action - Business Process Reengineering Case Study - The Business Modules in an ERP Package - Review of ERP Packages - ERP: Present and Future - Case Studies on ERP for Manufacturing & Service Sectors - Careers in ERP - ERP Audit – Emerging Trends in ERP.

Reference Books:

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 2008, ISBN (10): 0-07-065664-9, ISBN (13): 978-0-07-065664-2.
2. Vinod Kumar Garg, N. K. Venkata Krishnan, “Enterprise Resource Planning – Concepts and Planning”, Prentice Hall.
3. Marianne Bradford, “Modern ERP: Select, Implement & Use Today's Advanced Business Systems”, Second Edition, 2010, ISBN 978-0-557-43407-7.
4. Rajesh Ray, “Enterprise Resource Planning - Text & Cases”, Tata McGraw Hill, 2011, ISBN 978-0-07-070088-8.
5. Mahedo Jaiswal, Ganesh Vanapalli, “Text Book of Enterprise Resource Planning”, Macmillan Publishers India Limited, 2009 re-print, ISBN 978-1403-92745-3.
6. Ellen F.Monk, Bret J. Wagner, “Concepts in Enterprise Resource Planning”, 4th Edition, 2013 re-print, Cengage Learning, ISBN-13: 9781111820398.
7. D.P Goyal, “Enterprise Resource Planning - A Managerial Perspective”, Tata McGraw Hill, 2011, 978-0-07-107797-2.

15CA3026 HUMAN-COMPUTER INTERACTION

Credits: 3:0:0

Course Objective:

- To understand user and user-centred design principles.
- To learn models of action, perception, cognition and interaction in human-machine systems.
- To know the methods of interaction analysis and interaction representation.

Course Outcome:

Learners will able

- To bridge the communication gap between psychology, design, and computer science on user interface development projects.
- To provide the future user interface designer with concepts and strategies for making design decisions.
- To expose the future user interface designer to tools, techniques, and ideas for interface design.
- To stress the importance of good user interface design.

HCI Foundations - Paradigms: The History of Interaction - HCI Interaction and Software Design Process - HCI in the Software Design Process - Case study - User Evaluation and Universal accessibility, HCI Models and Theories - Communication and Collaborative Models - Task Models, Dialogue Models, Formal Models and Rich Interaction, HCI Strands - Groupware, Augmented and Alternative Realities, Multimedia, Global Information Systems and the Web.

Reference Books:

1. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, “Human Computer Interaction”, Pearson Education, 3/e, 2004, ISBN: 9788131717035.
2. Ben Shneidermann and Catherine Plaisant, “Designing the User Interface: Strategies for Effective Human-Computer Interaction”, Pearson Education, 3/e, 2004, ISBN: 0321537351.
3. Galitz, “The essential guide to user interface design”, Wiley DreamTech, 2007, 3/e, ISBN: 978-0-470-05342-3.
4. Preece, Rogers, Sharps, “Interaction Design”, Wiley DreamTech, 3/e, 2011, ISBN: 0470665769.
5. Soren Lauesen, “User Interface Design”, Pearson Education, 2004, ISBN: 9780321181435.

15CA3027 SOFTWARE ARCHITECTURE LAB

Credits: 0:0:2

Course Objective:

- To impart the knowledge about the various software architecture tools.
- To understand and to develop different software architecture model.
- To understand business process model.

Course Outcome:

Upon completing the course, the student will be able to

- handle various software architecture tools.
- develop different architecture models.
- develop the Business process model using Enterprise Architect.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

Reference Books:

1. Albin, Stephen T, “The Art of Software Architecture: Design Methods and Techniques”, Wiley, Second Edition, 2003, ISBN: 81-265-0387-4.
2. Len bass, Paul Clements, Rick Kazman, “Software Architecture in Practice”, Pearson Education, ISBN: 81-7808-546-1.
3. Vasudeva Varma, “Software Architecture: A Case Based Approach”, First Impression, 2009, ISBN: 978-81-317-0749-4.
4. Christine Hofmeister, Robert Nord, Deli Soni, “Applied Software Architecture”, Addison Wesley Professional, 1999, 1st Edition, ISBN: 0-201-32571.
5. Frank Buschmann, Hans Rohnert, Kevin Henney, Douglas C. Schmidt, “Pattern-Oriented Software Architecture” Volume 1, 2, 3, 4, 5, Wiley, 1st Edition, ISBN: 9971-51-421-4.

15CA3028 SOFTWARE QUALITY TESTING LAB

Co-requisite: 15CA3024 Foundations of Software Testing

Credits: 0:0:2

Course Objective:

- To identify and document test cases for a given user interface design.
- To identify and document test cases for a given functionality.
- To understand how to test the software.

Course Outcome:

Students will be able to

- create test plan.
- document test cases.
- test software projects.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3029 ELECTRONIC COMMERCE DEVELOPMENT

Credits: 3:0:0

Course Objective:

- The scope of e-commerce in the realm of modern business.
- The technologies used to develop and deliver e-commerce applications.
- The marketing methods used in e-commerce.
- The security and implementation aspects of internet marketing.

Course Outcome:

Upon successful course completion, students will be have clear idea of

- contemporary e-commerce concepts and terminology.
- the processes and management decisions that are involved in launching, operating and managing business activity on the World Wide Web.
- technologies used to deliver e-commerce applications.

The Dawn of a Maturing Industry – The World Wide Web - The Technology of E-Commerce – Internet Architecture – Intranets and Extranets - E-Strategies and Tactics – Building E – Presence – Internet Marketing – Business – to – Business E-commerce - Security Threats and Payment Systems – Encryption: A Matter of Trust – Getting the Money - Managerial and Customer Related Issues – Going Online - Application Development of E-Commerce site.

Reference Books:

1. Elias M. Awad, “Electronic Commerce: From Vision to Fulfillment”, Prentice-Hall of India, Third Edition. 2007, ISBN: 978-81-203-3027-6.
2. Bharat Bhasker, “Electronic Commerce: Framework, Technologies and Applications”, Tata McGraw – Hill, 2007, ISBN: 0-07-060095-3.
3. Kenneth C. Laudon, Carol Guercio Traver, “E-Commerce – Business, Technology, Society”, Addison Wesley, Third Edition, 2007, ISBN: 0-13-173516-0.
4. Gray P. Schneider, James T. Perry, “Electronic Commerce”, Course Technology, 2000, ISBN: 0-7600-1179-6.
5. Parag Diwan, Sunil Sharma, “Electronic Commerce: A Managers Guide to E-Business”, Vanity Books International, First Indian Edition, 2000, ISBN: 81-7514-044-5.

15CA3030 SECURITY APPROACHES IN COMPUTING SYSTEMS

Credits: 3:0:0

Course Objective:

- To discuss about various computer security threats.
- To know about the cyber security and the security investments.
- Study of 'secure' behaviour on the operation of computers.

Course Outcome:

At the end of the course students will be able to understand

- the need of security systems.
- planning and exploring the information in a secured manner.
- devise methodologies for data privacy issues.

Security Problems in Computing - Elementary Cryptography - Encryption Algorithms - Programs Security - Database Security - Data Mining Security - Security in Networks - Computing Systems and their Basic Vulnerabilities - Intrusion Patterns and Tools - Administering Security - Security Mechanisms - Economics of Cybersecurity - Cryptographic Protocols – Detecting Security Breaches - Legal and Ethical Issues in Computer Security - Management Role in Security - Case studies on Kerberos, PGP.

Reference Books:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing, 4/E”, Prentice Hall, Third edition, 2007. ISBN-10: 0132390779, ISBN-13: 9780132390774.
2. Prof. Dr. Joachim Biskup, “Security in Computing Systems – Challenges, Approaches and Solutions”, Springer Berlin Heidelberg, 2009, ISBN 978-3-540-78.
3. Seymour Bosworth, M.E. Kabay, Eric Whyne, “Computer Security Handbook”, Wiley, Fifth Edition, 2009, ISBN: 978-0-471-71652-5.
4. Matt Bishop, “Introduction to Computer Security”, Addison Wesley, 2005, ISBN: 0-321-24744-2.
5. Jaydip Sen, “Cryptography and Security in Computing”, Intech publishers, 2012, ISBN 978-953-51-0179-6.

15CA3031 PROGRAMMING WITH ASP.NET USING C#

Prerequisite: 14CA3002 Object Oriented Programming using Java

Credits: 3:0:0

Course Objective:

- To develop simple web pages using ASP.NET.
- To understand about State Management in web applications.
- To build full-fledged web applications.

Course Outcome:

- Developing simple web pages using ASP.NET.
- Understanding state management in web applications.
- Developing a full-fledged web application in ASP.NET.

The .NET Framework – Visual Studio – Web Form Fundamentals – Web Controls - Web Application Development using various Web Controls - State Management – Error Handling (excluding logging, error pages and tracing) – Validation - Rich Controls – User Controls and Graphics – Styles, Themes and Master Pages - Website Navigation – ADO.NET Fundamentals – The Data Controls - Web application development using master page and data controls - XML – Security Fundamentals.

Reference Books:

1. Matthew MacDonald, “Beginning ASP.NET 3.5 in C# 2008”, Apress, Berkeley, CA, USA, Second Edition, 2008, ISBN: 978-81-8128-902-5.
2. Jesse Liberty, Dan Hurwitz & Dan Maharry, “Programming ASP.NET 3.5”, O’Reilly, 4th Edition, 2008, ISBN 13: 978-81-8404-611-3.
3. Anne Boehm, Joel Murach, “MURCHS ASP.net 3.5 Web Programming with C# 2008”, Shroff Publishers & Distributors, First Indian Reprint, 2008, ISBN : 978-890774-48-6.
4. Imar Spaanjaars, “Beginning Asp.Net 3.5 in C# and VB”, Wiley India (P) Ltd., Reprint 2010, ISBN: 978-81-265-1624-7.
5. Farhan Muhammad, Matt Milner, “Real World ASP.Net Best Practices”, APress, First Indian Reprint, 2003, ISBN: 81-8128-067-9.
6. Dreamtech Software Team, “ASP.Net 2.0 Black Book: Includes VB 2005 And C# 2005 Codes”, DreamTech Press, 2008, ISBN: 978-81-7722-455-9.
7. Stephen C. Perry, Atul Kahate, Stephen Walther, “Essentials Of .Net Related Technologies with a focus on C# XML ASP.NET and ADO.NET”, Pearson Education Asia, First Impression, 2009, ISBN: 978-81-317-2752-2.

15CA3032 C# PROGRAMMING

Prerequisite: 14CA3002 Object Oriented Programming using Java

Credits: 3:0:0

Course Objective:

- To get a clear understanding of the .NET framework.
- To understand the object oriented programming concepts of C#.
- To develop stand-alone applications using C#.

Course Outcome:

Student will be able to

- understand the concepts of .NET framework.
- to get a deep understanding of the object oriented programming concepts of C#.
- to develop stand-alone applications in C#.

The Philosophy of .NET – Core C# Programming Constructs - Encapsulated Class Types – Inheritance and Polymorphism – Structured Exception Handling - Application development using Inheritance and polymorphism - Interfaces – Collections and Generics – Delegates - Application of interfaces, collections, generics and delegates - .NET Assemblies – Processes, AppDomains and Object Contexts - Multithreaded Applications - Windows Forms - ADO.NET: The Connected Layer - The Disconnected Layer - Database applications.

Reference Books:

1. Andrew Troelsen, “Pro C# 5.0 and the .Net 4.5 Framework”, Apress Private Limited, Sixth Edition, 2012, ISBN: 978-1-4302-4233-8.
2. Andrew Troelsen, “Pro C# 2008 and the .NET 3.5 Platform”, Apress, Springer India Private Limited, Fourth Edition, 2007, ISBN 978-81-8128-955-1.
3. Herbert Schildt, “The Complete Reference C# 2.0”, Tata McGraw-Hill Publishing Company Limited, 6th reprint 2007, ISBN-13: 978-0-07-061139-9.
4. Joseph Albahari, Ben Albahari, “C# 5.0 In a Nutshell”, O’Reily Media Inc., Fifth Edition, 2012, ISBN: 978-1-449-32010-2.
5. John Sharp, “Microsoft Visual C# 2012 Step by Step”, Microsoft Press, 2013, ISBN: 978-0-7356-6801-0.
6. Daniel Solis, “Illustrated C# 2012”, Apress Private Ltd, Fifth Edition, 2012, ISBN: 978-1-4302-4278-9.
7. Yashavant Kanetkar, “C#.Net Fundamentals”, BPB Publications, First Edition, 2003, ISBN: 81-7656-580-6.

15CA3033 AJAX PROGRAMMING USING ASP.NET

Prerequisite: 14CA3002 Object Oriented Programming using Java

Credits: 3:0:0

Course Objective:

- To gain experience about a strong comprehension of the new concepts and development techniques that ASP.NET AJAX brings to ASP.NET.
- To help students to understand the AJAX features and techniques.
- To develop applications using ASP.NET AJAX components.

Course Outcome:

- Students will be able to use AJAX features and techniques in web development.
- Students will be able to develop AJAX programs for asynchronous network calls.
- Students will have adequate knowledge based on ASP.NET AJAX components.

ASP.NET AJAX Basics – Introducing ASP.NET AJAX, First steps with the Microsoft Ajax library, JavaScript for Ajax Developers - Exploring the Ajax server extensions - Making asynchronous network calls, Partial-page rendering with UpdatePanels - ADVANCED Techniques-Under the hood of the UpdatePanel, ASP.NET AJAX client components - Building Ajax-enabled controls - Developing with the Ajax Control Toolkit - ASP.NET AJAX Futures - XML Script - Dragging and dropping - Developing Applications using update panels and Ajax Client component.

Reference Books:

1. Alessandro,David Barkol, Rama Krishna Vavilala, “ASP.NET AJAX IN ACTION”. Dreamtech Press, 2008. ISBN 10: 81-7722-778-5, ISBN 13: 978-81-77-22-778-9
2. Christian Wenz, “Programming ASP.Net AJAX”, O’Reilly, First Indian Reprint, 2007. ISBN 10: 81-8404-383-X, ISBN 13: 978-81-8404-383-9.
3. Rebacca M. Riordan, “Head FirstAjax”, Shroff Publishers O’reiley, 2008, ISBN: 978818405819.
4. Jerry. Lee Jr Ford, “Ajax programming for Absolute Beginning”, Course Technology, 2009, ISBN: 1435455312.
5. Michael Mahemoff, “Ajax Design patterns,” O’reiley Publisher, 2006, ISBN: 0596553617.

15CA3034 XML TECHNOLOGIES

Credits: 3:0:0

Course Objective:

- Focus on methods of using interconnected networks to effectively distribute text, audio, and video information.
- To build comprehensive business applications using XML Markup Language technologies.
- To learn the concepts of XSL.

Course Outcome:

Students will be able to

- develop interactive web pages.
- explore the concepts of XML .
- explore the concept of XSL.

Introducing CSS - Fonts and Text Styles - Selectors - Backgrounds and Color Gradients in CSS - Creating Boxes and Column - Developing web page using CSS - List - Tables - outlines - Positioning with CSS - Effects, Frames and Controls in CSS - Creating Boxes and Columns using CSS - Introduction to XML - Fundamentals of Document Type Definition - Developing a web page using XML and DTD - XML Namespaces - Creating XML Schema - Developing an XML Schema using Simple Type Elements - Transforming XML with XSL - Working with XPath, XLink and XPointer - Implementation of XPath.

Reference Books:

1. Jon Duckett, "Beginning Web Programming with HTML, XHTML and CSS", Wiley India Pvt. Ltd, 2nd Edition, 2011, ISBN: 978-81-265-1697-1.
2. Kogent Learning Solutions Inc., "HTML 5 Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP & jQuery Black Book", DreamTech Press, 2013, ISBN: 978-93-5004-095-9.
3. Ron Schmelzer, Travis VAndersypen et al, XML and Web Services, Dorling Kindersley India Pvt. Ltd, 2004, ISBN 9788131718698.
4. Joe Fawcett, Danny Ayers, Liam R.E.Quin, "Beginning XML", Wrox, 5th Edition, 2012, ISBN: 978-1-1181-6213-2.
5. James L. Mohler, Jon M.Duff, "Designing Interactive Web Sites", Cengage Learning, Second Indian Reprint 2009, ISBN 13: 978-81-315-0570-0.
6. Heather Williamson, "XML: The Complete Reference", Tata McGraw - Hill Education, 2001, ISBN: 9780070447257.
7. Erik T. Ray, "Learning XML" Second Edition, O'Reilly, 2009, ISBN: 9788184048964.

15CA3035 CLUSTER COMPUTING

Credits: 3:0:0

Course Objective:

- It focuses on Cluster Computing requirements, Single System image, High Performance and wide-area Computing.
- It covers system area networks, light-weight communication protocols.
- It discusses techniques and algorithms of process scheduling, migration and load balancing.

Course Outcome:

Students will have

- knowledge about various protocols and techniques of cluster computing.
- knowledge about High Speed Networks.
- knowledge about the techniques and algorithms of process scheduling, migration and load balancing.

Cluster Computing at a Glance - Cluster Setup and its Administration - Dependable Clustered Computing- Deploying a High Throughput Computing Cluster - High Speed Networks- Lightweight Messaging Systems – Job and Resource Management Systems - Scheduling Parallel Jobs on Clusters - Load Sharing and Fault Tolerance Manager - Parallel Program Scheduling Techniques- Customized Dynamic Load Balancing - Mapping and Scheduling on Heterogeneous systems .

Reference Books:

1. Rajkumar Buyya, “High performance Cluster Computing”, Volume-1, Pearson education, Second Impression, 2008, ISBN: 978-81-317-1693-9.
2. Prabhu C.S.R., “Grid and Cluster Computing”, First Edition 2008, ISBN: 978-81-203-3428-1.
3. Karl Heinz Hoffmann, Arnd Meyer, “Parallel Algorithms and Cluster Computing: Implementations, Algorithms and Applications”, Springer, ISBN: 978-3-540-33539-9.
4. Rajkumar Buyya, Clemens Szyperski, “Cluster Computing”, Nova Science Pub Inc, First Edition 2001, ISBN: 978-1590331132.
5. Damian M Lyons, “Cluster for Robotics and Computer Vision”, World Scientific Publishing Company, 2009, ISBN: 978-981-83-635-9.
6. Tadrash Shah, “Cluster Using MPI Paradigm”, Lap Lambert Academic Publishing, 2012, ISBN: 978-3-659-29618-5.
7. Dan Grigoras, “Advanced Environments, Tools and Applications for Cluster Computing”, Springer, 2002, ISBN: 978-3-540-43672-0.

15CA3036 INTERNET PROGRAMMING

Credits 3:0:0

Course Objective:

- To familiarize the basic components of how to develop a web page using HTML.
- To understand how to develop dynamic web pages using PHP.
- To familiarize web application development using PHP.

Course Outcome:

After the completion of the course, students will be able to

- Develop a basic web page.
- Include format and personalize the web pages.
- Use PHP to build dynamic web pages.

Overview of HTML 5 – Working with Text - Creating Tables - Working with forms - Application Development using HTML - PHP basics - Functions - Object-oriented PHP - Application Development to validate the HTML form using PHP - Strings and Regular Expressions - Working with the File and Operating System - Application Development to validate the HTML using Regular Expression - Authentication - Handling File Uploads - Session Handlers – MySQL Datatypes and Attributes - Application Development with MySQL - PHP's MySQLi Extension - Stored Routines - Importing and Exporting Data.

Reference Books:

1. Jason Gilmore, “Beginning PHP and MySQL 5, From Novice to Professional”, Apress, First Indian Reprint, 2007, ISBN: 978-81-8128-673-4.
2. Kogent Learning Solutions Inc, “HTML 5 Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP and jQuery Black Book”, Dreamtech Press, Reprint 2013, ISBN: 978-93-5004-095-9
3. Chris Bates “Web Programming: Building Internet Applications”, Wiley Dreamtech India (P) Ltd., Third Edition, 2009. ISBN: 978-81-265-1290-4.
4. Tim Converse and Joyce Park with Clark Morgan, “PHP 5 and MySQL Bible”, Wiley India Pvt.Ltd., 2008, ISBN: 10:81-265-0521-4.
5. Rasmus Lerdorf and Kevin Tatroe, “Programming in PHP”, O’Reilly and Associates, 2002, ISBN: 1-56592-610-2.
6. Robert Sheldon, Geoff Moes, “My SQL”, WILEY, First Edition, 2005, ISBN: 81-265-0592-3.
7. Janet Valade, “PHP5 and MySql Projects”, Wiley DreamTech India Pvt. Ltd., 2005, ISBN: 81-265-0619-9.

15CA3037 WEB SERVICE DEVELOPMENT

Prerequisite: 14CA3002 Object Oriented Programming using Java

Credits: 3:0:0

Course Objective:

- To gain knowledge to develop the web services.
- To elaborate discussion about SOAP, XML messaging and Java API.
- To understand web service standards and build architecture for web communication.

Course Outcome:

Students will be able to

- adopt the web service standards and build architecture for web communication.
- describe and discover the web services using SOAP and UDDI.
- develop and deploy JAXM and JAX RPC based web services.
- secure web services for reliable communication.

Introduction to Web Services – Web Services Architecture – Developing web services - Web Services and SOAP – Creating SOAP code – Developing SOAP Web Service using Java - Web Services Definition Language – Creating a WSDL Description and Discovery - Java Web Services Developer Pack - Java API for Remote Procedure Calls - Web Services Security - A Case Study of a Real time Web Service.

Reference Books:

1. Ramesh Nagappan, Robert Skoczylas and Rima Patel Sriganesh, “Developing Java Web Services”, Wiley Publishing Inc., 2005, ISBN: 81-65-0499-4.
2. Ron Schmelzer, Travis Vandersypen, Jason Bloomberg, “XML and Web Services Unleashed”, Pearson Education Inc., First Impression, 2008, ISBN: 978-81-317-1869-8.
3. Martin Kalin, “Java Web Services - Up and Running”, O’Reilly Publishers, First Edition, 2009, ISBN-13: 978-0596521127.
4. Mark D. Hansen, “SOA using Java Web Services”, Prentice Hall Publishers, 2007, ISBN-13: 978-0130449689.
5. Richard Monson Haefel, “J2EE Web Services”, Addison-Wesley Professional, First Edition, 2003, ISBN-13: 978-0321146182.
6. Thomas Erl, “Service-Oriented Architecture (SOA): Concepts, Technology, and Design”, Prentice Hall, 2005, ISBN: 01318585802000.
7. Sandeep Chatterjee, James Webber, “Developing Enterprise Web Services”, Pearson Education, 2004, ISBN: 9780131401600.

15CA3038 SOFTWARE DESIGN PATTERNS

Prerequisite: 15CA3002 Software Engineering Practices

Credits: 3:0:0

Course Objective:

- To learn the purpose of design patterns.
- To learn about the ways that design patterns are documented and classified.
- To learn about the various solutions that has developed and evolved over time.

Course Outcome:

Students will be able to

- describe simple and elegant solutions to specific problems in object oriented software design.
- make the designs more flexible, modular, reusable and understandable.

Introduction: Design Pattern - The Catalog of Design Patterns - How design patterns solve Design problems - A case Study: Designing a Document Editor - Creational Patterns - Abstract Factory - Builder - Factory Method - Prototype - Singleton - Structural Patterns - Adapter - Bridge - Composite - Decorator - Facade - Flyweight - Proxy - Behavioral Patterns - Chain of Responsibility – Command - Interpreter - Iterator - Mediator - Memento - Observer - State - Strategy - Template Method.

Reference Books:

1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, “Design Patterns: Elements of Reusable object oriented Software”, Addison Wesley, 1995, ISBN: 0-201-45563-3.
2. Alan Shalloway, James Trott, “Design Patterns Explained: A New Perspective on Object Oriented Design”, Addison Wesley, 2002, ISBN: 0-201-71594-5.
3. James William Cooper, “Java Design Pattern: A tutorial”, Addison Wesley, 2000, ISBN: 0-201-48539-7.
4. Eric T Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra, “Head First Design Patterns”, O'Reilly Media, First Edition, 2004, ISBN: 978-0596007126.
5. Scott Millet, “Professional ASP.NET Design Patterns”, Wiley Publishing, 2010, ISBN: 978-0470292785.
6. James W. Cooper, “Java Design Patterns”, Addison Wesley, 2000, ISBN: 978-0201485394.
7. William Sandors, “Learning PHP Design Patterns”, O'Reilly Media, First Edition, 2013, ISBN: 978-1-449-34491-7.

15CA3039 SEMANTIC WEB CONCEPTS

Credits 3:0:0

Course Objective:

- To know the latest developments in the Semantic Web scenario.
- To know about useful Semantic Web concepts and tools.
- To familiarize the concept of RDF model

Course Outcome:

- Understand the concept structure of the semantic web and how semantic technology revolutionizes the WWW
- Describe logic semantics and inference with OWL.
- Use ontology engineering approaches in semantic applications.

Semantic web vision - Semantic web Technologies - A Layered Approach - Introduction to XML Language- Structuring - Namespaces - Addressing and Querying XML Documents - Processing - RDF Basic Ideas-RDF: XML syntax – RDF Schema - Case study on creating a simple ontology of motor vehicles- Introduction to OWL - Description of the OWL Language - Layering of OWL - Case study on wildlife ontology with basic classes and their subclass relationships-Rules-Description Logic programs - Non monotonic Rules- rule markup language

Reference Books:

1. Grigorios Antoniou and Van Hermelen, “A Semantic Web Primer”, PHI Learning Private Limited, Second Edition, 2008, ISBN: 978-81-203-4054-1.
2. Karin K. Breitman, Marco Antonio Casanova, Walter Truszkowski, “Semantic Web Concepts, Technologies and Applications, Springer International Edition, First Indian Reprint, 2010, ISBN: 978-81-8489-397-7.
3. Dieter Fensel, James A. Hendler, Henry Lieberman and Wolfgang Wahlster, “Spinning the Semantic Web: Bringing the World Wide Web to its full potential”, MIT Press, 2005, ISBN: 978-0262562126.
4. Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, “The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management”, John Wiley and Sons, 2003, ISBN: 0-471-43257-1.
5. John Davies, Rudi Studer, Paul Warren, “Semantic Web Technologies: Trends and Research in Ontology-Based Systems”, Wiley India Private Limited, 2012, ISBN: 978-8126534333.
6. Toby Segaran, Colin Evans, Jamie Taylor, “Programming the Semantic Web”, O’ Reilly, 2009, ISBN: 978-0596153816

15CA3040 INFORMATION STORAGE NETWORKS

Credits 3:0:0

Course Objective:

- Evaluate storage architecture; understand logical and physical components of a storage infrastructure including storage subsystems
- Describe storage networking technologies such as FC-SAN, NAS, IP-SAN and data archival solution – CAS
- Identify different storage virtualization technologies and their benefits
- Understand business continuity solutions including, backup and recovery technologies, and local and remote replication solutions

Course Outcome:

Upon successful completion of this course, students will be able to:

- Design and evaluate the performance of the storage architecture for a Business
- Identify the suitable storage networking technology and virtualization technology for ISM implementation
- Provide an articulate business continuity solutions

Storage Systems-Storage System Environment – disk drive – RAID- Storage Networking Technologies Types of DAS – DAS benefits and limitations – Disk Drive Interfaces – SCSI – Storage Area Network – Fibre channel – SAN evolution – SAN components – FC Connectivity – Fibre channel ports – Fibre Channel Architecture – Fibre Channel login types – FC Topologies. NAS– Advanced Storage Networking and Virtualization -Storage Virtualization-Business Continuity –Local Replication- Remote replications

Reference Books:

1. EMC Corporation, “Information Storage and Management”, Wiley India,2010, ISBN:978-81-265-2147-0.
2. EMC Corporation, “Information Storage and Management: Storing, Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments”, 2nd Edition, Wiley, May2012, ISBN: 978-1-118-09483-9.
3. Alan Dennis, Alexandra Durcikova, “Fundamentals of Business Data Communications”, 11th Edition International Student Version, Dec, 2011, ISBN: 978-1-118-09792-2
4. Dr. Arun Kumar R, “Easy Oracle Automation-Oracle 10g, Automatic Storage, Memory and Diagnostic Features”, 2004, ISBN 0-9745993-6-0.
5. Robert Spalding, “Storage Networks: The Complete Reference “, Tata McGraw Hill, Osborne, 2003.
6. Marc Farley, “Building Storage Networks”, Tata McGraw Hill, Osborne, 2001.
7. Meeta Gupta, “Storage Area Network Fundamentals”, Pearson Education Limited, 2002.

15CA3041 DATA VISUALIZATION TECHNIQUES

Credits 3:0:0

Course Objective:

- To familiarize visualization techniques.
- To understand how to design dashboard.
- To familiarize in designing dashboard.

Course Outcome:

- After the completion of the course, students will be able to
- Design a Dashboard.
- Understand the visualization techniques.
- Understand the principle of visual perception.

Information Visualization - Time series analysis - Deviation analysis - Distribution analysis- Correlation analysis - Multivariate analysis - Introduction about dashboard - Variations in Dashboard Uses and Data - Common Mistakes in Dashboard Design - Tapping into the Power of Visual Perception - Eloquence Through Simplicity - Effective Dashboard Display Media - Designing Dashboards for Usability - various case studies on Dashboards

Reference Books:

1. Stephen Few, "Now you see it: Simple Visualization techniques for quantitative analysis", Analytics Press, 2009, ISBN: 0970601980
2. Stephen Few, "Information dashboard design: The effective visual communication of data", O'Reilly, 2006, ISBN: 978-0-596-10016-2
3. Edward R. Tufte, "The visual display of quantitative information", Graphics Press, Second Edition, 2001, ISBN: 0-9613921-4-2.
4. Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013, ISBN: 978-1-118-46219-5.
5. Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment", O'Reilly, 2008, ISBN: 978-0-596-51455-6.
6. Gert H. N., Laursen, Jesper Thorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010, ISBN: 978-0-596-51455-6.
7. Evan Stubbs, "The value of business analytics: Identifying the path to profitability", Wiley, 2011, ISBN: 978-1-118-09338-2.

15CA3042 INFORMATION RETRIEVAL

Credits: 3:0:0

Course Objective:

- Make known to the theoretical underpinnings of information retrieval, an active and rapid growing branch of web science and engineering
- Enable students to gain practical experience in building simple, but true-to-practice information retrieval software
- Open the door to the incredible job opportunities in the major Internet companies

Course Outcome:

Students will be able to

- understand how to pre-process text documents by tokenization, stemming, and removing stopwords
- understand the algorithms, techniques and software used in info retrieval
- to apply Precision, Recall, F-Score, nDCG to evaluate an information retrieval system
- to apply statistical language models with smoothing techniques
- to understand Google's PageRank algorithm
- to understand the algorithm, techniques used in opinion mining

Overview – Text processing – Query Operations – Retrieval models – Boolean model, Vector space model, TF-IDF weighting, Text-similarity metrics - Statistical language model, Page Rank - Social Network analysis – Opinion mining – Document Sentiment Classification – Aspect Based Sentiment Analysis.

Reference Books:

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schutze, “Introduction to Information Retrieval”, Cambridge University Press, 2008, ISBN: 0521865719, 9780521865715.
2. Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, “Information Retrieval: Implementing and Evaluating Search Engines”, MIT Press, 2010, ISBN: 0262026511, 9780262026512.
3. W. Bruce Croft, Donald Metzler, Trevor Strohman, “Search Engines: Information Retrieval in Practice”, Addison-Wesley, 2010, ISBN : 0136072240, 9780136072249
4. Soumen Chakrabarti, “Mining the web : Discovering Knowledge from Hypertext Data, Part 2”, Morgan Kaufmann, 2003, ISBN : 1558607544, 9781558607545
5. Bing Liu, Sentiment Analysis and Opinion Mining, Morgan & Claypool Publishers, May 2012. ISBN: 1608458849.
6. Bing Liu, “Web Data Mining – Exploring Hyperlinks, Contents and Usage Data”, Second Edition July 2011. First Edition, Dec 2006, Springer, ISBN: 3642194605.

15CA3043 MACHINE LEARNING

Credits: 3:0:0

Course Objective:

- To get the knowledge about machine learning algorithms
- To learn about parametric and non parametric methods
- To combine multiple learners

Course Outcome:

- The students will get the knowledge about the machine learning algorithms
- The students can able to combine multiple learners.
- The students are familiarized in various parametric and non parametric methods.

Introduction to Machine Learning - Examples of Machine Learning Applications - Parametric Methods - Nonparametric Methods - Linear Discrimination - Multilayer Perceptrons - Local Models - Kernel Machines - Graphical Model - Combining Multiple Learners - Reinforcement Learning - Elements of Reinforcement Learning - Model Based Learning and Temporal Difference Learning - Generalization - Partially Observed States.

Reference Books:

1. Ethem Alpaydin, "Introduction to Machine Learning", PHI Learning Private Limited, Second Edition 2010, ISBN- 978-81-203-4160-9.
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, First Edition, 2006, ISBN: 978-0-387-31073-2
3. Stephen Marsland, "Machine Learning: An algorithm Perspective", Series Editor, First Edition, 2009, ISBN-10: 1420067184
4. David Barber, "Bayesian Reasoning and Machine Learning", Cambridge University Press, 2012
5. Kevin P. Murphy., "Machine Learning: A Probabilistic Perspective", MIT, 2012. ISBN: 9780262018029

15CA3044 SCRIPTING USING PYTHON

Credits: 3:0:0

Course Objectives:

- Acquire fundamental knowledge on the concepts of python scripting.
- Understand the system and network security programming.
- Acquire knowledge on developing web servers and clients.
- Understand various exploitation techniques.

Course Outcomes:

- Understand the basic techniques used to create scripts for automating system administration tasks.
- Demonstrate the use of Python to prototype applications.
- Demonstrate the use of regular expressions in processing text.
- Demonstrate the use of Python in developing applications using networking and databases.

The Python Language - Object Oriented Python - Exception - Modules - Core Built-ins-Strings and Regular Expressions - File and Text Operations - Persistence and Databases - Time operations - Controlling Execution - Threads and Processes - Testing, Debugging and Optimizing - Client- Side Network Protocol Modules - CGI Scripting and Alternatives - MIME and Network Encodings-Structured Text: HTML - Structured Text: XML - Extending and Embedding Classic Python - Creating your own Application Code.

Reference Books:

1. Alex Martelli, "Python : In A Nutshell", Shroff Publishers & Distributors, Second Edition, 2008, ISBN: 978-81-8404-540-6.
2. Magnus Lie Hetland, "Beginning Python: From Novice to Professional", Apress Publisher, First Indian Reprint, 2009. ISBN: 978-81-8489-092-1.
3. Alex Martelli, Anna Martelli Ravenscroft, David Ascher, "Python Cookbook", Shroff Publishers & Distributor, Second Edition, 2005, ISBN 81-7366-479-X.
4. Wesley J. Chun, "Core Python Programming", Pearson Education Asia Publisher, Second Edition, 2007, ISBN: 81-317-1188-9.
5. Mark Lutz, "Programming Python" Shroff Publishers & Distributors, Second Edition, 2004, ISBN: 81-7366-750-0.
6. Dana Moore, Raymond Budd, William Wright, "Python Frameworks: Web 2.0 Programming with Django and Turbogears" Wiley India (P) Ltd., First Edition, 2007, ISBN: 978-81-265-1490-8.

15CA3045 WEB SERVICE LAB

Co-requisite: 15CA3037 Web Service Development

Credits: 0:0:2

Course Objective:

- To develop skills in designing and implementing web services.
- To enable to deploy the web service.
- To build an interface and avail the web service facilities.

Course Outcome:

Students will be able to

- adopt the web service standards and build architecture for web communication.
- describe and discover the web services using SOAP and UDDI.
- develop and deploy JAXM and JAX RPC based web services.
- secure web services for reliable communication.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3046 C# PROGRAMMING LAB

Co-requisite: 15CA3032 C# Programming

Credits: 0:0:2

Course Objective:

- To develop applications using object oriented concepts in C#.
- To develop applications using delegates, interface, collections and generics.
- To develop applications using database connectivity.

Course Outcome:

- Student will develop an application using object oriented concepts in C#.
- Students will develop applications using delegates, interfaces, collections and generics.
- Students will develop applications using database connectivity.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3047 ASP.NET USING C# PROGRAMMING LAB

Co-requisite: 15CA3031 Programming with ASP.net using C#

Credits: 0:0:2

Course Objective:

- To develop web applications with database connectivity.
- To develop web pages using all the advanced GUI controls.
- To develop online applications with state management.

Course Outcome:

- Students will be able to create interactive web pages.
- Students will be able to develop web applications with state management.
- Students will be able to develop web applications using database connectivity.

15CA3048 PROFESSIONAL SKILLS

Credits: 0:0:2

Course Objective:

- To solve numerical aptitude problems.
- To solve logical reasoning problems.
- To solve verbal reasoning problems.

Course Outcome:

The learners will be able to

- Solve numerical aptitude problems.
- Solve logical reasoning problems.
- Solve verbal reasoning problems.
- Expertise in soft skills.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

Reference Books:

1. B. S. Sijwali, Indu Suwali, “A New Approach to Reasoning Verbal & Non-verbal”, Arihant, 2012 Edition, ISBN: 978-8183482745.
2. B.S.Sijwali, “The Hand on Guide to Analytical Reasoning and Logical Reasoning”, Arihant, 2013 Edition, ISBN: 978-9350942482.
3. Ananta Ashisha, “Accredited Guide to Data Interpretation and Data Sufficiency”, Arihant, 2012 Edition, ISBN: 978-9350942123.
4. Dr. R. S. Aggarwal, “An Advanced Approach to Data Interpretation”, S Chand, 1986, ISBN: 978-8121913591.

15CA3049 MULTIMEDIA LAB

Credits: 0:0:2

Course Objective:

- To impart a decent practical knowledge on the use of animation software.
- To enrich creativity in the students.
- To impart core concepts of digital arts and illustration.

Course Outcome:

- Students will gain a practical knowledge in working with animation.
- Students will be able to work with digital arts and illustration.
- Students will be able to work with 3D animation.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

Reference Books:

1. Brian Underdahl, "Macromedia Flash MX: The Complete Reference", McGraw-Hill Osborne Media, 2005, ISBN-10: 0072134860 ISBN-13: 978-0072134872.
2. David Stiller, Rich Shupe, Jen deHaan, Darren Richardson, "The ActionScript 3.0 Quick Reference Guide: For Developers and Designers Using Flash CS4 Professional", Adobe Developer Library; 1st Edition, 2008, ISBN-10: 0596517351 ISBN-13: 978-0596517359.
3. Colin Moock, "ActionScript for Flash MX: The Definitive Guide, Second Edition", O'Reilly & Associates, 2005, ISBN 059600396X.
4. Robert Reinhardt, Joey Lott, "Macromedia Flash MX ActionScript Bible", John Wiley & Sons, 2002, ISBN 0764536141.
5. Derek Franklin and Jobe Makar, "Macromedia Flash MX 2004 ActionScript: Training from the Source", Macromedia Press, 2006, ISBN 0321213432.
6. David Vogelee and Matthew Pizzi, "Macromedia Flash MX Professional 2004 Unleashed", Sams, 2006, ISBN: 067232606X.

15CA3050 XML TECHNOLOGIES LAB

Co-requisite: 15CA3034 XML Technologies

Credits: 0:0:2

Course Objective:

- To give an insight about creation of web pages and learn how a document should appear.
- To create web pages by implementing all XML concepts.
- To create web pages by using style sheets.

Course Outcome:

Students will be able to

- Design websites using markup language.

- Develop web page using XML schema.
- Create interactive web pages using CSS and XML.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3051 INTERNET PROGRAMMING LAB

Co-requisite: 15CA3036 Internet Programming

Credits: 0:0:2

Course Objective:

- To develop application development skills in PHP.
- To familiarize in array, object oriented programming using PHP.
- To develop web applications using cookies and session.

Course Outcome:

- Students will have the proficiency to develop web based applications using PHP.
- Students will be able to implement user interface validation procedures.
- Students will be able to design and develop interactive, executable web applications.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3052 COMPUTER ORGANIZATION AND ARCHITECTURE

Credits: 3:0:0

Course Objective:

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study the different ways of communicating with I/O Devices and standard I/O interfaces.
- To study the hierarchical memory system including Cache Memories and virtual memory.

Course Outcome:

Students will have thorough knowledge about

- Basic structure of a Digital Computer.
- Arithmetic operations of binary number system.
- Organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.

Digital Logic Circuits - Apply Map Simplification to simplify Boolean Expressions - Digital Components - Data Representation - Illustrate all the conversions of the Number Systems - Register Transfer and Micro-operations - Basic Computer Organization and Design - Central Processing Unit - Computer Arithmetic - Memory Organization.

Reference Books:

1. M. Morris Mano, "Computer System Architecture", Pearson Education, Third Edition, 2007, ISBN: 978-81-317-0070-9.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Pearson Education, Seventh Edition, 2008, ISBN: 978-81-7758-993-1.
3. Nicholas Carter, "Schaum's outline of Computer Architecture", Tata McGraw Hill, First Edition, 2006, ISBN: 0-07-13627-X.
4. John L. Hennessy and David A Patterson, "Computer Architecture - A quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fourth Edition, 2007, ISBN: 978-0-12-370490-0.
5. Andrew S. Tanenbaum, Todd Austin, "Structured Computer Organization", Prentice Hall, Sixth Edition, 2013, ISBN-10: 0132916525, ISBN-13: 9780132916523.
6. Alka Vishwa, "Computer Organization and Architecture", I.K. International Publishing House, First Edition, 2013, ISBN: 978-93-82332-47-3.
7. Douglas E. Comer, "Essentials of Computer Architecture", Addison-Wesley, First Edition, 2005, ISBN-10: 0131491792, ISBN-13: 9780131491793.

15CA3053 PROGRAMMING IN C

Credits: 3:0:0

Course Objective:

- To gain experience about structured programming.
- To help students to understand the implementation of C language.
- To understand various features in C.

Course Outcome:

Students will be able to

- Solve the given problem using the syntactical structures of C language.
- Develop, execute and document computerized solution for various problems using the features of C language.
- Read and write C program that uses pointers, structures and files.

Introduction to Computers – Introduction to C Programming – Basic Input/Output - Library Functions - Application Development using library functions - Control Structures – Developing programs using control structures - User Defined Functions – Storage Classes - Application Development using user defined functions - Arrays and Strings – Application Development using Arrays and Strings - Structures and Union - Application Development using Structures and Arrays of Structures - Pointers – Application Development using Pointers - Dynamic Memory Allocation - Application Development using Dynamic Memory Allocation - File Handling - Developing a real time application using Files.

Reference Books:

1. Byron Gottfried, “Programming with C”, Schaum’s Outlines, Tata McGraw Hill Publishing Company Limited, Third Edition, 2011, ISBN: 978-0-07-014590.
2. K R Venugopal, S R Prasad, “Mastering in C”, Tata McGraw Hill Publishing Company Limited, First reprint 2006, ISBN: 0-07-061667-1.
3. Stephen G. Kochan, “Programming in C, A Complete Introduction to the C Programming Language”, Sams Publishing, Third Edition, 2005, ISBN: 0-672-32666.
4. Yashavant Kanetkar, “Let us C”, Eighth Edition, Jones & Bartlett Publishers, 2008.
5. Behrouz A. Forouzan & Richard F. Gilberg, “A Structured Programming Approach using C”, Thomson Course Technology, Third Edition, 2006, ISBN-13: 978-0534491321.
6. Brian W Kernighan, Dennis M Ritchie, “The C Programming Language”, Prentice Hall, Second Edition, 1988, ISBN: 0-13-110370-9.
7. V. V. Muniswamy, “C & Data Structures”, I. K International Publishing, 2009, ISBN: 978-93-80026-83-1.

15CA3054 PROGRAMMING IN C++

Prerequisite: 15CA3053 Programming in C

Credits: 3:0:0

Course Objective:

- To get a clear understanding of object-oriented concepts.
- To understand object oriented programming through C++.
- To solve real time problems using oriented programming approach.

Course Outcome:

Students will be able to

- gain the basic knowledge on Object Oriented concepts.
- develop applications using Object Oriented Programming Concepts.
- implement features of object oriented programming to solve real time problems.

Introduction to Object Oriented Programming - Characteristics of object oriented languages - Structures and Enumerations - Functions - Solving problems using modular approach - Storage Classes - Objects and Classes – Object oriented application development - Arrays and Strings - Developing programs using arrays and strings - Inheritance - Aggregation - Application development using inheritance – Polymorphism - Function Overloading - Programs using function overloading –Operator Overloading - Demonstration of Operator Overloading - Pointers – Demonstration of Pointers in real time applications - Virtual Functions – Implementing Virtual Functions for solving problems - Templates - Application Development using Templates - Streams and Files – Exception Handling - Real time application development using streams and files.

Reference Books:

1. Robert Lafore, “Object Oriented Programming in C++”, Pearson Education, Sams Publishing, Fourth Edition, Sixth Impression, 2011, ISBN: 978-81-317-2282-4.
2. K. R. Venugopal, Rajkumar Buyya, T. Ravishankar, “Mastering C++”, Tata McGraw Hill Publishing Company Limited, 35th Reprint, 2010, ISBN-13: 978-0-07-463454-7, ISBN-10: 0-07-4634542.
3. Stanley B. Lippman, Josee Lajoie, Barbaro E. Moo, “C++ Primer”, Addison Wesley, Fifth Edition, 2013, ISBN-13: 978-0-321-71411-4.
4. Bjarne Stroustrup, “Programming Principles and Practice using C++”, Addison Wesley, Pearson Education, 2009, ISBN: 978-0321543721.
5. Bjarne Stroustrup, “The C++ Programming Language”, Pearson Education, Fourth Edition, 2013, ISBN: 978-0-321-56384-2.
6. Herbert Schildt, “C++ - The Complete Reference”, Tata McGraw – Hill, Fourth Edition, 2003, ISBN: 0-07-053246-X.
7. Gary J. Bronson, “Object Oriented Program Development using C++: A Class Centered Approach”, Course Technology Publisher, First Edition, 2005, ISBN-13: 978-0619159665.

15CA3055 COMPILER DESIGN

Prerequisite: 15CA3053 Programming in C

Credits: 3:0:0

Course Objective:

- To introduce the major concept areas of language translation and compiler design.
- To develop an awareness of the function and complexity of modern compilers.
- To introduce various phases of compiler design.

Course Outcome:

- Students will have a concrete view on the theoretical and practical aspects of compiler design.
- Students will have acquired the skills to understand, develop, and analyze recognizers for programming languages.
- Students will be able to apply ideas and techniques discussed to various software designs.

Introduction to Compiling - A simple one-pass compiler - Lexical Analysis – A Case study on Lexical Analysis - Syntax Analysis - Syntax - Directed Translation – Type Checking – Run time environment - Intermediate Code Generation - A Case study on Intermediate Code Generation – Code Generation - Code Optimization- A Case study on Code Generation and Code Optimization -Case study on Lex and Yacc.

Reference Books:

1. Alfred V Aho, Monica, Ravi Sethi and Jeffrey D Ullman, “Compilers – Principles, Techniques and Tools”, Addison Wesley, 2nd edition, 2006. ISBN-10: 0321486811, ISBN-13: 978-0321486813.
2. David Galles, “Modern Compiler Design”, Pearson Education, 2009. ISBN-10:8131709418.
3. Santanu Chattopadhyay, “Compiler Design”, PHI, 2005. ISBN: 81-203-2725-X.
4. V. Raghavan, “Principles of Compiler Design”, TMH Second Edition, 2011, ISBN: 00701447.
5. Dr. O. G. Kakde, “Compiler Design”, Unversity Press, 2008, ISBN: 8131805646.
6. Y. N. Srikart and Priti Shankar, “The Compiler Design Handbook Optimization and Machine Code Generation”, Second Edition, CRC Press, 2007, ISBN: 1420043838.
7. Dick Grune, Henri E. Bal, Cerial J. H. Jacobs, “Modern Compiler Design”, Wiley DreamTech India Pvt. Ltd., First Edition Reprint, 2006. ISBN: 81-265-0418-8.

15CA3056 WEB DESIGNING

Credits 3:0:0

Course Objective:

- To study about the Basic web concept.
- To learn about HTML tags.
- To learn about CSS.

Course Outcome:

Upon successful completion of this course, the student will

- Apply the design principles, techniques and technologies in web designing.
- Construct websites that conform to the web standards of today.

Web site design principles - Planning the site - Fundamentals of HTML - Formatting text – Links- Tables – Images – Forms - Creating web page using HTML tags - Introducing CSS - Fonts and Text Styles - Backgrounds and Color Gradients in CSS- Creating Boxes and Column - List –Tables - outlines - Positioning with CSS - Effects, Frames and Controls in CSS - web publishing.

Reference Books:

1. Joel Sklar, “Textbook of Web Design”, Cengage Learning, 2009, ISBN: 81-315-0961-3.
2. Thomas Powell, “Web Design: The Complete Reference Second Edition”, Tata McGraw Hill Education Private Limited, Fifteenth reprint 2013, ISBN: 978-0-07-058252-1.
3. Kogent Learning Solutions Inc., “HTML 5 Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP & jQuery Black Book”, Kogent Learning Solutions Inc., 2013, ISBN: 978-93-5004-095-9.
4. Jon Duckett, “Beginning Web Programming with HTML, XHTML and CSS, 2nd Edition, Wiley India Pvt. Ltd, 2011, ISBN: 978-81-265-1697-1.
5. Kris Jamas, Konrad King, Andy Anderson, “HTML And Web Design: Tips And Techniques”, Tata McGraw-Hill , 12th Reprint 2010, ISBN: 978-0-07-049921-8.
6. Michael Meadhra, “How to Do Everything with Dreamweaver MX 2004 A Beginner’s Guide, Dreamtech Press, 2004, ISBN: 81-7722-448-4.

15CA3057 INFORMATION TECHNOLOGY AND ITS APPLICATIONS

Credits: 3:0:0

Course Objective:

- To obtain understanding of the concepts of Information Technology and its applications.
- To enable students to be aware of basic hardware and software components that makes the data processing possible.
- To help students to understand the key aspects like Operating systems, Internet browsers and applications, Database, Networking, Project management.

Course Outcome:

Students will have

- Understanding of the concepts of Information Technology and its applications.
- Knowledge of basic hardware and software components that makes the data processing possible.
- Knowledge about the key aspects like Operating systems, Internet browsers and applications, Database, Networking, Project management

Exploring computers and their uses – Anatomy of Computers -Computer Organization – Operating Systems – Case Study on Architecture of two operating systems – Organizing Data and information – Networking and Data Communications – Internets, Intranets and Extranets – Specialized Business Information Systems – Case study on Tools and Software related to Database, Networks and internet – Information Technology Architecture – Developing Business/IT solutions – Information Systems in Business and Society-Case study on IT architecture and project planning of an company .

Reference Books:

1. ITL Education Solutions Limited, “Introduction to Information Technology”, Pearson, 2011, ISBN: 978-81-317-6029-1.
2. James A. Obrien, “Introduction to Information Systems”, Tata McGraw-Hill Publishing Company Limited, 2009, ISBN: 978-0-07-058971-1.
3. Morris Mano M., “Digital Logic and Computer Design”, Pearson Education Asia, 2008, ISBN: 81-7224-459-2.
4. Craig Zacker, John Rourke, “The Complete Reference PC Hardware”, Tata McGraw-Hill Publishing Company Limited, 2007, ISBN: 0-07-043606-1.
5. Walker Royce, “Software Project Management: A Unified Framework”, Pearson Education Asia, 2006, ISBN: 81-7758-378-6.
6. Behrouz A. Forouzan, “Data Communications and Networking”, Tata McGraw-Hill Publishing Company Limited, 2006, ISBN: 0-07-063414-9.
7. Sanjay Saxena, Prabhpreet Chopra, “IT Tools and Applications”, Vikas Publishing House Pvt. Ltd, 2008, ISBN: 81-259-1666-0.

15CA3058 CONCEPTS OF PROGRAMMING LANGUAGES

Credits: 3:0:0

Course Objective:

- To present design issues for various language constructs
- To examine the design choices of the most common languages
- To compare the design alternatives

Course Outcome:

- Students will have the ability to learn new languages
- Students will be able to choose appropriate language for specific task
- Students will understand the significance of implementation.

Criteria used for Evaluating Programming Languages – Influence on Language Design, Design Tradeoffs –Basic Approaches to Implementation –Evolution of Major Programming languages – Syntax and Semantics – Names, Type Checking and Scope – Data Types –Expression and Assignment Statements – Statement-Level Control Structures –Subprograms

Reference Books:

1. Robert W. Sebesta, “Concepts of Programming Languages”, Pearson Education, Eighth Edition 2009, ISBN: 978-81-317-2165-0.
2. Ravi Sethi, “Programming Languages: Concepts & Constructs”, Pearson Education, Second Edition, 2007, ISBN: 978-81-7758-422-6
3. Kenneth C. Louden, Kenneth A. Lambert, “Programming Languages ,Principles and Practice”, Cengage Learning, 2012, ISBN-10: 1-111-52941-3
4. Terrence W.Pratt, Marvin V.Zelkowitz, T.V. Gopal, “Programming Languages, Design and Implementation”, Pearson, 2008, ISBN: 978-81-7758-688-6
5. Robert Harper., “Practical Foundations for Programming Languages”, Cambridge University,2012, ISBN: 9781107029576

15CA3059 PRINCIPLES OF COMPUTER GRAPHICS

Credits: 3:0:0

Course Objective:

- To understand the principles of computer graphics requires for the experimental work on a graphics system.
- To study how to utilize a computer system and methods to implement the algorithms and techniques necessary to produce basic 3-dimensional illustrations.
- To learn how a surface should be shaded to produce realistic illustrations.

Course Outcome:

Students will have thorough knowledge about

- Principles of Computer Graphics
- Transformational Geometry
- Ray-tracing and Animation Techniques.

Graphics display devices - Input devices - Rendering pipeline - Raster Graphics - Line and Circle drawing algorithms - Windowing, Clipping - Cohen and Sutherland line clipping - Cyrus-beck clipping method - 2D and 3D Geometrical Transformations, Viewing Transformations - parallel and perspective projection - Curves and Surfaces - Cubic splines -Bezier curves - B-splines - Tensor product surfaces - Surface of revolution Sweep surfaces - Fractal curves and surfaces - Hidden line/surface removal methods - Illumination model - Polygon Shading - Gouraud – Phong - Introduction to Ray-tracing - Animation.

Reference Books:

1. Andries van Dam, F. Hughes John, James D. Foley, Steven K. Feiner, “Computer Graphics Principles and Practice in C”, Pearson, Second Edition, 2007, ISBN-13: 978-8131705056
2. Donald D. Hearn and M. Pauline Baker, “Computer Graphics with Open GL”, Prentice Hall, Fourth Edition, 2010, ISBN-13: 978-0136053583.
3. David F. Rogers, J. Alan Adams, “Mathematical Elements for Computer Graphics”, McGraw-Hill, Second Edition, 1989, ISBN-13: 978-0070535305
4. David F.Rogers, “Procedural Elements for Computer Graphics”, McGraw Hill, 2010, ISBN-13: 9780070473713
5. Edward Angele, Dave Shreiner, “Interactive Computer Graphics, A top-down Approach with OpenGL”, Addison Wesley, Sixth Edition, 2011, ISBN-13: 978-0132545235
6. G Farin, “Curves and Surfaces for Computer Aided Geometric Design”, Fourth Edition, 2001, ISBN-13: 978-1558607378

15CA3060 INFORMATION TECHNOLOGY FOR BUSINESS AND MANAGEMENT

Credits: 3:0:0

Course Objective:

- To understand the applications of basic information system concepts to business operations and management.
- To understand the usage of information systems in a management perspective
- To understand the usage of information systems in technical decision making
- To understand the utilization of large scale computer application systems in business management.

Course Outcome:

Student will be able to

- Apply information system concepts to business operations and management
- Use information systems in a management perspective
- Use information systems for technical decision making
- Utilize large scale computer application systems in business operations and management.

Information systems in Global Business – Use of Information Systems in Global E-business – Information Systems, Organizations and Strategy – IT Infrastructure and Emerging Technologies – Foundations of Business Intelligence – Databases and Information Management – Telecommunications, Internet and Wireless Technology – Securing Information Systems – Operational Excellence and Customer Intimacy – E-Commerce – Digital Markets and Digital Goods – Decision Making and Knowledge Management.

Reference Books:

1. Kenneth C. Laudon, Jane P. Laudon, Ahmed Elragal, “Management Information Systems – Managing the Digital Firm”, Pearson Education, 2013, ISBN: 978-1-4082-7160-5.
2. Efraim Turban, Linda Volonino, Gregory R. Wood, “Information Technology for Management: Advancing Sustainable, Profitable Business Growth”, Ninth Edition, Wiley India, 2013, ISBN: 978-1-118-35704-0.
3. Rahul De, “Managing Information Systems in Business, Government and Society”, Wiley India, 2012, ISBN: 978-8126520190.
4. Raymond McLeod Jr, George Schell, “Management Information Systems”, Tenth Edition, Prentice Hall, 2006, ISBN: 978-0131889187.
5. Lisa Miller, “MIS Cases – Decision Making with Application Software”, Fourth Edition, Prentice Hall, 2008, ISBN: 978-0132381055.
6. R. Kelly Rainer, Hugh J. Watson, Brad Prince, “Management Information Systems”, Second Edition, Wiley India, 2013, ISBN: 978-1118443590.

15CA3061 PROGRAMMING IN C LAB

Co-requisite: 15CA3053 Programming in C

Credits: 0:0:2

Course Objective:

- To make the students to understand the concepts of C Language and motivate them to develop the Coding.
- To solve problem using arrays and functions.
- To solve problems using data files.

Course Outcome:

The students will be able to develop C programs

- that are non-trivial with efficiency, readability and modularity.
- utilizing various features like arrays pointers structures.
- using data files.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3062 WEB DESIGNING LAB

Co-requisite: 15CA3056 Web Designing

Credits: 0:0:2

Course Objective:

- To design websites using Markup Languages.
- To design develop website using Style Sheets
- To develop online applications using HTML, XML, CSS.

Course Outcome:

Students will be able to

- Design websites using markup languages.
- Design websites using Style Sheets.
- Develop online applications using HTML, XML, CSS.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3063 PROGRAMMING IN C++ LAB

Co-requisite:15CA3054 Programming in C++

Credits: 0:0:2

Course Objective:

- To implement the object oriented concepts to solve problems.
- To develop an application using object oriented concepts.
- To develop applications using files and structures.

Course Outcome:

Students will be able to

- Implement object oriented concepts to solve problems.
- Develop applications using object oriented concepts.
- Develop applications using files and structures.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

15CA3064 SCRIPTING USING PYTHON LAB

Co-requisite:15CA3044 Scripting Using Python

Credits: 0:0:2

Course Objective:

- To write basic programs using conditionals and iterations.
- To develop programs using object oriented programming Concepts
- To develop programs using files and functions.

Course Outcome:

Students will be able to

- Solve problems with well documented programs.
- Solve problems in Python language including use of logical constructs.
- Demonstrate significant experience with Python program development environment.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HOD/Director and notify it at the beginning of each semester.

14CA3003 NETWORK COMPONENTS AND TROUBLESHOOTING (V-1.1)

Credits: 3:0:0

Course Objective:

- Build an understanding of the Networking Components.
- Familiarize with the basic taxonomy and terminology of the computer networks.
- To gain expertise in specific areas of networking such as the design and troubleshoot of individual networks.

Course Outcome:

After completing this course the student must demonstrate the knowledge and ability to:

- Understand and explain Data Communications System and its components.
- Identify the different types of network topologies and protocols.
- Identify the different types of network devices and their functions within a network.
- Methods of troubleshooting.

Basic Computer Hardware Architecture - Network Components - Topologies - A case study on network topologies - Add on Cards, Cables & Connectors - Case study on network components and cables - Network Design - LAN and WAN network design - Implement WAN design for simple network application - Troubleshooting - Trouble shooting applications - A case study on different trouble shooting techniques - A study on LAN network architecture design.

Reference Books:

1. McCabe James, “Network Analysis, Architecture, and Design”, Morgan Kaufmann Publishers. An imprint of Elsevier Science, San Francisco, CA 94104-3205, USA, 2007 ISBN: 978-0-12-370480-1.
2. Vilas S. Bagad and Iresh A. Dhotre, “Computer Networks”, Technical Publications, 2010, ISBN: 9788184312591.
3. James F. Kurose, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson Education, Sixth edition, 2012. ISBN: 9780132856201.
4. Odom, “Computer Networks First Step”, Cisco Press, First Edition, 2004, ISBN: 1587201011.
5. Gilbert Held, S. Ravi Jagannathan, “Practical Network Design Techniques: A Complete Guide for WANs and LANs”, Auerbach Publications, Second Edition, 2004, ISBN: 1439832234.
6. Patrick Ciccarelli, Christina Faulkner, “Networking Foundation - Technology Fundamentals for IT success”, BPB Publication, First Edition, 2005, ISBN: 81-7656-992-5.
7. Jonathan Feldman, “Sams Teach Yourself Network Troubleshooting”, Sam Techmedia, Second Edition, 2002, ISBN-13: 978-0-672-32373-7

14CA3008 CLOUD COMPUTING TECHNOLOGIES (V-1.1)

Credits: 3:0:0

Course Objective:

- To guide the student for building a virtualized computing infrastructure using open source software.
- To urge the knowledge of the students in the area of cloud-oriented environments such as high-speed access to the internet, secure data storage, and various standardizations.
- To know about various applications of cloud computing.

Course Outcome:

- Students will be oriented to innovate the cloud services depends ultimately on acceptance of the application by the user community.
- Students will be intent to provide the transition from fixed devices connected to the internet to the new mobile device-empowered Internet.
- Gains adequate knowledge about the essential techniques in cloud computing.

Introduction to Cloud Computing - The Evolution of Cloud Computing - Web Services delivered from the Cloud - Virtualization using XEN and KVM - Openstack - Federation, Presence, identity, and Privacy in the Cloud - Building Cloud Networks – Case study - Security in the cloud - Common Standards in cloud computing - End-user Access to cloud computing - Mobile Internet Devices and the cloud - Case study.

Reference Books:

1. W. Rittinghouse, James F. Ransome, “Cloud Computing - Implementation, Management & Security”, John, CRC Press, 2010, ISBN: 978-1-4398-0680-7.
2. Sander Van Vugt, “The Definitive Guide to SUSE Linux Enterprise Server”, 2006, ISBN: 978-1-59059-708-8.
3. Tom Fifield, Diane Fleming, Anne Gentle, Lorin Hochstein, Jonathan Proulx, Everett Toews, Joe Topjian, “OpenStack Operations Guide Set Up and Manage Your OpenStack Cloud”, O'Reilly Media, April 2014. ISBN :978-1-4919-4695-4
4. Judith Hurich, Robin Bloor, Marcia Kaufman, Fern Halper, “Cloud Computing for Dummies”, Wiley Publication Inc., 2010, ISBN: 978-81-265-2487-7.
5. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud”, O'REILLY, 2009, ISBN: 978-81-8404-714-1.
6. Tim Mather, Subra Kumarasamy, Shahed Latif, “Cloud Security and Privacy: An Enterprise on Risk and Compliance”, O'REILLY, 2009, ISBN: 978-81-84-04-815-5.
7. Kris Jamsa, “Cloud Computing: Saas Paas Iaas Virtualization Business Models Mobile Security and More”, Jones and Bartlett Publishers, 2013. ISBN: 978-93-80853-77-2.
8. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, “Distributed and Cloud Computing: From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012, ISBN: 978-93-81269-23-7.
9. Achyut Godbole, Atul Kahate, “Web Technologies: TCP/IP Web/Java Programming and Cloud Computing”, McGraw-Hill Education (India) Pvt. Ltd, Third Edition, 2013, ISBN: 978-1-25-906268-1.

LIST OF SUBJECTS

Subject Code	Name of the Subject	Credits
14CA3001	Networking Fundamentals	3:0:0
14CA3002	Object Oriented Programming using Java	3:0:0
14CA3003	Network Components and Troubleshooting	3:0:0
14CA3004	Principles of Network Security	3:0:0
14CA3005	Wireless Networks	3:0:0
14CA3006	Essentials of System Administration	3:0:0
14CA3007	Principles of Mobile Communication	3:0:0
14CA3008	Cloud Computing Technologies	3:0:0
14CA3009	Ad Hoc Networking Technologies and Protocols	3:0:0
14CA3010	Wireless LAN	3:0:0
14CA3011	Wireless Network Security	3:0:0
14CA3012	Satellite Communication Principles	3:0:0
14CA3013	Principles of Network Management	3:0:0
14CA3014	Network Analysis, Architecture and Design	3:0:0
14CA3015	IP Routing Technology	3:0:0
14CA3016	Virtual Private Networks	3:0:0
14CA3017	LAN Switching Technologies	3:0:0
14CA3018	Basics of Multimedia Communications	3:0:0
14CA3019	High Speed Networks and Internets	3:0:0
14CA3020	Distributed Operating System	3:0:0
14CA3021	Client Server Computing	3:0:0
14CA3022	Grid Computing Techniques and Applications	3:0:0
14CA3023	Internetworking using TCP/IP	3:0:0
14CA3024	Programming in JavaEE	3:0:0
14CA3025	Programming in JavaME	3:0:0
14CA3026	Object Oriented Programming Using Java Lab	0:0:2
14CA3027	Network Simulation Lab	0:0:2
14CA3028	Network Components and Troubleshooting Lab	0:0:2
14CA3029	Cryptography and Network Security Lab	0:0:2
14CA3030	Wireless Lab	0:0:2
14CA3031	LAN Switching Technologies Lab	0:0:2
14CA3032	Socket Programming and Internetworking Lab	0:0:2
14CA3033	Linux System Administration Lab	0:0:2
14CA3034	JavaEE Programming Lab	0:0:2
14CA3035	Network Management Lab	0:0:2
14CA3036	IP Routing Technology Lab	0:0:2
14CA3037	JavaME Programming Lab	0:0:2
14CA3038	Cloud Computing Technologies Lab	0:0:2
14CA3039	Mobile Application Lab	0:0:2
14CA341	XML Technologies	4:0:0
14CA342	Machine Learning	4:0:0
14CA343	Big Data Analytics	4:0:0

14CA344	XML Technologies Lab	0:0:2
14CA345	Multimedia Lab	0:0:2
14CA346	Essentials of Computer Science	4:0:0

14CA3001 NETWORKING FUNDAMENTALS

Credits: 3:0:0

Course Objective:

- To understand the concepts of data communications with networking models.
- To study the functions of different layers of the network.
- To gain practical knowledge about networking protocols and standards.

Course Outcome:

Students will

- expertise in functionalities of OSI and the TCP/IP reference model.
- able to resolve the practical problems in networking.
- Able to implement/simulate networking protocols.

Network Basics - Components - Practical Problems - The Internet-Protocols and Standards - The OSI model - TCP/IP Protocol Suite – Addressing - Guided Media - Unguided Media - Block Coding - Linear Block Codes – Cyclic Codes - Check sum – Applications - Noiseless Channels - Noisy Channels – Random Access - Controlled Access – Channelization - IPv4 Addresses - Real time applications - IPV6 Addresses - Address Mapping – ICMP - Routing Protocols - Process-to-Process Delivery – UDP – TCP -Applications on UDP/TCP - Congestion Control - Quality of Service - Domain Name System - Remote Logging - Electronic Mail - Case study.

Reference Books:

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw-Hill, Fourth Edition, 2006, ISBN: 0-07-063414-9.
2. Vilas S. Bagad, Iresh A. Dhotre, “Computer Networks”, Technical Publications, 2013, ISBN: 9789350990803.
3. James F. Kurose and Keith W. Ross, “Computer Networking A Top–Down Approach Featuring the Internet”, Pearson Education, 2005, ISBN: 978-81-7758-878-1.
4. Andrew S. Tanenbaum, “Computer Networks”, Fourth Edition, Prentice Hall of India, 2008, ISBN: 978-81-203-2175-5.
5. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007, ISBN: 0.13-243310.9.
6. Prakash C. Gupta, “Data Communications and Computer Networks”, PHI Learning Private Limited, 2006. ISBN: 978-81-203-2846-4.
7. Uyless Black, “Computer Networks: Protocols, Standards, and Interfaces”, Prentice Hall of India Private Limited, Second Edition, Fifth Reprint, 1993. ISBN: 81-203-1041-.

14CA3002 OBJECT ORIENTED PROGRAMMING USING JAVA

Credits: 3:0:0

Course Objective:

- To learn basic concepts of java.
- To solve problems using Object Oriented Paradigm.
- To learn about Networking concepts in java.

Course Outcome:

Students will be able to

- develop applications using Object Oriented Programming concepts.
- use Exception Handling and Multithreading.
- develop GUI Applications using Swing.

History and Evolution of Java - An Overview of Java - Data types, Variables and Array - Operators - Control Statements - Application Development using control statements - Introducing Classes & Methods - Development of student Application using class and methods - Inheritance - Application Development using Inheritance - Package and Interface - Application Development using Package - Exception Handling - Multithreading - Application Development using Multithreading - I/O Basics - Network - File Transfer Application Development using UDP - Applet Class - Web Application Development using Applet - Introducing Swing -Exploring Swing - Application Development using Swing.

Reference Books:

1. Herbert Schildt, “Java™: The Complete Reference”, Seventh Edition, McGraw – Hill Edition, Seventh reprint, 2008, ISBN 978-0-07-063677-4.
2. Cay S. Horstmann, Garry Cornell, “Core Java 2 Volume I Fundamentals”, Pearson Education, Eighth Edition, 2008, ISBN 978-81-317-1945-9.
3. C. Thomas Wu, “An Introduction to Object Oriented Programming with Java”, McGraw Hill, Fifth Edition, 2006, ISBN 0-07-061103-3.
4. Deitel H. M, Deitel P. J, “Java How to Program”, Prentice Hall India, Sixth Edition, 2005, ISBN: 0131483986.
5. K. Rajkumar, “Java Programming”, Pearson, First Impression 2013, ISBN: 978-81-317-9909-3.
6. Pravin M Jain, “The class of Java”, Pearson, Third Impression 2011, ISBN 978-81-317-5544-0.
7. Joyce Farrell, “Java for Beginners”, Cengage Learning, First Indian Reprint, 2009, ISBN- 13: 978-81-315-0957-9.

14CA3003 NETWORK COMPONENTS AND TROUBLESHOOTING

Credits: 3:0:0

Course Objective:

- Build an understanding of the Networking Components.
- Familiarize with the basic taxonomy and terminology of the computer networks.
- To gain expertise in specific areas of networking such as the design and troubleshoot of individual networks.

Course Outcome:

The student will be able to

- understand and explain Data Communications System and its components.
- identify the different types of network topologies and protocols.
- identify the different types of network devices and their functions within a network.
- methods of troubleshooting.

Network Components - Topologies - A case study on network topologies - Add on Cards, Cables & Connectors - Case study on network components and cables - Network Design - LAN and WAN network design - Implement WAN design for simple network application - Troubleshooting - Trouble shooting applications - A case study on different trouble shooting techniques - A study on LAN network architecture design.

Reference Books:

1. McCabe James, “Network Analysis, Architecture, and Design”, Morgan Kaufmann Publishers. An imprint of Elsevier Science, San Francisco, CA 94104-3205, USA, 2007 ISBN: 978-0-12-370480-1.
2. Vilas S. Bagad and Iresh A. Dhotre, “Computer Networks”, Technical Publications, 2010, ISBN: 9788184312591.
3. James F. Kurose, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson Education, Sixth edition, 2012. ISBN: 9780132856201.
4. Odom, “Computer Networks First Step”, Cisco Press, First Edition, 2004, ISBN: 1587201011.

5. Gilbert Held, S. Ravi Jagannathan, "Practical Network Design Techniques: A Complete Guide for WANs and LANs", Auerbach Publications, Second Edition, 2004, ISBN: 1439832234.
6. Patrick Ciccarelli, Christina Faulkner, "Networking Foundation - Technology Fundamentals for IT success", BPB Publication, First Edition, 2005, ISBN: 81-7656-992-5.
7. Jonathan Feldman, "Sams Teach Yourself Network Troubleshooting", Sam Techmedia, Second Edition, 2002, ISBN-13: 978-0-672-32373-7.

14CA3004 PRINCIPLES OF NETWORK SECURITY

Credits: 3:0:0

Course Objective:

- To give a clear insight into cryptography, authentication and emerging security standards.
- To impart knowledge on network security protocols.
- To develop network security algorithms.

Course Outcome:

Students will have

- adequate knowledge about cryptography, techniques for access control and E-mail security.
- ability to develop security algorithms in the network.
- adequate knowledge about authentication applications.

Cryptography - Conventional Encryption and Message Confidentiality - A case study on Conventional Cryptographic Algorithm - Public Key Cryptography and Message Authentication Code - A Case study on Message Digest - Authentication Applications - Electronic Mail Security - Basic Concepts of SNMP - Intruders - Firewalls - Virtual Private Networks - A Case study on creating IPsec Tunnel mode tunnels.

Reference Books:

1. William Stallings, "Network Security Essentials Applications and Standards", Pearson Education Inc, 2005, ISBN: 81-7808-307-8.
2. Behrouz A. Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", Tata McGraw Hill Publishing, Second Edition, 2010, ISBN: 978-07-070208-0.
3. Charlie Kaufman, Radia Perlman, Mike Speciner, "Network Security Private Communication in Private world", Prentice Hall India, Second Edition, 2002, ISBN: 81-203-2213-4.
4. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education Inc, Fourth Edition, 2006.
5. Christina Bird, Edward Stockwell, "Implementing Virtual Private Networks: A Practitioner's Guide", The Landmark Series, New Riders Pub, 1999, ISBN: 978-0735700475.
6. Greg Holden, "Guide to Firewalls and Network Security: Intrusion Detection and VPNs", Thomson Course Technology, 2005, ISBN: 981-265-264-7.
7. Eric Cole, Ronald Krutz, James W. Conley, "Network Security Bible", Wiley India, 2006, ISBN: 81-265-0576-1.

14CA3005 WIRELESS NETWORKS

Credits: 3:0:0

Pre-requisite: 14CA3001 Networking Fundamentals

Course Objective:

- To impart knowledge about the wireless communication principles and fundamentals.
- To equip the students in various kinds of wireless networks and its operations.
- To know about various generations of wireless networks.

Course Outcome:

Students will

- expertise in various techniques and operations of wireless networks.
- be able to design a wireless network.
- be familiarized in wireless security and applications.

Introduction - The Electromagnetic Spectrum - Wireless Propagation Characteristics and Modeling - Analog and Digital Data transmission - Modulation Techniques-Real time applications - The Cellular Concept, First Generation (1G) Advanced Mobile Phone System (AMPS) - GSM, Third Generation (3G) Spectrum Allocation, Fourth Generation (4G) Services and Applications - Satellite Systems - VSAT Systems – Satellite based Internet Access - Wireless Local Loop - Wireless LAN - Wireless ATM and Ad Hoc Routing - Wireless ATM Architecture - Routing in Wireless Ad Hoc Networks - Personal Area Networks - Security Issues in Wireless Systems - Case study.

Reference Books:

1. P.Nicopolitidis, M. S. Obaidat, G. I. Papadimitriou, A. S. Pomportsis, “Wireless Networks”, John Wiley & Sons, Ltd., First Edition, 2009, ISBN:978-81-265-2220-0.
2. Ivan Stoj, Menovic, “Handbook of Wireless Networks and Mobile Computing”, John Wiley and Sons, 2006, ISBN: 81-265-0768-3.
3. Toh C. K., “Ad Hoc Mobile Wireless Networks: Protocols and Systems”, Pearson, First Impression 2008, ISBN: 978-81-317-1510-9.
4. Kaveh Pahlavan, Prashant Krishnamurthy, “Principles of Wireless Networks: A Unified Approach”, Prentice Hall of India Private Limited, First Edition, 2008. ISBN: 978-81-203-2380-3.
5. Jochen Schiller, “Mobile Communications”, Third Edition, Pearson Education, Ltd., 2007, ISBN: 81-7758-263-1
6. Theodore.S. Rappaport, “Wireless Communications: Principles and Practice”, Second Edition, Prentice Hall, 2003, ISBN: 81-203-2381-5.
7. Siva Ram Murthy C., Manoj B.S., “Ad Hoc Wireless Networks: Architectures and Protocols”, Pearson Education Asia, 2004, ISBN: 978-81-317-0688-6.

14CA3006 ESSENTIALS OF SYSTEM ADMINISTRATION

Credits: 3:0:0

Course Objective:

- To learn fundamentals of Linux operating system.
- To define system and network administration.
- To learn various network services and System administration tasks.

Course Outcome:

Students will be able to

- use linux commands effectively.
- describe file system and system configuration files.
- understand the tasks required to maintain the system.

Introduction to Linux - Basic Shell Commands - Applying commands to real time situation - Duties of System Administrator - Exploring the desktops - System Startup and Shutdown - Configuring the System at Command Line - Administering Users and groups - Working out Administration - The file System - System Configuration files - TCP/IP Networking - Network File system.

Reference Books:

1. Paul Love, Joe Merlino, Jeremy C Reed, Craig Zimmerman,Paul Weinstein, “Beginning Unix”, Wiley Dreamtech India(P) Ltd., 2005, ISBN:81-265-0596-6.
2. Terry Collings, Kurt Wall, “Red Hat Linux Networking and System Administration”, Wiley India(P) Ltd., Third Edition, Reprint 2008, ISBN: 81-265-0655-5.

3. Evi Nemeth, Garth Snyder and Trent R. Hein, "Linux Administration Handbook", 2nd Edition, Prentice Hall, 2006, ISBN: 0131480049.
4. Wale Soyinka, "Linux Administration: A Beginner's Guide", Tata McGraw Hill Education, 6th Edition, 2012, ISBN: 1259061183.
5. Richard Petersen, "Linux: The Complete Reference", McGraw-Hill Osborne, Sixth Edition, 2008, ISBN: 007149247X.
6. Ashok Kumar Harnal, "Linux Applications And Administration", Tata McGraw Hill, 2009, ISBN: 0070656754.
7. Tom Adelstein, Bill Lubanovic, "Linux System Administration", O'Reilly Media, 2007, ISBN: 0596009526.

14CA3007 PRINCIPLES OF MOBILE COMMUNICATION

Prerequisite: 14CA3001 Networking Fundamentals

Credits: 3:0:0

Course Objective:

- To know about the main concepts of Global System for Mobile communications.
- To have a clear idea and focus on the communication networks.
- To gain knowledge in radio engineering, data communications, computer networks, distributed systems, information management, and applications.

Course Outcome:

Students will

- gain knowledge in mobile environment fundamentals.
- familiarize in 2G technologies for future generation wireless and mobile communications.
- familiarize the concepts of ad hoc routing environments.

Introduction - Wireless Transmission - Frequencies for Radio Transmission – Signals - Antenna, Signal Propagation - Multiplexing - Modulation - Spread Spectrum - Medium Access Control: Motivation for Specialized MAC, SDMA, FDMA, TDMA, CDMA, Telecommunication Systems GSM, UMTS and IMT – 2000 - Applications of GSM/EMTS - Satellite Systems - Broadcast Systems - Wireless LAN: Infrared VS Radio Transmission, Infrastructure and Ad-Hoc networks - IEEE 802.11 - Bluetooth - File systems - World Wide Web - Wireless Application Protocol - Applications of Ad-Hoc networks.

Reference Books:

1. Jochen Schiller, "Mobile Communications", Pearson Education, Second Edition, Ltd., 2007, ISBN: 81-7758-263-1.
2. William C. Y. Lee, "Mobile Communications Engineering: Theory And Application", Tata McGraw-Hill, Second Edition, 2008, ISBN: 978-0-07-025220-2.
3. Ivan Stoj, Menovic, "Handbook of Wireless Networks and Mobile Computing", John Wiley and Sons, 2006, ISBN: 81-265-0768-3.
4. James F. Kurose, "Computer Networking - A Top-Down Approach Featuring The Internet", Pearson Education, Third Edition - Fifth Reprint, 2009, ISBN: 81-7808-247-0.
5. Toh C.K., "Ad Hoc Mobile Wireless Networks: Protocols and Systems", Pearson, First Impression 2008, 2002, ISBN: 978-81-317-1510-9.
6. Alan Gatherer, Edgar Auslander, "The Application of Programmable DSPs in Mobile Communications", John Wiley And Sons, First Edition, 2002, ISBN: 0471-48643-4.
7. Nicopolitidis P., Obaidat, G.I Papadimitriou, A.S. Pomportsis, "Wireless Networks", Wiley Publishers, First Edition, 2009, ISBN: 978-81-265-2220-0.

14CA3008 CLOUD COMPUTING TECHNOLOGIES

Credits: 3:0:0

Course Objective:

- To guide the student for building a virtualized computing infrastructure using open source software.
- To urge the knowledge of the students in the area of cloud-oriented environments such as high-speed access to the internet, secure data storage, and various standardizations.
- To know about various applications of cloud computing.

Course Outcome:

Students will be

- oriented to innovate the cloud services depends ultimately on acceptance of the application by the user community.
- intent to provide the transition from fixed devices connected to the internet to the new mobile device-empowered Internet.
- gaining adequate knowledge about the essential techniques in cloud computing.

Introduction to Cloud Computing - The Evolution of Cloud Computing - Web Services delivered from the Cloud - Building Cloud Networks - Federation, Presence, identity, and Privacy in the Cloud - Case study - Security in the cloud - Common Standards in cloud computing - End-user Access to cloud computing - Mobile Internet Devices and the cloud - Case study.

Reference Books:

1. W. Rittinghouse, James F. Ransome, "Cloud Computing - Implementation, Management & Security", John, CRC Press, 2010, ISBN: 978-1-4398-0680-7.
2. Judith Hurich, Robin Bloor, Marcia Kaufman, Fern Halper, "Cloud Computing for Dummies", Wiley Publication Inc., 2010, ISBN: 978-81-265-2487-7.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud", O'REILLY, 2009, ISBN: 978-81-8404-714-1.
4. Tim Mather, Subra Kumarasamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise on Risk and Compliance", O'REILLY, 2009, ISBN: 978-81-84-04-815-5.
5. Kris Jamsa, "Cloud Computing: Saas Paas Iaas Virtualization Business Models Mobile Security and More", Jones and Bartlett Publishers, 2013. ISBN: 978-93-80853-77-2.
6. Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing: From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012, ISBN: 978-93-81269-23-7.
7. Achyut Godbole, Atul Kahate, "Web Technologies: TCP/IP Web/Java Programming and Cloud Computing", McGraw-Hill Education (India) Pvt. Ltd, Third Edition, 2013, ISBN: 978-1-25-906268-1.

14CA3009 AD HOC NETWORKING TECHNOLOGIES AND PROTOCOLS

Prerequisite: 14CA3001 Networking Fundamentals

Credits: 3:0:0

Course Objective:

- To gain adequate knowledge about the various protocols in ad hoc networks.
- To develop and demonstrate a complete system of ad hoc networking that paves the way to new technologies, and applications for the future benefit of the research community and telecommunications Industry.
- To know the current technology trends for the implementation and deployment of wireless ad-hoc networks.

Course Outcome:

Students will be able to

- gain adequate knowledge about the fundamentals of ad hoc network technologies, protocols and realizations.
- develop a new routing protocol in ad hoc networks.
- gain adequate knowledge in designing MAC, routing and transport protocols for wireless ad-hoc networks.

Ad Hoc Networking - A DoD Perspective on Mobile Ad Hoc Networks - DSDV: Routing over a Multihop - Simulating the performance of routing protocols - Wireless Network of Mobile Computers – Cluster Based Networks - DSR: The Dynamic Source Routing protocol for Multihop Wireless Ad Hoc Networks - The Ad Hoc On - Demand Distance - Vector Protocol - A Hybrid Framework for Routing in Ad Hoc Network - Link Reversal Routing - The Effects of Beaconing on the Battery Life of Ad Hoc Mobile Computers – Bandwidth - Efficient Link - State Routing in Wireless Networks.

Reference Books:

1. Charles E. Perkins, “Ad Hoc Networking”, Addison-Wesley, 2008, ISBN: 978-81-317-2096.
2. C.K Toh, “Ad Hoc Mobile Wireless Networks”, Pearson Education Inc., 2007, ISBN: 978-81-317-1510-8.
3. C. Siva Ram Murthy and B.S Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Pearson Education, 2008, ISBN-978-81-317-0688.
4. Ramin Hekmat, “Ad-hoc Networks: Fundamental Properties and Network Topologies”, springer Netherlands, 2006, ISBN: 978-1-4020-5165-4, ISBN: 978-1-4020-5165-4.
5. Prasant Mohapatra, Srikanth Krishnamurthy, “Ad Hoc Networks: Technologies and protocols”, 2005, Second Edition, ISBN-10: 0387226893, ISBN-13: 978-0387226897.
6. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing, Jan 2006.
7. Subir Kumar Sarkar, “Wireless Sensor and Ad Hoc Networks under Diversified Network Scenarios”, 2012, ISBN: 13:978-1-60807-468-6.

14CA3010 WIRELESS LAN

Prerequisite: 14CA3001 Networking Fundamentals

Credits: 3:0:0

Course Objective:

- To know about the network components of WLAN.
- To know about the MAC Layer and frame types of the network.
- To know about the authentication protocols of wireless networks.
- To know about the installation and analysis procedures of the network.

Course Outcome:

- Students learn about the working of 802.11.
- Students learn about the security issues of WLA.
- Students learn to deploy and maintain wireless LAN network.

Overview of 802.11 Networks - 802.11 MAC - 802.11 Framing - 802.11 Security - Management Operations - Contention Free Service with PCF - Physical Layer - Using - 802.11 Access Points - 802.11 Network Deployment - 802.11 Performance Tuning - Case studies: System Implementation, Testing and Optimization.

Reference Books:

1. Mathew S Gast, “802.11 Wireless Networks, The definitive Guide”, O ’Reilly & Associates, Second Edition, 2005, ISBN: 978-0-596-10052-0.
2. Ron Olexa, “Implementing 802.11, 802.16 and 802.20 Wireless Networks: Planning Troubleshooting and Operations”, Elsevier 2005, ISBN: 81-312-0046-9 .

3. Jim Geier, “Designing and Deploying 802.11n Wireless Networks”, Cisco Press, 1edition, 2010, ISBN: 978-1587058899.
4. Neil Reid and Ron Seide, “802.11 Wi-Fi Networking Handbook”, Tata McGraw-Hill, 2003, ISBN: 0-07-053143-9.
5. Pejman Roshan, Jonathan Leary, “802.11 Wireless LAN Fundamentals”, Cisco Press, 2005, ISBN: 15870.
6. Jon Edney, William A. Arbaugh, “Real 802.11 Security: Wi-Fi Protected Access and 802.11i”, Pearson Education 2004, ISBN: 0321136209.
7. Bob O'Hara, Al Petrick, “IEEE 802.11 Handbook: A Designer's Companion”, IEEE Standards Association, 2005, ISBN: 073814495.

14CA3011 WIRELESS NETWORK SECURITY

Prerequisite: 14CA3005 Wireless Networks

Credits: 3:0:0

Course Objective:

- To explore vast array of wireless technologies, techniques and methodologies.
- Provide relevant analysis and understanding of wireless security issues.
- To explore cryptographic security measures in wireless security.

Course Outcome:

Students have

- knowledge of wireless technologies, techniques and methodologies.
- understanding of wireless security issues.
- understanding of cryptographic security measures.

Wireless Information Warfare - Wireless Is Information Warfare (IW) – A Classification scheme based on network architecture - Circuit-switched Networks and Packet-switched networks - Telephone system vulnerabilities - Interception/Ease of Interception - Unintentional Interrupts Natural hazards - International interruptions – Cell Phone - Cryptographic security- The Wireless Local Area Network - Wireless Transport Layer Security.

Reference Books:

1. Randall K. Nichols, Panos C. Lekkas, “Wireless Security”, Tata McGraw-Hill, Edition 2007, ISBN: 0-07-061884-4.
2. John R. Vacca, “Guide to Wireless Network Security”, Springer Science and Business Media LLC, 2006, ISBN: 13:978-0-387-95425-7.
3. Wolfgang Osterhage, “Wireless Security”, Science Publishers, 2011, ISBN-13: 978-1578087686.
4. Tyler Wrightson, “Wireless Network Security”, The McGraw-Hill, 2012, ISBN 978-0-07-176095-9.
5. Yan Zhang, Jun Zheng, Honglin Hu, “Security in Wireless Mesh Networks”, Auerbach Publications, ISBN 13: 978-0-8493-7399-2.

14CA3012 SATELLITE COMMUNICATION PRINCIPLES

Prerequisite: 14CA3001 Networking Fundamentals

Credits: 3:0:0

Course Objective:

- To understand operation of satellite systems.
- To learn about the basic theory of digital radio transmission.
- To acquire knowledge in satellite applications and services.

Course Outcome:

Students will be able to

- gain knowledge on satellite access, its applications and services.
- discuss launch methods and technologies depending upon the orbital mechanic and characteristics of common orbits.
- gain adequate knowledge about satellite access and multiple access techniques.

Kepler's Three Laws of Planetary Motion - Orbital Parameters-Orbital Perturbations - Orbit Types (LEO, MEO, GEO) – Regulatory Service-Transmission Losses – Link power Budget calculation – Uplink – Downlink – C/N Ratio – Rain Effects-Earth Station General Block Diagram – Transmitter and Receiver – Antennas – Tracking system-voice, Data, Video Transmission system – FDMA – TDMA – CDMA –SPADE- INTELSAT – INSAT - U.S DOMSAT – VSAT – GSM - GPS Applications - E-Mail – Mobile Services – Video Conferencing and Internet – DTH (cable TV) – Navigation – Remote Sensing - Case study.

Reference Books:

1. Dennis Roddy, "Satellite Communications", McGraw-Hill International, 4th Edition, 2009, ISBN: 978-0-07-007785-0.
2. Timothy Pratt and Charles W. Bostian, "Satellite Communication", John Wiley and Sons, 2010, ISBN: 978-81-265-0833-4.
3. Michael C. Keith, "The Radio Station: Broadcast Satellite and Internet", Focal Press, 7th Edition, 2007, ISBN: 978-0-240-80850-5.
4. Tarjeet Sabharwal, "Satellite Television: An Impact on Social Participation", Kanishka Publication, 2008, ISBN: 978-81-8457-064-9.
5. Wilbur L. Pritchard and Joseph A Sciulli, "Satellite Communication Systems Engineering", Second Edition, Pearson Education, 2003, ISBN: 81-297-0141-3.
6. Richharia M., "Mobile Satellite Communications: Principles and Trends", Pearson Education Asia, First Indian Reprint, 2003. ISBN: 81-297-0025-5.
7. Tom Logsdon, "Mobile Communication Satellites: Theory and Application", McGraw Hill, 1994. ISBN: 0-07-038476-2.

14CA3013 PRINCIPLES OF NETWORK MANAGEMENT

Prerequisite: 14CA3001 Networking Fundamentals

Credits: 3:0:0

Course Objective:

- To understand the fundamental concepts of network management.
- To study network management protocols and Applications.
- To familiarize with network management standards, models, tools and systems.

Course Outcome:

Students will be able to

- manage the operation of modern data communication networks.
- acquire depth knowledge about SNMP protocols, Remote monitoring and web management.
- manage network using network management tools and systems.

Overview of Network Management - A case study on Telephone Communication - Network Management Strategies - Simple Network Management Protocol v1 Architecture and Applications - Simple Network Management Protocol v2 Architecture - A Case study on configuring NMS - Management Information Bases - Network Management Software Components - A case study on Configuring SNMP Agent.

Reference Books:

1. Stephen B. Morris, "Network Management MIBs and MPLS: Principles Design and Implementation", Pearson Education, 2004, ISBN-81-291-0346-7.
2. J. Richard Burke, "Network Management: Concepts and Practice, A Hands-On Approach", Prentice Hall, 2008, ISBN-978-81-203-3367-3.

3. Mani Subramanian, "Network Management Principles and Practice", Addison Wesley, 2000, ISBN: 81-7808-595-X.
4. Sebastian Abeck, Adrian Farrel, "Network Management Know it all", Elsevier Morgan Kaufmann, 2008, ISBN: 978-012374598-9.
5. John C. Strassner, "Policy Based Network Management: Solutions for the Next Generation", Morgan Kaufmann, 2005, ISBN:81-8147-594-1
6. McCabe James, "Network Analysis, Architecture, and Design", Morgan Kaufmann Publishers. An imprint of Elsevier Science, San Francisco, CA 94104-3205, USA, Third Edition, 2007.
7. Greg Holden, "Guide to Firewalls and Network Security: Intrusion Detection and VPNs", Thomson Course Technology, 2005. ISBN: 981-265-264-7.

14CA3014 NETWORK ANALYSIS, ARCHITECTURE AND DESIGN

Prerequisite: 14CA3001 Networking Fundamentals

Credits: 3:0:0

Course Objective:

- To provide students with a comprehensive and structured view of network design from a theoretical and a practical perspective.
- Presents basic principles and methods for developing traffic characterization and optimization models for a subset of network design problem.
- It also aims at helping students to understand recent advances and to be exposed to research problems in network design.

Course Outcome:

Students will

- become familiar with gathering, deriving, and defining real network requirements.
- determine how and where addressing and routing, security, network management, and performance are implemented in the network.
- evaluate and choose different network technologies.
- determine where to apply performance mechanisms, including quality of service, service level agreements, and policies in the network.

Introduction - Requirement Analysis: Concepts - Requirement Analysis - A case study on requirement architecture analysis - Process - Flow Analysis - Network Architecture - A case study on Network Architecture Analysis - Network Management Architecture - Performance Architecture - Security and Privacy Architecture - A case study on security issues - Network Design - A case study on RIP v2 for network.

Reference Books:

1. McCabe James, "Network Analysis, Architecture, and Design", Third Edition (2007), Morgan Kaufmann Publishers. An imprint of Elsevier Science, San Francisco, CA 94104-3205, ISBN: 978-0-12-370480-1.
2. A. Forouzan, "Data Communications and Networking", Tata McGraw Hill, Fourth Edition, 2007, ISBN: 0072967757.
3. James F. Kurose, "Computer Networking - A Top-Down Approach Featuring the Internet", Third Edition - Fifth Reprint, Pearson Education 2007, ISBN: 9780123704801.
4. Michael J. Palmer, Robert Bruce Sinclair, "A Guide to Designing and Implementing Local and Wide Area Networks", Thomson Course Technology 2009, ISBN: 0760010935, 9780760010938.
5. Harry G Perros, "Connection oriented Networks: SONET/SDH, ATM, MPLS and OPTICALS Networks", Wiley, 2005, ISBN: 978-0-470-02163-7.

14CA3015 IP ROUTING TECHNOLOGY

Prerequisite: 14CA3001 Networking Fundamentals

Credits: 3:0:0

Course Objective:

- Plan the configuration and verification of routing protocols and their optimization in enterprise networks.
- Technologies, components, and metrics of EIGRP used to implement and verify EIGRP routing in diverse, large-scale internetworks based on requirements.
- Identify, analyze, and match OSPF multi-area routing functions and benefits for routing efficiencies in network operations in order to implement and verify OSPF routing in a complex enterprise network.
- Implement and verify a redistribution solution in a multiprotocol network that uses Cisco IOS features to control path selection and provides a loop-free topology according to a given network design and requirements.
- Evaluate common network performance issues and identify the tools needed to provide Layer 3 path control that uses Cisco IOS features to control the path.
- Implement and verify a Layer 3 solution using BGP to connect an enterprise network to a service provider.

Course Outcome:

Students will be able to

- select an appropriate Routing Protocol based on user requirement.
- configure routing protocols.
- perform initial configuration on a router.
- configure a router for additional administrative functionality.

Network Overview – OSI Network Model - Network Equipment - TCP/IP Review - Routing Basics - Routing begins at home - Anatomy of a Routed Packet - Anatomy of Route Table - static routing – Configuration of Static Routers - Dynamic Routing - Categorizing Dynamic Routing Protocol - RIP - RIP Background – IGRP - IGRP Background - EIGRP - EIGRP Terminology – OSPF - OSPF Operations - Extended Routing Protocols in Brief – Redistribution and Default Routing - Default Routing - Case Study on configuring routers using different protocols.

Reference Books:

1. James Macfarlane, “Network Routing Basics: Understanding IP Routing in Cisco Systems”, Wiley Publishing, Inc, 2006, ISBN: 978-0-471-77273-6.
2. Deepankar Medhi, Karthikeyan Ramasamy, “Network Routing Algorithms, Protocols and Architectures”, Morgan Kaufmann Publisher, 2007, ISBN: 10-0-12-088588-6.
3. Bruce Hartpence, “Packet Guide to Routing and Switching Exploring the Network Layer”, O'Reilly Media, 2011, ISBN: 978-1-4493-0655-7.
4. Ravi Malhotra, “IP Routing”, O’ Reilly & Associates, 2002, ISBN: 0-596 -00275-0.
5. Das R, Chakrabarty K, “Enabling IP Routing With Cisco Routers”, Firewall Media, First Edition 2006, ISBN: 81-7008-748-1.

14CA3016 VIRTUAL PRIVATE NETWORKS

Prerequisite: 14CA3001 Networking Fundamentals

Credits: 3:0:0

Course Objective:

- To explain the role of a VPN that may perform in a security posture of an organization.
- To analyze security requirements of an organization and to recommend an appropriate technical solution for a VPN.

- To configure VPNs using diverse equipment such as routers, firewalls, clients and dedicated VPN termination equipment.

Course Outcome:

Students will be able to

- configure VPNs using diverse equipment such as routers, firewalls, clients and dedicated VPN termination equipment.
- configure a VPN solution using a Certificate Authority and digital certificates.
- gain adequate knowledge in VPNs installation, implementation and troubleshooting.

IP/MPLS VPN Service Network Overview-IP/MPLS VPN Multi-Service Network Overview - Case Study - Case Study-Building Converged Service Networks with IP/MPLS VPN Technology- IP/MPLS VPN Protocol Fundamentals - RSVP - TE Protocol - Label Distribution Protocol - Ethernet VPN Services - Virtual Private LAN Service - VPLS Design Case Study - Where to Break the Mesh? - High Availability in an IP/MPLS VPN Network - A case study on Building a Network with High Availability - Cryptography – Encryption – Secure communication and Authentication – VPN operating System - VPN Security Attacks – Security toolset – Intrusion Detection and Security Scanning – Emerging Technologies for VPN's.

Reference Books:

1. Zhuo_Xu, “Designing and Implementing IP/MPLS-Based Ethernet Layer 2 VPN Services: An Advanced Guide for VPLS and VLL”, John Wiley, 2009, ISBN: 978-0-470-45656-9.
2. Steven Brown, “Implementing Virtual Private Networks”, Tata McGraw-Hill, 2000, ISBN: 0 – 07 – 463780 -0.
3. William Stallings, “Cryptography and Network Security”, Pearson Education, Second Edition, 2002, ISBN – 81-7808-605-0.
4. Marcus Goncalves, “Firewalls – A Complete Guide”, Tata McGraw-Hill, 2000. ISBN 0-07-4639722.
5. Christina Bird, Edward Stockwell, “Implementing Virtual Private Networks: A Practitioner's Guide (The Landmark Series)”, New Riders Publication, 1999. ISBN: 978-073 5700475.
6. Greg Holden, “Guide to Firewalls and Network Security: Intrusion Detection and VPNs”, Thomson Course Technology, 2005, ISBN: 981-265-264-7.
7. Eric Cole, Ronald Krutz, James W. Conley, “Network Security Bible”, Wiley India, 2006, ISBN: 81-265-0576-1.

14CA3017 LAN SWITCHING TECHNOLOGIES

Prerequisite: 14CA3003 Network Components and Troubleshooting

Credits: 3:0:0

Course Objective:

- To gain knowledge about design of LAN switches and switched internetworks.
- To enrich the knowledge exposure in advanced LAN switching concepts.
- To equip students with knowledge of Virtual LANs.

Course Outcome:

Students will be able to

- apply the routing principles in real time environments.
- develop Virtual LANs.
- apply LAN security mechanisms.

Network Architecture - Transparent bridges - Principles of LAN switches - Implementing the basic concepts of LAN switching - LOOP resolution - Advanced LAN switch concepts: Full duplex operation, LAN & switch flow control.- Virtual LANs - Implementing Inter - VLAN techniques - Applications & concepts - LAN Security - Switch

Management - To implement the concepts of security issues in LAN technology - A case study on LAN switching and flow control.

Reference Books:

1. Rich Seifert, Jim Ewards, "The All-New Switch Book: The Complete Guide to LAN Switching Technology", Second Edition, August 2008, Wiley, John & Sons, Incorporated, ISBN-13: 9780470287156
2. John J. Roese, "Switched Lans: Implementation, Operation, Maintenance, Computer communications", McGraw-Hill Series on Computer Communications, McGraw-Hill, 1998, ISBN: 007053136, 80070534131.
3. Darryl P. Black, "Building switched networks: multilayer switching, QoS, IP multicast, network policy, and service level agreements - Professional Computing Series", Addison-Wesley, 1999, ISBN: 0201379538, 9780201379532.
4. Daniel Minoli, Andrew Schmidt, "Network Layer Switched Services", Wiley, 1998, ISBN: 0471190802, 9780471190806.
5. Mathians Hein, David Griffiths, "Switching technology in the local network: from LAN to switched LAN to virtual LAN", International Thomson Computer Press, 1997, ISBN: 1850321663, 9781850321668.
6. Stephen A Thomas, "IP switching and routing essentials: understanding RIP, OSPF, BGP, MPLS, CR-LDP, and RSVP-TE", Wiley, 2002, ISBN: 0471034665, 9780471034667.
7. Matthew Castelli, "LAN Switching First-Step", Cisco Press, 2004, ISBN: 1587201003, 9781587201004.

14CA3018 BASICS OF MULTIMEDIA COMMUNICATIONS

Credits: 3:0:0

Course Objective:

- To discuss about various Multimedia Representations.
- To provide strong knowledge in various audio, video, text and image compression techniques.
- To provide knowledge in securing Multimedia Communications.

Course Outcome:

Students should be able to

- understand Multimedia Information Representation and Communication.
- understand Multimedia service creation and communication services.
- understand Securing Multimedia Communications.

Multimedia Information Representation - Multimedia Networks - Multimedia Applications - Multimedia Information Representation - Case Study on the Communication Network of an Organization - Digitization principles - Text Images - Audio - Video - Case Study on Live Streaming technique in an University. Compression Principles - Text and Image Compression - Audio and Video Compression - Reference Models - Standards relating to interactive applications over the Internet & entertainment applications - Survey Study on the different standards used in social media.

Reference Books:

1. Fred Halsall, "Multimedia Communications Applications, Networks, Protocols and Standards", Pearson Education, Fourth Indian Reprint, 2011, ISBN: 81-7808-532-1.
2. John F. Koegel Buford, "Multimedia Systems", Pearson education, 2009, ISBN: 81-7808-162-8.
3. Ze-Nian Li, Mark S.Drew, "Fundamentals of Multimedia", Pearson Education, 2008, ISBN: 7758-823-0.
4. A. Rajaraman, "Computer Graphics with Multimedia", Reprint 2012, ISBN: 8-81-7319-477-1.
5. Gour Karmakar and Laurence S. Dooley, "Multimedia Communications: Concepts, Applications, and Challenges - Series", IGI Global, 1st Edition, 2007, ISBN: 1591407664
6. K. R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic, "Multimedia Communication Systems: Techniques, Standards and Networks", 2006, ISBN: 013031398X.

14CA3019 HIGH SPEED NETWORKS AND INTERNETS

Prerequisite: 14CA3001 Networking Fundamentals

Credits: 3:0:0

Course Objective:

- To provide an overview about ATM and frame relay.
- To acquire knowledge about the techniques that support real-time traffic and congestion control.
- To acquire knowledge in interior and exterior routing protocols.

Course Outcome:

Students will be

- familiarized with high speed networking technologies.
- enabled to optimize and troubleshoot high-speed networks.
- demonstrate the knowledge of network planning and optimization.

High Speed Networks-High-Speed LANs - A case study on LAN configuration - Congestion Control in Data Networks and Internets - Level Flow and Error Control - TCP Traffic Control -Traffic and Congestion Control in ATM Networks - Internet Routing - A case study on simulating the routing protocols - Exterior routing Protocols and Multicast - Integrated and Differential Services - Protocols for QoS Support.

Reference Books:

1. William Stallings, "High-Speed Networks And Internets", Pearson Education, Second Edition, 2002, ISBN: 81-7808-578-X.
2. Warland & Pravin Varaiya, "High Performance Communication Networks", Jean Harcourt Asia Pvt. Ltd., Second Edition, 2001.
3. William Stallings, "Data and Computer Communications", Prentice-Hall, Eighth Edition, 2007.
4. Douglas E Comer, "Computer Networks and Internets", Prentice Hall, 5th edition, 2011, ISBN: 0133002101
5. H. Jonathan Chao, Xiaolei Guo, "Quality of service control in High Speed Networks", Wiley & Sons, 2002, ISBN: 0471003972.
6. James P.G. Sterbenz, Joseph D. Touch, "High speed networking: A systematic approach to high-bandwidth low-latency communication", Wiley, 2001, ISBN: 0471330361, 9780471330363.
7. William Stallings, "High Speed Networks: TCP/IP and ATM principles", Prentice Hall, 1998, ISBN: 0135259657, 9780135259658.

14CA3020 DISTRIBUTED OPERATING SYSTEM

Credits: 3:0:0

Course Objective:

- To provide fundamental concepts and design principles of distributed operating systems.
- To provide an overview of various communication techniques that facilitates to exchange information among distributed computing systems.
- To provide exposure to scheduling synchronization and deadlock.

Course Outcome:

Students will be able to

- describe various communication techniques used for exchange of information.
- recognize CPU Scheduling, synchronization, and deadlock.
- describe OS support for processes and threads.
- describe algorithms for handling synchronization, deadlock, and election related to distributed systems.
- able to identify security and protection issues in distributed systems.

Distributed Computing system - Distributed Communicating System Models - Distributed Operating System - Distributed computing Environment - Computer Networks - Case Study on Distributed Communication System Models - Message Passing - Remote procedure Calls - Distributed Shared Memory - Synchronization - Implementing Synchronization Concepts - Resource Management - Process Management - Distributed File Systems - Naming.

Reference Books:

1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007, ISBN: 978-81-203-1380-4.
2. Andrew S. Tanenbaum, "Distributed Operating System", Pearson Education, 2007, ISBN: 0-13-239227-5.
3. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems: Concepts and Design", Pearson Education Ltd., 2001, ISBN: 81-7808-462-7.
4. Yakup Paker, Jean-Pierre Banatre, Müslim Bozyigit, "Distributed operating systems: Theory and Practice", Springer-Verlag, 1987, ISBN: 3540176993.
5. Singhal, "Advanced Concepts in Operating System", Tata McGraw Hill Education Private Limited, 2009, ISBN: 0070472688, 9780070472686.
6. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed System Concepts and Design", Dorling Kindersley Pvt. Ltd, 2009, ISBN: 978-81-317-1840-7.
7. Shubhra Garg, "Fundamentals of Distributed Operating System", S.K. Kataria & Sons, 2010, ISBN: 978-93-80027-41-8.

14CA3021 CLIENT SERVER COMPUTING

Credits: 3:0:0

Course Objective:

- To understand the components of client/server applications and systems development.
- To acquire adequate knowledge in client/server Technologies.
- To understand CORBA, System Oriented Technologies.

Course Outcome:

Students will have

- adequate knowledge about the components of client server applications.
- adequate knowledge in client/server technologies.
- knowledge about CORBA and System Oriented Technologies.

Basic Concepts - Components of Client Server Application - Client Server Middleware - An Introduction to CORBA - Existential CORBA Client Server Operating System - Client Server Transaction Processing - Client / Server groupware - Client / Server with distributed objects - Client Server Systems Development Service and Support - Case study: Applying Client Server in Businesses.

Reference Books:

1. Robert Orfali, Dan Harkey and Jerri Edwards, "Essential Client Server Survival Guide", John Wiley & Sons, Third edition, 2007, ISBN: 0471131199.
2. Tamer, Patrick Valduriez, S. Sridhar, "Principles of Distributed Database Systems", Pearson Education, Inc., 2006, ISBN 81-7758-177-5.
3. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007, ISBN: 978-81-203-1380-4.
4. Devandra Kumar, "Client Server Computing", Global Vision Publishing House, 2012, ISBN: 9789381695159.
5. Yadav, Subash Chandra, "An Introduction to Client Server Computing", New Age International, 2009, ISBN: 9788122428612.

14CA3022 GRID COMPUTING TECHNIQUES AND APPLICATIONS

Prerequisite: 14CA3001 Networking Fundamentals

Credits: 3:0:0

Course Objective:

- To know about grid and the distributed computing resources available over a local or wide area network that appears to an end user or application as one large virtual computing system.
- To discuss about grid computing by applying the resources of many computers in a network to a single problem at the same time.
- To learn about importance of grid computing parameters such as load balancing, cost effectiveness, pervasive computing.

Course Outcome:

At the end of the course students will be able to

- describe how to apply the resources of many computers to solve a single problem
- understand the various grid computer parameters and apply it to grid computing problems
- solve the applications based on Grid and Cloud computing components

Basic values of grid computing - Desktop Grids - Cluster Grids - HPC Grids - Data Grids - The Open Grid Architecture - Creating and Managing Grid Services - Desktop Supercomputing –Grid Enabling Software Applications - Analysis of Grid Computing in Bio-medical Applications - Managing Grid Environments - Grid computing adoption in Research and Industry - A case study on multiple Grid computers to solve a single problem.

Reference Books:

1. Ahmar Abbas, “GRID Computing: A Practical Guide to Technology and Applications”, Firewall Media, 2008. ISBN: 81-7008-626-4.
2. Janakiram D, “Grid Computing -a Research Monograph”, TATA McGraw-Hill Publications, 2005.
3. Barry Wilkinson, “Grid Computing: Techniques and Applications”, CRC Press, 2011, ISBN: 1420069543, 9781420069549.
4. El-Ghazali Talbi, , “Computing for Bioinformatics and Computational Biology”, Wiley 2008, ISBN:0470191627.
5. Frederic Magoules, “Fundamentals of Grid Computing: Theory, Algorithms and Technologies”, CRC Press, 2009, ISBN: 1439803684.

14CA3023 INTERNETWORKING USING TCP/IP

Prerequisite: 14CA3001 Networking Fundamentals

Credits: 3:0:0

Course Objective:

- To focus on the concept of internetworking and TCP/IP internet technology.
- To review the architecture of network interconnections and principles of protocols.
- To study the limitations of the internet approach.

Course Outcome:

Students will be able to

- explain common networking concepts and terminology.
- describe the operation of the major transport layer protocols.
- describe architecture of the internet.

Introduction and overview - Classful Internet addresses - Mapping Internet Addresses to physical addresses - Internet Protocol: Connectionless datagram delivery - Forwarding IP datagrams - Error and Control Messages - Classless and Subnet Address Extensions - Case study on addressing – User Datagram Protocol - Reliable Stream Transport Service - Routing Architecture: Cores, Peers and Algorithms, Internet Multicasting - IP Switching and MPLS -Mobile IP - Private Network Interconnection.

Reference Books:

1. Douglas E. Comer, “Internetworking with TCP/IP – Principles, Protocols and Architecture”, Pearson Education, Fifth Edition, 2006, ISBN: 81-203-2998-8.
2. Charles M. Kozierok, “The TCP/IP guide: A Comprehensive, Illustrated Internet Protocols Reference”, No Starch Press Inc.2005, ISBN: 1-59327-047-x.
3. Behrouz A. Forouzan, “TCP/IP protocol suite”, Third Edition, McGraw Hill, 2005, ISBN: 0071115838.
4. Kevin R Fall, W. Richard Stevens, “TCP/IP Illustrated Volume – I, The Protocols”, 2nd Edition, Addison Wesley 2011, ISBN: 0321336313.
5. Douglas Comer, David L. Stevens, “Internetworking with TCP/IP: Design, Implementation, and Internals”, Prentice Hall 2006, Fifth Edition, ISBN: 0139738436.
6. Walter Goralski, “The Illustrated Network: How TCP/IP Works in a Modern Network”, Morgan Kaufmann, 2009, ISBN: 9780123745415.
7. Peter Loshin, “TCP/IP Clearly Explained”, Morgan Kaufmann, Fourth Edition, 2003, ISBN: 155860782X.

14CA3024 PROGRAMMING IN JAVAEE

Prerequisite: 14CA3002 Object Oriented Programming using Java

Credits: 3:0:0

Course Objective:

- To know the need of Enterprise JAVA applications.
- To know about various JEE components such as Servlets, JDBC, JavaBeans and RMI.
- To develop simple applications using JEE components.

Course Outcome:

Students will be able to

- develop application with JavaEE components.
- acquire knowledge about enterprise architecture.
- acquire knowledge about Security measures in JavaEE.

Introducing J2EE - Architecture of J2EE – J2EE Components – J2EE Best Practices - Java Servlets - Reading and sending data from a client – Reading HTTP request headers - writing the HTTP response header – Working with Cookies - Tracking sessions - Mini Application Development using JavaEE - JDBC Objects - JDBC and Embedded SQL - Enterprise Java Beans: Java Mail API - Remote Method Invocation - JavaEE Security - Implementation a project on Java Mail.

Reference Books:

1. James Keogh, “J2EE-The Complete Reference”, Tata McGraw Hill, Sixteenth Reprint, 2006, ISBN: 0-07-052912-4.
2. David R. Heffelfinger, “Java EE 5 Development with Net Beans 6”, 2012.
3. Kogent Solutions Inc, “J2EE 1.4 Projects”, DreamTech Press, 2007, ISBN: 81-7722-7378.
4. Eric Jendrock, “The Java EE 5 Tutorial”, Addison-Wesley, 2006, ISBN: 0321490290
5. William Crawford, “Java Enterprise in a Nutshell”, O’Reilly Media Inc., 2005, ISBN: 0596101422.
6. Budi Kurniawan, “Java Web Development With Servlets, JSP, and EJB”, Sams, 2nd Edition, 2004, ISBN: 0672326264.

7. Robert McGovern, Stuart Charlton, edited by Gregory Brill, "CodeNotes for J2EE: EJB, JDBC, JSP, and Servlets", Random House, 2005, ISBN: 0812991907.

14CA3025 PROGRAMMING IN JAVAME

Prerequisite: 14CA3002 Object Oriented Programming using Java

Credits: 3:0:0

Course Objective:

- To program mobile telephones using Java Technology.
- To understand Mobile Information Device Profile (MIDP) and advanced concept.
- To program mobile telephones using Java Technology.
- To understand Mobile Information Device Profile (MIDP) and advanced concepts.
- To acquire knowledge about networking using JavaME.

Course Outcome:

Students will be able to

- integrate JavaME client applications with server-side application.
- build and deploy JavaME based solution.
- do mobile networking using JavaME techniques.

JavaME Overview – Small Computing Technology – JavaME Architecture and Development Environment - JavaME User Interface – Command, Items and Event Processing – High Level Display Screens – Low Level Display: Canvas - JavaME Data Management – Record Management System – JavaME Database Concepts - JDBC and Embedded SQL – JavaME Personal Information Manager Profile - JavaME Networking and Web Services – Generic Connection Framework – Web Services- Case study on Mobile technology in Education.

Reference Books:

1. James Keogh, "The Complete Reference J2ME", Tata McGraw-Hill Publishing Company Limited, 2008, ISBN: 978-0-07-053415-5.
2. Ray Rischpater, "Beginning Java ME Platform", Apress, 2009, ISBN: 8184891520.
3. Sing Li, Jonathan Knudsen, "Beginning J2ME from Novice to Professional", Springer (India) Pvt. Ltd., 2006. ISBN 81-8128-292-2.
4. John P Flynt, Martin J. Wells, "Java ME Game Programming", Cengage Learning PTR, Second Edition, 2007. ISBN-10: 1598633899
5. Robert Virkus, "Pro J2ME Polish: Open Source Wireless Java Tools Suite", Apress, First Edition, 2005, ISBN-10: 1590595033
6. Ovidiu Iliescu, "Pro Java ME Apps: Building Commercial Quality Java ME Apps", Apress, First Edition, 2011, ISBN-10: 1430233273
7. Carol Hamer, "Creating Mobile Games: Using Java ME Platform to Put the Fun into Your Mobile Device and Cell Phone", Apress, First edition, 2007, ISBN-10: 1590598806

14CA3026 OBJECT ORIENTED PROGRAMMING USING JAVA LAB

Co-requisite: 14CA3002 Object Oriented Programming using Java

Credits: 0:0:2

Course Objective:

- To apply the object-oriented paradigm features of Java.
- To implement java concepts like interface, packages, multithreading etc.

- To develop graphic applications in applet and using AWT.

Course Outcome:

Students will be able to

- show competence in the use of Java programming.
- develop small to medium sized application programs of professional standards.
- demonstrate their understanding of multithreaded and event driven programming.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA3027 NETWORK SIMULATION LAB

Credits: 0:0:2

Course Objective:

- To understand the concepts of networking using network simulation tools.
- To learn about the network simulation tool in detail.
- To gain hands on experience by simulating networking concepts.

Course Outcome:

Students will

- be able to simulate any network protocol using network simulation tools.
- be able to analyse results to verify network interactions
- have practical exposure of the various networking concepts.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

Reference Books:

1. Richard M. Fujimoto, Kalyan S. Perumalla, George F. Riley, "Network Simulation", Morgan & Claypool Publishers, 2007, ISBN: 978-159-829-406-4.
2. Kim Lew H., Spank McCoy, Tim Stevenson, "Internetworking Troubleshooting Hand Book: An Essential Reference To Solving Difficult Networking Problems", Techmedia, First Indian Edition, 1999, ISBN: 81-7635-210-1.
3. Cisco Inc., "Fundamentals Network Design and Case Studies", First Edition, Techmedia, ISBN: 81-7635-130-X, 1999.
4. Peter Nortons, "Complete Guide To Networking", Techmedia, First Edition, 2000, ISBN: 81-7635-356-6.
5. Greg Tomsho, Ed Tittel, David Johnson, "Guide to Networking Essentials", Cengage Learning India Private Limited, 2009, ISBN: 81-315-0213-9.
6. Spurgeon Charles E, "Practical Networking With Ethernet", Comdex Computer Publishing, 1998.

14CA3028 NETWORK COMPONENTS AND TROUBLESHOOTING LAB

Co-requisite: 14CA3003 Network components and Troubleshooting

Credits: 0:0:2

Course Objective:

- To cover the networking concepts and components and introduces common hardware devices.
- To learn about Network hardware, Media Types (cables, Wireless), Categories of UTP, Connectors, and Network interface Card.
- To learn connecting hosts, Peer to Peer Networks.

Course Outcome:

- Students will have a practical base in computer network issues.
- Students get familiar with Networking Devices (Layer 1, Layer 2).
- Knowledge of Troubleshooting.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA3029 CRYPTOGRAPHY AND NETWORK SECURITY LAB**Credits: 0:0:2****Course Objective:**

- To clearly understand the security issues of computer networking.
- To learn to simulate the network security algorithms.
- Greater understanding of what cryptography is and how it works.

Course Outcome:

At the end of the course,

- students are enabled to simulate any security algorithms in the network.
- students acquire thorough knowledge about network security concepts.
- Gaining the knowledge of information security, aspects of cryptography and its application.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

Reference Books:

1. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson Education, 2013, ISBN: 978-0273793359.
2. Jonathan Knudsen, "JAVA Cryptography", O' Reilly & Associates Inc. 1998, ISBN: 1-56592-102-9.
3. Jason Weiss, "Java Cryptography Extensions Practical Guide for Programmers", Morgan Kaufmann Publishers, 2004. ISBN: 0-12-742751-1.
4. Keith M. Martin, "Everyday Cryptography - Fundamental Principles and Applications", Oxford University Press 2012, ISBN: 978-0-19-969559-1.
5. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, "Handbook of Applied Cryptography", CRC Press, 1997. ISBN: 0-8493-8523-7.

14CA3030 WIRELESS LAB**Co-requisite:** 14CA3005 Wireless Networks**Credits: 0:0:2****Course Objective:**

- To understand concepts of wireless networks.
- To learn about the functionalities of components used in wireless networks.
- To acquire knowledge in wireless applications and services.

Course Outcome:

- Gain knowledge on wireless systems, its applications and services.
- Ability to discuss technologies used in 2G, 3G and 4G networks.
- Gain adequate knowledge about applications of different generation networks.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA3031 LAN SWITCHING TECHNOLOGIES LAB

Co-requisite: 14CA3017 LAN Switching Technologies

Credits: 0:0:2

Course Objective:

- Configure passwords to ensure that access to the CLI is secured.
- Configure a switch to remove http server status for security.
- Configure port security.
- Disable unused ports.
- Monitor traffic.

Course Outcome:

The students will have thorough knowledge in

- switch configurations.
- enforcing security methods.
- traffic issues related LAN switching.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA3032 SOCKET PROGRAMMING AND INTERNETWORKING LAB

Co-requisite: 14CA3023 Internetworking using TCP/IP

Credits: 0:0:2

Course Objective:

- To understand the concepts of internetworking through networking simulation tool.
- To acquire adequate knowledge about communication using TCP packets.
- To acquire adequate knowledge about communication using UDP packets.

Course Outcome:

Students will be able to

- simulate any TCP/IP communication using various techniques.
- Implement communication using TCP packets.
- Implement communication using UDP packets.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA3033 LINUX SYSTEM ADMINISTRATION LAB

Co-requisite: 14CA3006 Essentials of System Administration

Credits: 0:0:2

Course Objective:

- To familiarize students with the Linux environment

- To learn the fundamentals of shell scripting/programming
- To familiarize students with basic Linux administration

Course Outcome:

Students will be able to

- work confidently in Unix/Linux environment.
- write shell scripts to automate various tasks.
- do administrative tasks of Linux system.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA3034 JAVAEE PROGRAMMING LAB

Co-requisite: 14CA3024 Programming in JavaEE

Credits: 0:0:2

Course Objective:

- To enable the students implementing the concepts of Servlets and JSP by developing online applications.
- To enable students in implementing remote method invocation in java.
- To make students use the data access process (JDBC) and understand the EJB procedure by creating and accessing various online transactions like Bank Management System.

Course Outcome:

- Students are well-versed in implementing the basic J2EE concepts.
- Students will be able to apply RMI, Java Beans in applications.
- Students can create any online transaction involved applications and online Query answering system.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA3035 NETWORK MANAGEMENT LAB

Credits: 0:0:2

Course Objective:

- To understand the basic concepts of TCP and UDP protocols.
- To understand the working principles of a switched LAN and various queues.
- To gain a potential knowledge by using simulator tools to implement the routing protocols like RIP.

Course Outcome

Students will be able to

- understand the significance of routing protocols.
- simulate a network environment to verify and / or correct the network
- disseminate the types of TCP protocols and distinguish the features among them.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

Reference Books:

1. Marc Blachet, "Migrating to IPV6 - A Practical Guide to Implementing IPV6 in Mobile and Fixed Networks", Wiley Publications, 2005, ISBN: 978-0-472-49892-6.

2. Adarshpal S. Sethi Vasil Y. Hnatyshin, "The Practical OPNET User Guide for Computer Network Simulation", CRC Press, 2013, ISBN: 978-1-4398-1206-8.
3. Stephen B. Morris, "Network Management, MIBs and MPLS: Principles Design and Implementation", Pearson, 2004, ISBN-81-291-0346-7.
4. J. Richard Burke, "Network Management: Concepts and Practice, A Hands-On Approach", Prentice Hall, 2008, ISBN-978-81-203-3367-3.
5. William Stallings, "Computer Networking with Internet Protocols and Technology", Prentice Hall, 2003, ISBN: 9780131410985.

14CA3036 IP ROUTING TECHNOLOGY LAB

Co-requisite: 14CA3015 IP Routing Technology

Credits: 0:0:2

Course Objective:

- To configure the EIGRP, OSPF and BGP routing protocols.
- To configure advanced route redistribution and route filtering.
- To understand the different methods to modify routing information as it passes throughout the network.

Course Outcome:

Students will be able to

- configure the EIGRP, OSPF and BGP routing protocols.
- configure advanced route redistribution and route filtering
- configure route maps.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA3037 JAVAME PROGRAMMING LAB

Co-requisite: 14CA3025 Programming in JavaME

Credits: 0:0:2

Course Objective:

- To familiar with the basic components and programming issues of JavaME.
- To program mobile telephones, pagers, PDAs, and other small devices using Java.
- To provide practical knowledge required for designing and building successful mobile applications.

Course Outcome:

- Students will be familiar about basic components and programming of JavaME.
- Familiar with programming mobile telephones, pagers, PDAs, and other small devices using Java Technology.
- Design and development of user friendly applications.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA3038 CLOUD COMPUTING TECHNOLOGIES LAB

Co-requisite: 14CA3008 Cloud Computing Technologies

Credits: 0:0:2

Course Objective:

Students are expected to learn and demonstrate practical elements of:

- Cloud Computing principles.
- Cloud Computing components and services.
- Cloud Computing architectures and implementations
- Cloud Computing management and security

Course Outcome:

- Understand what cloud computing is and how it works.
- Understand the benefits of cloud computing
- Applying principles of best practice in cloud application design.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA3039 MOBILE APPLICATION LAB

Credits: 0:0:2

Course Objective:

- To acquire knowledge about the functionalities of mobiles.
- To know about the various operations of mobiles
- To enable the students to develop/simulate any mobile application

Course Outcome:

- Familiarized in various applications of mobiles
- Students could develop any application using mobiles
- Expertise in resolving problems in any kind of mobile application.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

Reference Books:

1. Reto Meier, "Professional Android 4 Application Development", Wiley India Pvt. Ltd., 2012, ISBN: 812653608x
2. Wei-Meng Lee, "Beginning Android 4 Application Development", Wiley India Pvt. Ltd., 2012, ISBN: 8126535571
3. Ian G. Clifton, "Android User Interface Design: Turning Ideas and Sketches into Beautifully Designed Apps", Addison Wesley, 2013, ISBN: 0321886739
4. Mark L Murphy, "The Busy Coder's Guide to Advanced Android Development", CommonsWare, 2011, ISBN: 098167805X
5. W.Frank Ableson, "Android in Action", Dreamtech Press, Third Edition, 2012, ISBN: 9350042916
6. Mike McGrath, "Building Android Apps in Easy Steps", Tata McGraw Hill Education, 2012, ISBN: 1259060977

14CA341 XML TECHNOLOGIES

Credits: 4:0:0

Course Objective:

- Focus on methods of using interconnected networks to effectively distribute text, audio, and video information.
- To build comprehensive business applications using XML Markup Language technologies.
- To learn the concepts of XSL.

Course Outcome:

Students will be able to

- develop interactive web pages.
- explore the concepts of XML.
- explore the concepts of XSL.

Unit I

Introducing CSS - Fonts and Text Styles – Selectors - Backgrounds and Color Gradients in CSS - Creating Boxes and Columns.

Unit II

List - Tables - outlines - Positioning with CSS - Effects, Frames and Controls in CSS.

Unit III

Working with Basics of XML – DTD - XML Namespaces.

Unit IV

XML Schema - Converting XML Documents in other formats.

Unit V

XSLT - XPath, XLink and Xpointer.

Text Books:

1. Jon Duckett, “Beginning Web Programming with HTML, XHTML and CSS”, 2nd Edition, Wiley India Pvt. Ltd, 2011, ISBN: 978-81-265-1697-1.
2. Kogent Learning Solutions Inc., “HTML 5 Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP & jQuery Black Book, 2013, ISBN 978-93-5004-095-9.

Reference Books:

1. Ron Schmelzer, Travis VAndersypen et al, XML and Web Services, Dorling Kindersley India Pvt. Ltd, 2004, ISBN 9788131718698.
2. Joe Fawcett, Danny Ayers, Liam R.E.Quin, “Beginning XML”, Wrox, 5th Edition, 2012, ISBN: 978-1-1181-6213-2.
3. James L. Mohler, Jon M. Duff, “Designing Interactive Web Sites”, Cengage Learning, Second Indian Reprint 2009, ISBN 13: 978-81-315-0570-0.
4. Heather Williamson, “XML: The Complete Reference”, Tata McGraw - Hill Education, 2001, ISBN: 9780070447257.
5. Erik T. Ray, “Learning XML”, O’Reilly, Second Edition, 2009, ISBN: 9788184048964.

14CA342 MACHINE LEARNING

Credits: 4:0:0

Course Objective:

- To get the knowledge about machine learning
- To learn about parametric and non parametric methods

- To combine multiple learners

Course Outcome:

- The students will get the knowledge about the machine learning
- The students can able to combine multiple learners.
- The students are familiarized in various parametric and non parametric methods.

Unit I

Introduction- what is Machine Learning? - Examples of Machine Learning Applications-Parametric Methods – Introduction - Maximum Likelihood Estimation-Evaluating an Estimator: Bias and Variance- Bayer’s Estimator-Parametric Classification-Regression -Tuning Model Complexity: Bias/Variance Dilemma- Model Selection Procedures- Multivariate Methods-Multivariate Data- Parameter Estimation- Estimation of Missing Values-Multivariate Normal Distribution- Multivariate Classification-Tuning Complexity- Discrete Features- Multivariate Regression.

Unit II

Nonparametric Methods- Introduction-Nonparametric Density Estimation- Generalization of Multivariate Data-Nonparametric Classification - Condensed Nearest Neighbor- Nonparametric Regression: Smoothing Models - How to choose the Smoothing Parameter. Linear Discrimination – Introduction - Generalizing the Linear Model - Geometry of the Linear Discriminant - Pairwise Separation - Parametric Discrimination Revisited - Gradient Descent- Logistic Discrimination - Discrimination by Regression.

Unit III

Multilayer Perceptrons- Introduction- The Perceptron- Training a Perceptron-Learning Boolean Functions-Multilayer Perceptrons- MLP as a Universal Approximator - Backpropagation Algorithm -Training Procedures - Tuning the Network Size- Bayesian view of Learning- Dimensionality Reduction - Learning Time - Local Models-Introduction - Competitive Learning- Radial Basis Functions-Incorporating Rules- Based Knowledge-Normalized Basis Functions- Competitive Basis Functions - Learning Vector Quantization- Mixture of Experts-Hierarchical Mixture of Experts.

Unit IV

Kernel Machines-Introduction- Optimal Separating Hyperplane- The Nonseparable Case: Soft Margin Hyperplane-v-SVM- Kernel Trick-Vectorial Kernels-Defining Kernels-Multiple Kernel Learning-Multiclass Kernel Machines-Kernel Machines for Regression- One Class Kernel Machines-Kernel Dimensionality Reduction- Graphical Model-Introduction- Canonical Cases for Conditional Independence- Example Graphical Models- d-Separation- Belief Propagation- Undirected Graphs: Markov Random Fields- Learning the Structure of a Graphical Model- Influence Diagrams.

Unit V

Combining Multiple Learners- Rationale – Generating Diverse Learners- Model Combination Schemes- Voting-Error Correcting Output Codes- Bagging-Boosting-Mixture of Experts Revisited – Stacked Generalization- Fine Tuning an Ensemble-Cascading- Reinforcement Learning- Introduction- Single State Case: K-Armed Bandit-Elements of Reinforcement Learning- Model Based Learning- Temporal Difference Learning- Generalization – Partially Observed States.

Text Book:

1. Ethem Alpaydin, “Introduction To Machine Learnig”, PHI Learning Private Limited, Second Edition 2010, ISBN- 978-81-203-4160-9.

Reference Books:

1. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer, First Edition, 2006, ISBN: 978-0-387-31073-2
2. Stephen Marsland, “Machine Learning: An algorithm Perspective”, Series Editor, First Edition, 2009, ISBN-10: 1420067184

14CA343 BIG DATA ANALYTICS

Credits: 4:0:0

Course Objective:

- To understand the basics of big data analytics
- To understand Map Reduce Concepts
- To get a clear understanding about mining unstructured data
- To analyze big datasets using Hadoop

Course Outcome:

Student will be able to

- Understand the basics of big data analytics
- Understand the concepts of Map Reduce
- Understand the mining of unstructured data
- Analyze big data sets using Hadoop

Unit I

Map Reduce and the New Software Stack: Distributed File Systems – Map Reduce – Algorithms using Map Reduce – Extensions to Map Reduce – The Communication Cost Model – Complexity Theory for Map Reduce – Mining Data Streams: The Stream Data Model – Sampling Data in a Stream – Filtering Streams - Counting Distinct Elements in a Stream – Estimating Moments – Counting Ones in a Window – Decaying Windows.

Unit II

Link Analysis: Page Rank – Efficient Computation of Page Rank – Topic-Sensitive Page Rank – Link Spam – Hubs and Authorities – Advertising on the Web: Issues on On-Line Advertising – On-Line Algorithms – The Matching Problem – The Adwords Problem.

Unit III

Recommendation Systems: A Model for Recommendation Systems – Content-based Recommendations – Collaborative Filtering – Dimensionality Reduction – Mining Social Network Graphs: Social Networks as Graphs – Clustering of Social-Network Graphs – Direct Discovery of Communities – Partitioning of Graphs – Finding Overlapping Communities – Simrank – Counting Triangles – Neighborhood Properties of Graphs.

Unit IV

Hadoop: Distributed Systems and Hadoop – Comparing SQL Databases and Hadoop – Understanding Map Reduce – Simple Program in Hadoop – Starting Hadoop: The Building Blocks of Hadoop – Setting up SSH for a Hadoop Cluster – Running Hadoop – Web based Cluster UI – Components of Hadoop: Working with Files in HDFS – Anatomy of a Map Reduce Program – Reading and Writing - Basic Map Reduce Programs: Constructing the basic template of a Map Reduce Program – Counting Things – Adapting for Hadoop's API Changes – Streaming in Hadoop.

Unit V

Programming Practices: Developing Map Reduce Programs – Monitoring and Debugging on a Cluster – Tuning for Performance – Running Hadoop in the Cloud: Introduction to Amazon Web Services – Setting up AWS – Setting up Hadoop on EC2 – Running Map Reduce Programs on EC2 – Cleaning up and Shutting down EC2 Instances – Case Studies: New York Times Archive – China Mobile – Stumble Upon.

Text Books:

1. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Second Edition, Cambridge University Press, 2013, ISBN: 978-1107015357.
2. Chuck Lam, "Hadoop in Action", Dreamtech Press, 2011, ISBN: 978-8177228137.

Reference Books:

1. Garry Turkington, "Hadoop Beginner's Guide: Learn How to Crunch Big Data to Extract Meaning from the Data Avalanche", Shroff/Packt Publishing, 2013, ISBN: 978-9351101109.

2. Viktor Mayer-Schonberger, Kenneth Cukier, “Big Data”, John Murray Publishers, 2013, ISBN: 978-1848547902.

14CA344 XML TECHNOLOGIES LAB

Credits: 0:0:2

Course Objective:

- To give an insight about creation of web pages and learn how a document should appear.
- To create web pages by implementing all XML concepts.

Course Outcome:

- Students will be able to create interactive web pages using CSS and XML.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA345 MULTIMEDIA LAB

Credits: 0:0:2

Course Objective:

- To impart a decent practical knowledge on the use of animation software.
- To enrich creativity in the students.
- To impart core concepts of digital arts and illustration.

Course Outcome:

- Students will gain practical knowledge in working with animation.
- Students will be able to work with digital arts and illustration.
- Students will be able to work with 3D animation.

The faculty conducting the laboratory will prepare a list of 12 experiments and get the approval of HoD/Director and notify it at the beginning of each semester.

14CA346 ESSENTIALS OF COMPUTER SCIENCE

Credits: 4:0:0

Course Objective:

- To know about the core network concepts.
- To understand the functionalities of different layers of the network.
- To get clear understanding about the basic data structures and their operations.
- To understand the concepts of algorithms.
- To get an understanding about the concepts of operating systems

Course Outcome:

The students will

- understand the core concepts of the network.
- comprehend the network layers and their functionalities
- understand the basics of data structures.
- Implement the basic search and sort algorithms.
- familiarize with the concepts of the operating systems.

Unit I

Introduction to Operating Systems: Computer System Organization – Computer System Architecture – Operating System Structure – Operating System Operations – Process Management Memory Management – Storage

Management – Protection and Security – **Process:** Process Concept – Process Scheduling – Operation on Processes – Interprocess Communication

Unit II

CPU Scheduling: Basic concepts – Scheduling Criteria – Scheduling Algorithms - **Process Synchronization:** The Critical Section Problem – Peterson’s Solution – Semaphores – Classic Problems of Synchronization – Monitors - Atomic Transactions. - **Memory management:** Main Memory – Swapping – Contiguous Memory Allocation

Unit III

Arrays: Concepts - representation of arrays - simple applications. **Stack:** Fundamentals - Operation - Application of Stack - evaluation of expression. **Queue:** Fundamentals - Operation - Application of Queue - Multiple Stacks and Queues - Concepts – Operations. **Searching:** Binary Search - Sequential Search - Sorting: Internal sorting - Insertion, Quick, sorts - Bubble Sort.

Linked Lists: Singly Linked List - Concepts – Operations.

Unit IV

Data Communications: Components, Data Representation, Data Flow, Networks –The Internet-Protocols and Standards –Layered Tasks-The OSI model – Layers in the OSI Model TCP/IP Protocol Suite- **Network Layer:** Logical Addressing: IPv4 Addresses-IPv6 Addresses- Internetworking-IPv4-IPv6-Transition from IPv4 to IPv6- Address Mapping-ICMP-IGMP-Network Layer: Delivery, Forwarding, and Routing: Unicast Routing Protocols-Multicast Routing Protocols.

Unit V

Domain Name System: Namespace-Domain Name Space-Distribution of Name Space-DNS in the Internet-Resolution-DNS Messages-Types of Records-Remote Logging, Electronic Mail and File Transfer: Remote Logging, Electronic Mail, File Transfer.

Text Books:

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw-Hill, Fourth Edition, 2006, ISBN: 0-07-063414-9.
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, “Operating System Principles”, John Wiley & Sons, Eighth Edition, 2009, ISBN: 978-0-470-12872-5.
3. Ellis Horowitz & Sartaj Sahni, “Fundamentals of Data Structures”, Computer Science Press India, 2000, ISBN: 091-489-420X.