DIVISION

OF

COMPUTER SCIENCE &

ENGINEERING

Code No.	Subject Name	Credit
CS201	Computer Programming in C	3:0:0
CS202	Software and Computer Programming Lab (CS201 P)	0:0:2
CS203	Data Structures and Algorithms I	3:1:0
CS204	Data Structures and Algorithms II	3:1:0
CS205	Operating System	4:0:0
CS206	System Software	4:0:0
CS207	Object Oriented Analysis and Design	4:0:0
CS208	Java Programming	3:1:0
CS209	Java Programming Lab	0:0:2
CS210	Windows Programming	3:1:0
CS211	Windows Programming Lab	0:0:2
CS212	Distributed Computing	3:1:0
CS213	Database Management Systems	3:1:0
CS214	Database Management Systems Lab	0:0:2
CS215	Principles of Compiler Design	4:0:0
CS216	Unix Architecture	4:0:0
CS217	Unix and Linux Lab	0:0:2
CS218	Data Structures Lab	0:0:2
CS301	Data Mining and Warehousing	4:0:0
CS302	Object Oriented Systems Development	3:1:0
CS303	Distributed Operating Systems	4:0:0
CS304	Cryptography and Network Security	3:1:0
CS305	Software Project Management	3:1:0
CS306	Computer Architecture and Organization	4:0:0
CS307	Genetic Algorithm	4:0:0
CS308	Real Time Systems	4:0:0
CS309	Discrete Structures	3:1:0
CS310	Software Development Lab	0:0:2

CS201 COMPUTER PROGRAMMING IN C

Credit : 3:0:0
Marks : 40+60

Unit I: Introduction to Computers
What is a computer? Hardware – software types of software system utility and application, Elementary Computer Organization Block diagram.

Introduction to Computing : What are algorithms, types of algorithm finite, deterministic algorithms and computer program? Why we need programming languages? Levels of languages compiler. Programming Language C.

Basic Notations: Variables, Expressions, Assignments Iterative Instructions.

Out First C Program : A program for insertion sort, full-fledged C program.

Constants, Variables and Types : Variables, types and constants in C, names in C, Basic types in C, Qualified types, constants, declarations.

Operators, Expressions and Statements: Operators, Expressions, Statements, Type Conversions.

Unit II : Input and Output

Function printf, scanf, getchar and putchar.

Control Statements : Control flow statements, the execution flow, the if-statement, the if-else statement, the else-if ladder, the switch statement, the break statement, the ?: operator, loops, the continue statement, the goto statement.

Unit III : Arrays

Arrays, one dimensional array, two dimensional arrays, multidimensional arrays.

Strings : Reading strings, writing strings, character and integer, combining two strings.

Unit IV : Functions

Function definition, statement return, the exit statement, functions of type void, declaration and definition, internal and external variables, scope, blocks.

Stepwise Refinement Through Functions: A program through stepwise refinement, overall idea, broad idea, data structure issues, example.

Recursion: Recursion, definitions leading to recursive programs, some computing best described recursively, Towers of Hanoi problem.

Unit V : Pointers & Structures

Address of a variable, operators and pointers, declaring pointers, operations with pointers, pointers as function arguments. Address of an array, address of a string. Pointers to functions, structures and pointers, dynamic memory allocation, unions.

Data Files : File operations, file handling functions organization, Blodk I/O, modifying records, advanced I/O.

C Processor and other Features: Introduction, macro expansion, file inclusion, conditional compilation, miscellaneous directives, command line arguments, defining new data types, other features.

Text Book

1. IBM Publication C complete reference by Herbert Schildt

Reference Books

1. Programming language by Kezninghan & Ritchie
2. Schaums Outline series C Programming by Byran Gotfried

CS202 (CS201 P) SOFTWARE AND COMPUTER PROGRAMMING LAB

Credit 0:0:2
Marks: (50 + 50)

1. Microsoft Windows 98
2. Microsoft Word 2000
3. Microsoft Excel 2000
4. Microsoft Power Point 2000
5. Programming With C
   i)   Generating Fibonacci series
   ii) Finding a number is armstrong number or not
   iii) Solving a quadratic equation
   iv) To check a number for prime
   v)   Towers of Hanoi problem

CS203 DATA STRUCTURES AND ALGORITHMS I

Credit: 3:1:0
Marks (40 + 60)

Unit I : Introduction
Structure and problem solving, Algorithmic notation, Introduction to algorithm analysis for time and space requirements and Primitive data structures. (Chapter 0)

Unit II : Representation And Manipulation Of Strings
Definitions and concepts, String manipulation and pattern matching, Markov algorithms, Primitive and composite functions, Grammars, Storage representation of strings and String manipulation applications. (Chapter 2)

Unit III : Linear Data Structures Sequential Storage Representation
Storage structures for arrays, structures and arrays of structures, Stacks Applications of stacks, Queues, priority queues. (Chapter 3)

Unit IV : Linked Storage Representation
Pointers and linked allocation linked linear lists, Operations, Circularly and doubly linked list applications, Associative lists. (Chapter 4)

Unit V : Non-Linear Data Structures
Trees Definitions and concepts operations, Storage representation and manipulation of binary trees, conversion of general trees, Sequential and other representation of trees, Applications of trees Multi linked structures, Graphs and their representations, Applications of graphs, Dynamic storage management. (Chapter 5)

Text Book
1. Jean-Paul Tremblay and Paul G Sorenson, *An Introduction to Data structures with Applications,* Second Edition, McGraw Hill, 1994.(chapters 0,2-5)

CS204 DATA STRUCTURES AND ALGORITHMS II

Credit: 3:1:0
Marks (40 + 60)

Pre-requisite: CS203 DATA STRUCTURES AND ALGORITHMS I

Unit I : Sorting Techniques
Selection sort, bubble sort, merge sorting tree sort, partition, exchange sort, radix sort, address calculation sort. (Sections 6.1.1 to 6.1.9)

Unit II : Searching Techniques
Sequential searching, binary searching, search trees, height balanced trees, weight balanced trees, tree structures, Hash functions, collision, Resolution techniques.
(Sections 6.2.1 to 6.2.4.3)

Unit III : File Structures
External and intermediate storage devices, sequential files in structure and processing, sorting on disks, indexed sequential files, structure and processing of indexed sequential files, class record retrieval system, direct files, An on line banking system.
(Sections 7.1 to 7.10)

Unit IV : External Sorting
Dynamic hashing techniques, linear and virtual hashing, multiple key access and data base systems. (Sections 7.11 to 7.14)

Unit V : Algorithm Design Model
The Greedy method, Divide and conquer, Dynamic programming, Backtracking, Branch and bound.

Text book
1. Jean-Paul Tremblay and Paul G Sorenson, *An Introduction to Data structures with Applications*, Second Edition, McGraw Hill Book Company, 1984.

Reference book
1. Sartaj Sahni, *Data Structures, Algorithms and Applications in C++*, McGraw Hill, 1998.

CS205 OPERATING SYSTEM

Credit: 4:0:0
Marks (40 + 60)

Unit I
Generations and history of operating systems - performance factors utilisation - throughput response time - multiprogramming and time sharing concepts -, process states - state transition - pcb - suspend and resume - interrupt processing - job and processor scheduling levels, objectives and criteria for scheduling - pre emptive and non - pre emptive scheduling

- interval timer - priorities - deadline scheduling - FIFO - round robin - quantum size - SJF - SRT - HRT scheduling - multilevel feedback queries.

Unit : II

storage organisation - management strategies - contiguous and non- - contiguous storage allocation - fixed partition multi - programming - variable partitions - swapping. Virtual storage, multilevel organisation, Block mapping, paging, m segmentation, paging /- segmentation systems - page replacement Locality, Working sets - Lemand paging - Anticipatory paging - page release - page size - program behaviour under paging.

Unit : III

File systems, Data hierarchy, Blocking and Buffering, Files organisation, Queued and basic access methods - file characteristics - File system - Allocating and freeing space, file descriptor Access control matrix - User classes - Back up and recovery - Data page systems. Security - Pass word protection - Security kernels OS penetration, Disk scheduling - seek optimisation rotational optimisation - systems considerations.

Unit : IV

Parallel processing - parbeging - parend - mutal exclusion - Critical sections - Implementing mutual exclusion primitives - Dekker's algorithm - Test and set instruction - Semaphores - Process synchronisation with semaphores - Producer consumer relationship - counting semaphores. Communication between computer - Elements of Computer networks - Network operating systems.

Unit : V

Monitors - Resource allocation with monitors - Ring buffer - Readers and writers - Ada Multi testing - Rendezvous - Accept - producer - consumer - select ads examples. Deadlock - conditions for deadlock prevention Avoidance - Banker's algorithm - Detection and Recovery. Performance measurement, monitoring and evaluation. The UNIX operating system.

Text Book:
1. An introduction to operating systems, Harvey M.Deital-Addis6n - Wesley publishing company - Revised edition, 1984.

Reference Book:
1. Operating systems concepts - James L.Paterson, Abraham Silberschatz, Addison wesley Publishing Co., Second Eciition, 1 985
2. Operating Systems - S.Tanenbaum.
3. Milen Milan Kovic - Operating Systems Concepts and Design Mc Graw Hill ISE, 1987.
4. M.Bach - Design of Unix Operating Systems - Prentice Hall of India. 1988.

CS206 SYSTEM SOFTWARE

Credit: 4:0:0
Marks (40 + 60)

Unit : I
Language processors, Language processing activities – fundamentales of language processing –specification – languages processor development tooling – scanning and parsing.

Unit II : Assemblers
Elements of assembly language programming – pass structure of assembles – design of two-pass assemblers – single pass assembler for PCs.

Unit III : Macros And Macro Processors
Macro definition and Call macro expression – nested macro calls – advanced macro facilities – design of macro processors.

Unit : IV
Compilers and Interpreters: Aspects of compilation – memory allocation – compilation of expressions- compilation of control structure code optimization – interpreters.

Unit : V
Loaders and Linkers: Functions – various loading schemes – design loaders – relocation and linking concepts – design of linker – self recating programs – linking for overlays. Software Tools: Software tools program development – editors – debug monitor.

Text Book
1. D.M. Dhamdhere – System programming & operating system, Tat McGraw Hill Publishing Co., 1997.

Reference Books
1. J.J.Donovan, System programming, Tata McGraw Hill , 1996.

CS207 OBJECT ORIENTED ANALYSIS AND DESIGN

Credit: 4:0:0
Marks (40 + 60)

Pre-requisite: CS201 OBJECT ORIENTED PROGRAMMING IN C++

Unit I : An Overview Of Object Oriented Systems Development
Object Basics , Object oriented philosophy, objects, classes, attributes, object behavior and methods, encapsulation and information hiding, class hierarchy, polymorphism, object relationships and associations, aggregations and object containment, case study, object identity, persistence.

Object oriented systems development life cycle: Software development process, building high quality software, use- case driven approach, reusability.(chapters 1-3)

Unit II : Object Oriented Methodologies

Rumbaugh et al.'s object modeling technique, Booch methodology, Jacobson et al methodologies, patterns, frameworks, the unified approach.

Unified modeling language: Static and dynamic models, UML diagrams, UML class diagrams, use-case diagrams, UML dynamic modeling, packages, UML extensibility and UML metamodel.(chapters 4 & 5)

Unit III : Object Oriented Analysis Process

Business object analysis, use-case driven object oriented analysis, business process modeling, use-case model, developing effective documentation, case study. Classification: Classification theory, noun phrase approach, common class patterns approach, use-case driven approach, classes, responsibilities, and collaborators, naming classes. (chapters 6&7)

Unit IV : Identifying Object Relationships, Attributes And Methods

Association, super-subclass relationships, a-part of relationships, case study, class responsibility, defining attributes for vianet bank objects, object responsibility, defining methods for vianet bank objects

Design process and design axioms: Corollaries, design patterns. (chapters 8 & 9)

Unit V : Designing Classes

UML object constraint languages, designing classes, class visibility, refining attributes for the vianet bank objects, designing methods and protocols, designing methods for the vianet bank objects, packages and managing classes. (chapter 10)

Designing access layer, case study. (sections 11.10,11.11)

Designing view layer, macro level process.(sections 12.3 ,12.4)

Text-Book
1. Ali Bahrami, *Object Oriented Systems Development using the Unified Modeling Language*, McGraw Hill, 1999 (chapters 1-10 & sections 11.10,11.11,12.3, 12.4 only).

Reference Book
1. Bernd Oestereich, *Developing Software with UML, Object-Oriented Analysis and Design in Practice,* Addison-Wesley, 2000.

CS208 JAVA PROGRAMMING

Credit: 3:1:0
Marks (40 + 60)

Unit I : Introduction to JAVA

Object oriented language – The JAVA environment – comparing JAVA C and C++– Keywords & operators – Identifiers – Literal – Expressions – Control flow – Arrays & Strings – Functions – Command line Arguments .Data members – methods – Overloading

constructors – Class Assignment – This – Static members & methods -Inheritance – Abstract classes – exceptions .

Unit II : The JAVA Standard Library

Overview – interfaces – packages – Exploring java.Lang–Simple type Wrappers.
Input Output: Exploring java . io_Java I/O classes and Interfaces – The Character Stream – BufferedReader –BufferedWriter **.**
Multithreaded Programming: Thread model –Creating a thread . Creating multiple thread– Thread Priority .

Unit III : The Applet class

HTML – Programming– applet initialization and terminatipon – Applet skeleton – Simple Applet Display method – Passing parameters to applet .Events – Classes – Handling AWT Controls – Sources of events –Event Listener interfaces–Handling the events .AWT Classes –Windows fundamentals – Creating frame Window– Handing events in frame window - Working with graphics – Working with Color – Working with font –Layout Managers – MenuBars and menus –Dialog Boxes.

Unit IV : A Tour of Swing_

Japplet –Icons and Labels – Text fields –Buttons – Combo Boxes – Tabbed Panes – Scroll -Panes – Tables–Trees.
JDBC: ODBC – RDBMS Concepts – Setting up a database – Setting up tables – Establishing connection – Getting Data from a table –Prepated Statements–Callable Statements – Stored Procedures – DastabaseMetadata –ResultsetMetadata.

Unit V : Networking _Basis

Java and Net – InetAddress –TCP/IP Client socket – URL Connection –TCP/IP Server socket – Datagrams.
Servlets **:** Life cycle of servlet – jsdk – A simple servlet – Servlet API – javax.servlet Package
Reading servlet parameters – Reading initialisation parameters– javax.servlet.http
Package – Handling HTTP Request and response –Using Cookies.

Text Book

1. Patric Naughton , Herbert Schildt, *The Complete Reference "Java 2 ",*Third edition Tata Mc Graw Hills ,1999.

Reference Books:

1. E. Balaguruswamy,*Programming with java* , Second Edition,TMH,1999.
2. Graham Hamilton , Rick Cattell, Maydene Fisher ,"*JDBC Database access with java*".

CS209 JAVA PROGRAMMING LAB

Credit: 0:0:2
Marks: (50 + 50)

1. Program to create a simple applet and application
2. Using Java Classes and Objects
3. Using inheritance and interface
4. Using arrays in Java
5. Using exceptions
6. Using threads (Synchronization, communication, critical section)
7. Program using AWT packages: Windows, controls and message layout managers
8. Using package.net
9. Using I/O package (files and streams)
10. Create a simple web page for college information system
11. Create a web page for to implement of searching technique

CS210 WINDOWS PROGRAMMING

Credit: 3:1:0
Marks (40 + 60)

Unit I : Windows & Messages
Architectural overview, registering the window class , creating & displaying window, message loop, window procedure, processing the windows, playing a sound file, WM_PAINT, WM_DESTROY messages, queued and non-queued messages, valid and invalid rectangles.
GDI: Introduction, scrollbars, structure of GDI, device context drawing dots and lines, drawing filled areas, GDI mapping mode, rectangles, regions and clipping.

Unit II : Keyboard
Basics, keystroke messages, character messages, caret.
Mouse: Basics, client area mouse messages, capturing the mouse, mouse wheel.
Timer: Basics, using the timer.

Unit : III
Child window controls: button class, controls and colors, static class, scrollbar class, edit class, list box class.
Menus and Resources: Icons, cursors, strings, custom resources, menus, keyboard accelerators.

Unit IV : Dialog boxes
Modal, modeless and common dialog boxes. Clipboard: Use of clipboard
Printer : Fundamentals, printing graphics and text.

Unit V : Bitmaps
Basics, dimensions, Bit block transfer, GDI bitmap object .
MDI: Concepts, implementation.

Multitasking and Multithreading: modes of multitasking, windows multithreading, thread synchronization, event signaling,

Internet : Windows sockets, win Inet and FTP.

Text Book
1. Charles Petzold, **Programming Windows,** 5th edition, Microsoft press. 1998

Reference Book
1. James L.Conger, **Windows API Bible – Programmer's reference,** Galgotia Publications Ltd., 1996.

CS211 WINDOWS PROGRAMMING LAB

Credit: 0:0:2
Marks (50 + 50)

1. Working with simple window operations – Creation and basic manipulations in window
2. Creation of child windows from a Parent window
3. Developing an Application revealingthe usage of the "Scroll Bar"
4. Developing an Application that works with Models and Models dialog Box
5. Working with simple mouse functions – Right Click, Left Click, Middle Click, Mouse UP, Mouse Down etc.,
6. Developing an Application which scrolls the text vertically - File concept could be used
7. Creation of an editor performing all the operations like Cut, Copy, Paste, File Open File, Close File Save etc.,
8. Developing an Application supporting Graphical objects like arc, ellipse etc.,
9. Developing a program that works on different fonts over a text.

CS212 DISTRIBUTED COMPUTING

Credit: 3:1:0
Marks (40 + 60)

Unit I : Introduction
Distributed Processing - Models for distributed computing – Load balancing – Remote Procedure Calls – Process migration – Concurrency issues on databases – Hardware Concepts – Bus based multiprocessors – Switched multicomputers – Software Concepts – Network Operating systems and NFS – Time distributed systems – Multiprocessor time sharing system – Design issue – Transparency – Flexibility – Reliability – Performance and scalability.

Unit II : Communications
Communications in distributed systems – The Client-Server model - Blocking Vs Non Blocking primitives – Buffered versus Unbuffered primitives – Implementation of Client-Server model.

Unit III : Synchronization

Synchronization in distributed systems – Clock synchronization – Mutual exclusion – Electron Algorithms – Atomic transactions –Dead Locks in distributed systems – Threads – Thread usage and Implementation of thread packages – Processor allocation.

Unit IV : Distributed File Systems

File service interface – Semantics of the sharing – Distributed file systems.

Unit V : Software Concepts:

Distributed Programming Languages – Issues – Applications – Review of Distributed Databases.

Text Books

1. Mukesh Singal and Shivaratri N.G., "Advanced Concepts in Operating System ", McGraw Hill.,New York,1994.
2. Tanenbaum A.S., "Modern Operating Systems",Prentice Hall.

CS213 DATA BASE MANAGEMENT SYSTEMS

Credit: 3:1:0
Marks (40 + 60)

Unit I : Databases And Database Users

Characteristics of the Database approach, advantages of using DBMS, implications of the Database approach.

Database System Concepts and Architecture:

Data models, schemas and instances, DBMS architecture and data independence, Database languages and interfaces, Database system environment, classification of DBMS.

Data Modeling using the Entity-Relationship:

conceptual Data models for Database design, Entity types, sets attributes, roles and structural constraints, refining the ER design for the company Database, ER diagrams, Naming conventions.

Enhanced Entity-Relationship and Object Modeling:

Subclasses, specialization and generalization, constraints and characteristics of specialization and generalization, modeling, Conceptual object modeling using UML class, relationship types ,data abstraction and knowledge representation (Chapters 1 to 4).

Unit II : Record Storage and Primary File Organizations

Secondary storage devices, buffering of blocks, placing file records, operation on files, heap files, sorted files, Hashing techniques, Index Structures fir Files. Types of single-level ordered index, multilevel indexes, B+ trees, indexes.

The Relational Data model, Relational Constraints, and the Relational Algebra:

Relational model concepts, relational constraints and relational Database schemas, relational operations (Chapters 5 to 7).

Database models:

The hierarchical database model, the network database model

Unit III : SQL – The Relational Database Standard

Data definition, Constraints and schema changes in SQL2, Queries, Insert, delete update statements in SQL, specifying general constraints as assertion.

ER-and EER-to-Relational Mapping and other Relational Languages:

Relational Database design using ER-to-relational mapping, mapping EER model concepts to relations, The tuple relational calculus, the domain relational calculus (Chapters 8 to 9)

Unit IV : Concepts For Object-Oriented Databases

Object identity, object structure, and type constructors, Encapsulation of operations, methods, and persistence, complex objects, other object-oriented concepts.

Object database standards, Languages, and Design:

overview of the Object model of ODMG, object definition language, object query language, overview of the C++ language binding, object database conceptual design (Chapters 11 to 12).

Unit V : Object Relational And Extended Relations Database Systems

Object-relational features of Oracle 8, an overview of SQL 3, implementation and related issues for extended type systems.

Functional dependencies and Normalization for relational databases:

informal design guidelines for relation schemas, functional dependencies, normal forms based on primary keys ,Boyce- Codd normal form.

Relational database design algorithms and further dependencies: Algorithms for relational database, multivalued dependencies, join dependencies, other dependencies (Chapters 13 to 15).

Text Book

1. Ramez Elmasri, Shamkant B. Navathe, *Fundamentals of Database Systems*, Third Edition,Addison Wesley, 2000,

Reference Book

1. Suneel galgotia , *Data base systems* , Galgotia publications private limited ,1998
2. Raghu Ramakrishnan, *Database Management Systems*, WCB/McGraw Hill, 1998.

CS214 DATA BASE MANAGEMENT SYSTEMS LAB

Credit: 0:0:2
Marks (50 + 50)

1. Usage of DDL commands
2. Usage of DML and DCL commands
3. Usage of TCL commands
4. Multiple sub-queries
5. Correlated sub-queries
6. Usage of REF and OID
7. Object creation
8. Arrays manipulation

9. BFILE management
10. Usage of explicit cursors & implicit cursors
11. Usage of functions
12. Usage of procedures
13. Exception handling
14. Usage of database triggers
15. Packages (Oracle forms)
16. Personnel management system
17. Inventory control
18. Student Information System
19. Election Processing

CS215 PRINCIPLES OF COMPILER DESIGN

Credit: 4:0:0
Marks (40 + 60)

Unit I : Programming Language Grammar

Definition of programming language – Lexical and syntactic structure of a language – Elements of a format lan – guage grammar – Derivation, reduction and syntax trees – A ambiguity – context free grammars – Capabilities of a context free grammar – Regular expressions.

Unit II : Lexical Analysis

Role of a lexical analyzer – Finite automats –Regular expressions to finite automata – Minimizing the number of states of DFA – Implementation of a lexical analyzer – Illustrations.

Unit III : Parsing Techniques

Parse trees – Left most and right most Parsing techniques- Top down and bottom up parsing – Handles – Shift reduce Parse- Recursive descent Parser – Operator precedence and predictive Parse. Automatic Parsing techniques: LR grammars – LR Parsing – Canonical – collection of LR (0) items – construction of ACTION and GO TO table – Introduction to SLR – canonical and LALR Parsing.

Unit IV : Syntax Directed Translation

Syntax directed translation scheme – Semantic actions – Implementation – Intermediate code generation – Address codes, quadruples and triples, parse trees and syntax trees- Methods of translating assignment statements, expressions control statements- Array references, procedure calls, declarations, case statements – Record structures. Symbol tables and error handling: Representation of information in symbol tables – Data structures for symbol tables – Errors- Lexical phase errors – Syntactic phase errors.

Unit V : Code Optimization And Code Generation

Principal sources of optimization – Loop optimization – The DAG representation of basic blooks – Introduction to code generation.

Text Book
1. A.V. Aho, J.D.Ullman , *Principles of compiler design* , Naroton   Publishing House, 1993.

Reference Book
1. Dhamdhere. D.M., *Compiler Construction*,Second Edition, Macmillan India Ltd., 1997.

CS216 UNIX ARCHITECTURE

Credit: 4:0:0
Marks (40 + 60)

Unit : I
General Overview of the system: History, system structure, user perspective, operating system services, and assumptions about hardware.
Introduction to the kernel: Architecture of the UNIX operating system, introduction to system concepts kernel data structures, system administration.
The buffer cache: Buffer headers, structure of the buffer pool, scenarios for retrieval of a buffer, reading and writing disk blocks, advantages and disadvantages of the buffer cache.

Unit : II
The internal representation of files: INODE, structure of a regular file, directories, conversion of a path name to an INODE, super block, INODE assignment to a new file, allocation of disk blocks, other file types.
System calls for the file system: Open, read, write, file and record locking, adjusting the position of the file I/O – lseek, close, file creation, creation of special files, change directory and change root, change owner and change mode, stat and fstat, pipes, DUP, mounting and unmounting file systems, link, unlink, file system abstractions, file system maintenance.
The structure of processes: Process states and transitions, layout of system memory, the context of a process, saving the context of a process, manipulation of the process address space, sleep.

Unit : III
Process control: Process creation, signals, process termination, awaiting process termination, invoking other programs, the user ID of a process, changing the size of a process, shell, system boot and the init process. Process scheduling and time: process scheduling, system calls for time, clock.

Unit : IV
Memory Management policies: Swapping, demand paging, a hybrid system with swapping and demand paging. The I/O subsystem:Driver interfaces, disk drivers, terminal drivers streams.

Unit : V
Interprocess communication: Process tracing, system V IPC, network communications, sockets.

Text book
Maruice J. Bach, *The Design of the UNIX Operating System*, Prentice-Hall of India, 1986. (chapters 1 to 11 only)

CS217 UNIX AND LINUX LAB

Credit: 0:0:2
Marks (50 + 50)

UNIX
1. Basic UNIX commands.
2. Write shell script to simulate a calculator.
3. Write a shell script to do the following
   a) Fibonaci series
   b) Factorial of given number
   c) To find whether given number is Armstrong or not
   d) To reverse the given number
4. Write a shell script to check whether the given string is Palindrome or not.
5. Write a shell script to convert the decimal number to binary number.
6. Write a shell script to count number of words, lines in a given file.
7. Write a shell script for the following
   a) To find whether the given input is file / directory
   b) To delete a particular pattern in file

LINUX
1. Basic commands
2. Write a shell script to find the user login
3. Write a shell script for students evaluation
4. Write a shell script for employee details using files.
5. To delete a particular pattern from a line in a file.

CS218 DATA STRUCTURES LAB

Credit: 0:0:2
Marks (50 + 50)

1. Write a C++ program to implement binary search technique.
2. Write a C++ program to implement quick sort
3. Write a C++ program to implement radix sort
4. Write a C++ program to implement bubble sort
5. Write a C++ program to implement selection sort
6. Write a C++ program to implement shell sort
7. Write a C++ program to implement address calculation sort.

8. Write a C++ program to implement stack operation
9. Write a C++ program to implement queue operation
10. Write a C++ program to convert the given infix expression to postfix and prefix form.
11. Write a C++ program to convert the given expression to ALP using stack
12. Write a C++ program to implement singly linked list(addition, deletion, insertion in all positions).
13. Write a C++ program to implement doubly linked list(addition, deletion, insertion in all positions).
14. Write a C++ program to convert the tree to binary tree.

CS301 DATA MINING AND WAREHOUSING

Credit 4:0:0
Marks 40 +60

Unit – I

Data mining – introduction – Information and production factor – Data mining Vs query tools – Data mining in marketing – self learning computer systems – concept learning – data mining and the data warehouse.

Unit – II

Knowledge discovery process – Data selection – cleaning – Enrichment – coding – Preliminary analysis of the data set using traditional query tools – Visualization techniques – OLAP tools – Decision trees – Neural networks – Genetic algorithms – KDD (Knowledge Discover in Databases) environment.

Unit - III

Data warehouse architecture – system process – process architecture – Design – database schema – partitioning strategy – aggregations – data marting – meta data – System and data warehouse process managers.

Unit – IV

Hardware and operational design of data warehouses – Hardware architecture –
Physical layout – security – Backup and recovery – service level agreement – operating the data warehouse.

Unit – V
Planning, Tuning and Testing:
Capacity planning – Tuning the data warehouse – Testing the data warehouse – data warehouse features.

Text Books
1. Pieter Adriaans, Dolf Zantinge, "data Mining , Addison Wesley,1996
2. Sam anahory, Dennis Murray," Data Warehousing in the Real Word",Addison Wesley,1996.

Reference Book

1. Michael J. Berry., Gordon S. Linoff., "Mastering Data Mining".

CS302 OBJECT ORIENTED SYSTEMS DEVELOPMENT

Credit 3:1:0
Marks 40 +60

Unit – I

THE OBJECT MODEL : The structure of complex systems – The models of object-oriented development – Major and Minor elements in object model – Classes and Objects – Relationships among classes and objects – Building classes and Objects.

Unit – II

THE OBJECT : Importance of classification – Key abstractions and mechanism – Elements of Notation – Class diagrams – State Transition Diagrams – Object Diagrams – Interaction Diagrams – Module Diagrams – Process Diagrams – Applying Notation.

Unit – III

APPLICATIONS (Case Study Approach) : Client-Server Computing – ATM Banking – Inventory Tracking System – System Requirements – Analysis – Design – Evolution – Maintenance.

Unit – IV

OBJECT-ORIENTED METHODOLOGIES : Introduction – Survey of some of the object oriented methodologies – Rumbaugh object modeling technique – The Booch methodology – The Jacobson methodology.

Unit – V

UNIFIED MODELLING LANGUAGE : Introduction – Static and Dynamic models – UML Diagrams – UML class Diagram – Use Case Driven – UML Dynamic Modelling Model Management – UML Meta Model

Text Book

1. Grady Booch, "Object Oriented Analysis and Design", The Benjamin /Cummings publishing Company, 1994.

Reference

1. Ali Bahrami, "Object Oriented Systems Development" McGraw Hill, 1999.
2. James Rumbaugh, "Object Oriented Modelling and Design", Prentice Hall of India, 1997.

CS303 DISTRIBUTED OPERATING SYSTEMS

Credit 4:0:0
Marks 40 +60

Unit-I

Introduction to O.S: What is an operating system – Operating system? – History of operating system concepts – operating system structure.

Introduction to Distributed Systems: Goals – Advantages of Distributed Systems over Centralized ones – Advantages of Distributed Systems over Independent PCs – Disadvantages of Distributed Systems – Hardware Concepts – Bus-Based Multiprocessors – Switched Multiprocessors – Bus-Based Multicomputers – Switched Multicomputers – Software Concepts – Network Operating Systems and N FS – True Distributed Systems – Multiprocessor Timesharing Systems – Design Issues – Transparency – Flexibility – Reliability – Performance – Scalability – Summary.

Unit-II

Communication In Distributed Systems : Layered Protocols – The physical Layer – The data Link Layer – The Network Layer – The Transport Layer – The Session Layer – Presentation Layer – Application Layer – The Client Server Model - Client and Servers – An Example Client and server – Addressing – Blocking versus Nonblocking Primitives – Buffered versus Unbuffered primitives – Reliable versus Unreliable primitives – Implementing the Client server model – Remote Procedure Call – Basic RPC operation – Parameter passing – Dynamic Binding – RPC semantics in the presence failures – Implementation Issues – Problem areas – Group Communication – Introduction to Group communication – Design issues – Group Communication in ISIS – Summary.

Unit-III

Synchronization in Distributed Systems : Clock Synchronization -Logical Clocks – Physical clocks – Clock Synchronization Algorithms – Mutual Exclusion – A Centralized Algorithm – A Distributed Algorithm – A Token Ring Algorithm – A Comparison of the Three Algorithms – Election Algorithms – The Bully Algorithm – A Ring Algorithm – Atomic Transactions – Introduction to Atomic Transactions – The Transactions Model – Implementation – Concurrency Control – Deadlocks In Distributed Systems – Distributed Deadlock Detection – Distributed Deadlock Prevention – Summary.

Unit-IV

Processes And Processors In Distributed Systems: Threads – Introduction to Threads – Thread Usage – Design Issues for Threads packages – Implementing a Threads package – Threads and RPC – An Example Threads Package – System Models – The Workstation Model – Using the Workstations – The Processor Pool Model – A Hybird Model –Processor Allocation – Allocation Models – Design Issues for Processor Allocation Algorithms – Implementation Issues for Processor Allocation Algorithms – Example Processor Allocation Algorithms – Scheduling In Distributed Systems- Summary.

Distributed File Systems : Distributed File System Design – The File server interface – The directory server interface –Semantics of file sharing – Distributed File System

Implementation – File Usage – System Structure – Caching – Replication – An Example: The Andrew File System – Lessons Learned –Trends In Distributed File Systems – New Hardware – Scalability –Wide Area Networking – Mobile Users- Fault Tolerance – Summary.

Unit-V

Case Study : AMOEBA : Introduction to AMOEBA – History of Amoeba – Research goals – The Amoeba System Architecture – The Amoeba Microkernel – The Amoeba Servers – Objects and Capabilities In Amoeba – Capabilities – Object Protection – Standard Operations – Process Management In Amoeba – Processes – Threads – Memory Management in Amoeba – Segments – Mapped Segments – Communication in Amoeba – Remote Procedure call – Group Communication in Amoeba – The Fast Local Internet Protocol – The Amoeba Servers –The Bullet Server – The Directory Server – The Replication Server – The Run server – The Boot server – The TCP/IP server – Other servers – Summary

Text Book
1. Andrew S. Tanenbaum., : " Modern Operating Systems", Prentice- Hall of India.

Reference Book
1. Harvey M. Deital " An Introduction to Operating Systems", - Addison – Wesley Publishing Company – Revised edition – 1984.

CS304 CRYPTOGRAPHY AND NETWORK SECURITY

Credit 3:1:0
Marks 40 +60

Unit - I
Conventional Encryption:
Convention Encryption : Conventional Encryption Model – Steganography – Classical Encryption Techniques – Simplified DES – Block Cipher Principles – The Data Encryption Standard – The Strength of DES – Differential and Linear Cryptanalysis – Block Cipher Design Principles – Block Cipher Modes of operation – Conventional Encryption algorithms

Unit - II
Public Key Encryption and Hash Functions
Public Key Cryptography – Principles of Public Key Cryptosystems – The RSA Algorithm – Key Management – Diffie Hellman Key Exchange – Elliptic Curve Cryptography
Message Authentication and Hash Functions
Authentication Requirements – Authentication Functions – Message Authentication Codes – Hash Functions – Security of Hash Functions

Unit - III
Hash and Mac Algorithms
MD5 Message Digest Algorithm – Secure Hash Algorithm (SHA-I) – RIPEMD – HMAC
Digital Signatures and Authentication Protocols

Digital Signatures – Authentication Protocols – Digital Signature Standard

Unit - IV
Authentication Applications – IP Security – Web Security

Unit - V
Intruders, Viruses and Worms
Intruders – Viruses and Related Threats
Firewalls
Firewall Design Principles – Trusted Systems

Text Book
1. William Stallings, " Cryptography and Network Security", Second edition, Prentice Hall,1999

Reference Book
1. Bruce Schneier, " Applied Cryptography", Second Edition – 1996.

CS305 SOFTWARE PROJECT MANAGEMENT
Credit 3:1:0
Marks 40 +60

Unit-I
Software Management Renaissance : Conventional Software Management – The Waterfall Model – In Theory – In Practice – Conventional Software Management performance – Evolution of Software Economics – Software Economics – Pragmatic Software Cost Estimation – Reducing Software product Size – Reducing software product size – languages – Object – Oriented Method and Visual Modeling – Reuse – Commercial Components – Improving Software Processes – Improving Team Effectiveness – Improving Automation through software environments - Achieving Required Quality – Peer Inspections A pragmatic View – The Old way and the New – The principles of Conventional Software Engineering – The Principles of Modern Software management – Transitioning to an Iterative process

Unit-II
A Software management Process Framework: Life-Cycle Phases- Engineering and Production stages – Inception Phase – Elaboration Phase – Construction Phase – Transition Phase – Artifacts of the process – The Artifacts of the process – The Artifact sets – The Management set – The Engineering set – Artifact Evolution over the life cycle – Test Artifact – Management Artifacts – Engineering Artifacts – pragmatic Artifacts

Unit-III
Model-Based Software Architectures – Architecture: A Management Perspective – Architecture : A Technical Perspective – Workflows of the Process – Software process Workflows – Iteration workflows – Checkpoints of the process – Major milestones – Minor milestones –Periodic status Assessments.

Unit-IV

Software Management Disciplines : Iterative Process Planning – work breakdown structures – Conventional WBS Issues – Evolutionary work Breakdown Structures – Planning Guidelines – The cost and schedule Estimating process – The Iteration planning process – Pragmatic planning – Project Organizations and Responsibilities – Line –of- Business Organizations – project organizations – Evolution of organizations – Process Automation – Tools: Automation Building Blocks – The project Environment - Round- Trip Engineering –Change Management – Infrastructures – Stakeholder Environments

Unit-V

Project Control and process Instrumentation – The seven Core Metrics – Management Indicators – Work and progress- Budgeted Cost and Expenditures – Staffing and Team Dynamics – Quality Indicators – Change Traffic and Stability – Breakage and Modularity – Rework and Adaptability – MTBF and Maturity – Life –cycle Expectations – Pragmatic Software metrics – Metrics Automation.

Text Book

1. Walker Royce., " Software Project Management", Addison Wesley Longman, Inc.,

Reference Book

1. Roger S Pressman, "Software Engineering A Practitioner's approach" , Fourth Edition, McGraw Hill International, 2000.
2. Lan Somerville, "Software Engineering", Fifth Edition, Addison Wesley publications, 1996.

CS306 COMPUTER ARCHITECTURE AND ORGANISATION

Credit 4:0:0
Marks 40 +60

Unit-I

Computing and Computers : The Nature of Computing – The elements of computers – Limitations of computes – The Evolution of Computers – The mechanical Era – Electronic Computers – The Later Generations – The VLSI Era – Integrated Circuits – Processor Architecture- System Architecture – summary – problems – references.

Design Methodology: System Design – System representation – Design process – The Gate Level – The register level – Register –Level Components – Programmable Logic Devices – Register Level Design – The Processor – Level Components – Processor –Level Design – Summary – Problems – References.

Unit-II

Processor Basics : CPU origination – Fundamentals – Additional Features – Data Representation – Basic Formats – Fixed –Point Numbers – Floating – Point Numbers – Instruction Formats – Instruction Types – Programming Considerations – Summary – Problems – References

Unit-III

Control Design : Basic Concepts – Introduction – Hardwired Control – Design Examples – Microprogrammed Control – Basic Concepts – Multiplier Control Unit- CPU control unit – Pipeline Control – Instruction Pipelines – Pipelines Performance – Superscalar Processing – Summary – Problems – references.

Unit-IV

Datapath Design: Fixed- Point Arithmetic – Addition and Subtraction – Multiplication – Division – Arithmetic – Logic Units – Combinational ALUs – Sequential ALUs – Advanced Topics – Floating – point Arithmetic – Pipeline Processing – summary – problems – References – Memory Organization – Memory Technology – Memory Device Characteristics – Random – Access memories – Serial – Access memories – Memory Systems –Multilevel Memories – Address Translation – memory Allocation – Caches – Main Features – Address mapping – Structure versus performance – summary – problems – references.

Unit-V

System Organization: Communication Methods – Basic concepts – Bus Control – IO And System Control – Programmed IO – DMA and Interrupts – IO processors – Operating systems – Parallel processing – Processor – Level parallelism – Multiprocessors – Fault Tolerance – Summary – Problems – References.

Text Book

1. John P. Hayes., "Computer Architecture and Organization" McGraw Hill International Editions.

Reference Book

1. William Stallings, " Computer Organization and Architecture", Fourth Edition, Prentice Hall of India, 1996

CS307 GENETIC ALGORITHM

Credit 4:0:0
Marks 40 +60

Unit –I

Introduction to Genetic algorithms – History of evolutionary computation, biological terminology – Robustness of traditional optimization and search methods – Goal of optimization – Elemant of genetic algorithms – A simple genetic algorithm.

Unit – II

Theoretical foundations of Genetic algorithms – Fundamental theorem – Schema processing – Building block hypothesis – Minimal deceptive problem – Statistical mechanics approaches.

Unit – III

Implementing a Genetic algorithm – Encoding a problem for the Genetic algorithm – Adopting the encoding – Selection methods – genetic operators – Crossover mutation – Mapping objective function – Fitness scaling parameters for genetic algorithms.

Unit – IV

Applications of Genetic Algorithms – Dejong and function optimization – Advanced operators and techniques in genetic search – dominance diploidy – obeyance – inversion and reordering operators – multi-objective optimization.

Unit – V

Genetic based machine Learning – Introduction to genetic based machine learning – classified systems – rule and message system – application of genetic based machine learning – GBML – development of CS-1 first classifier systems – Smith poker player.

Text Books
1. David E. Goldberg, Genetic algorithms in search, optimizing and machine learning, Addison Wesley, 1989.
2. Melanie Mitchell, An introduction to Genetic Algorithms, Prentice hall of India, 1998.

CS308 REAL TIME SYSTEMS

Credit 4:0:0
Marks 40 +60

Unit-I

Introduction: Real – time Definitions, Types, Examples – Structure of a RTS – Task classes Real – time system issues : Architecture issues – OS issues – other issues - Performance measure for real –time systems.

Unit – II

Programming languages and tools : Language features – survey of commonly used programming languages – programming environments – run – time support Real –Time Systems life cycle.

Real –time Specification and Design Techniques : Natural languages – mathematical specification – Flow charts – structure charts – Pseudocode and PDL, FSA, DFD – Petri Nets – Warnier – Orr notation – state charts.

Unit-III

Real –Time OS : Task – control block model – Task states – Task management - POSIX.

Task assignment and scheduling : classical uniprocessor scheduling Algorithms – Task assignment – Fault Tolerance scheduling.

Unit-IV

Real -time communication: Network Topologies – Protocols.

Reliability, Testing and Fault Tolerance: Faults, Failures, Bugs and effects – reliability – Testing – Fault Tolerance.

Unit –V

Real – Time Applications : The first real – time application – Real – time database – real – time image processing – real –time UNIX.

Text Books
1. Phillip A. Laplante .,: " Real –Time Systems Design and Analysis" – Prentice Hall of India Pvt. Ltd., - 2nd Edition.
2. C.M. Krishna . Kang G. Shin: "Real –Time Systems", McGraw –Hill International 1997.

CS309 DISCRETE STRUCTURES

Credit 3:1:0
Marks 40 +60

Unit–I : Mathematical Logic

Prepositions- logical operator – truth tables – Equivalence and implication – laws of logic normal forms – proofs in prepositional calculus – Quantifiers.

RELATIONS AND FUNCTIONS: Definition and properties of binary relations Relation matrix and Graph of relation – partition, covering of a set – Equivalence relation – partial ordering – Hasse diagram – Composition of binary relations.

Unit–II : Combinatorics

Counting Methods for arrangement and selections- two basic counting principles- Simple arrangements and selections- arrangements and selections with repetition, Generating functions – calculating coefficients of generating functions.

Unit–III : Recurrence Relations

Recurrence relation models – solution linear recurrence relations – solution of non- – homogeneous linear relations.

Graph Theory : Introduction – basic terminology – representation of graphs – connectivity – Eulerian and Hamiltonian graphs.

Unit–IV : Trees

Binary tree – traversals of a binary tree – Expansion trees.

Formal Languages: Four classes of grammars (Phrase structure, context sensitive, context free, regular) – definitions – context free grammar derivation tree – ambiguity.

Unit –V : Finite Automata

Definition of deterministic finite state automation, Non deterministic finite state automaton – equivalence of DFA and NFA – Equivalence of regular grammars and finite automata.

Push Down Automata: Informal description – Definition – Deterministic - PDA – Equivalence of acceptance by final state and empty stack – Equivalence of PDA's and context free languages.

Text Books

1. Doerr Alan and Levasseur Kenneth, "Applied Discrete Structures for Computer Science", Galgotia Publication (P) Ltd.,
2. Alan Tucker, "Applied Combinatorics", John Wiley & Sons. 1984.

Reference Books

1. John E.Hopcroft and Jeffrey D. Ullman, "Introduction to automata theory, languages and computation", Narosa publishing house 1995.
2. John C.Martin, "Introduction to languages and the theory of computation", Tata McGraw Hill Companies Inc. 1997.

CS310 SOFTWARE DEVELOPMENT LAB

Credit 0:0:2
Marks 50 +50

Suitable Laboratory assignments on System Design may be given on the following topics

1. Data Structure & Algorithm Design
2. Networking
3. Data Base Systems
4. Multimedia and Virtual Reality
5. Computer Graphics
6. Internet and JAVA

ADDITIONAL SUBJECTS

Code No.	Subject Name	Credit
CS219	Data Structures	3:0:0
CS220	Data Structures Lab	0:0:2
CS221	Operating Systems	3:0:0
CS222	Java Programming	3:1:0
CS223	Data and Computer Communication	4:0:0
CS224	Design and Analysis of Algorithms	3:0:0
CS225	Java Programming Lab	0:0:2
CS226	Database Systems	4:0:0
CS227	Unix Architecture	4:0:0
CS228	System Software	3:0:0
CS229	Database Systems Lab	0:0:2
CS230	Unix and Linux Lab	0:0:2
CS231	Web Technology & Multimedia Lab	0:0:2
CS232	Cryptography and Network Security	4:0:0
CS233	Principles of Compiler Design	3:1:0
CS234	Software Engineering	3:0:0
CS235	System Software and Compiler Lab	0:0:2
CS236	Windows Programming Lab	0:0:2
CS237	Case Tools and Networking Lab	0:0:2
CS238	Enterprise Java (J2EE)	4:0:0
CS239	Enterprise Java (J2EE) Lab	0:0:2
CS240	Principles of Real Time Systems	4:0:0
CS241	Soft Computing	4:0:0
CS242	Computer Hardware Peripherals & Networking Lab	0:0:2
CS243	Distributed Systems	4:0:0
CS244	Natural Language Processing	4:0:0
CS245	Programming in C	3:1:0
CS311	Theory of Computation	4:0:0
CS312	Advanced Computer Architecture	4:0:0
CS313	Advanced Operating Systems	4:0:0
CS314	High Performance Networks	4:0:0
CS315	Real Time Systems	4:0:0
CS316	Computer Lab I	0:0:2
CS317	Speech and Language Processing	4:0:0
CS318	Parallel Processing	4:0:0
CS319	Software Agents	4:0:0
CS320	Computer Lab II	0:0:2
CS321	C# and •Net Platform	4:0:0
CS322	C# and •Net Programming Lab	0:0:2
CS323	Mobile Communication and Computing	5:0:0
CS324	Network Management	5:0:0

CS219 DATA STRUCTURES

Credits: 3: 0 : 0   **Marks: (40 + 60)**

UNIT I

Algorithms for Data Structures - Specifics of PSEUDO - Data types, constants, Variables and expressions, Program modules in PSEUDO Logic and Control structures in PSEUDO - Linked lists, arrays, singly linked lists - Insertions and deletions - variations on linked list structures, Dummy Headers, Circular linked lists, Doubly linked circular list - Fixed length string method - workspace/Index table method Processing efficiency considerations of the workspace/Index talk method - Garbage collection - Linked list method.

UNIT II

Circular implementation of a queue - Linked list implementation of a queue, priority queues - stacks - Array implementations of a stack - linked list implementation of a stack - Parsing and Evaluation of Arithmetic expressions using stacks - postfix, prefix and infix notations converting to infix expressions to postfix - Evaluating post fix expressions - Recursion, Towers of Hanoi Problem - Recursive Algorithms - Implementing non –recursively – recursion - stacks and backtracking - The 8 queens problem

UNIT III

Tree structures - Binary trees, implementation of Binary trees - linear representation of a binary tree - linked representation of a binary tree- binary tree traversals - pre-order, In order-post order traversals of a binary tree - Deletion algorithm for lists maintained with binary tree - Threaded binary trees - insertions into a binary tree - height - balanced trees, AVL rotations - General trees.

UNIT IV

Implementing a multidimensional array - sparse matrices and generalized Dope vector implementation - Linked list implementation of a sparse matrix. Graphs and networks, implementation of graphs - the adjacency matrix, Depth-first search, breadth-first search. Networks - Minimum spanning tree - The shortest path algorithm - Topological ordering.

UNIT V

Data structures and Data Management - Introductory Considerations - Garbage Collections - Data Base Management - Data Base Management Systems

Text Book:
1. Bhagat Singh and Thomas L.Naps, *Introduction to Data Structures*, Tata McGraw-Hill 1986.

Reference Book:
1. Robert Kruse, C.L.Tondo and Bruce Leung, *Data Structures and Program Design in C,* Prentice-Hall India, Second Edition, 1997.

CS220 DATA STRUCTURES LAB

Credits: 0 : 0 : 2   **Marks: (50 + 50)**

12 experiments will be notified by the HOD from time to time

CS221 OPERATING SYSTEMS

Credits: 3 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Introduction – Overview of different types of systems – Feature Migration – Computing Environments – Computer-System Operation – I/O Structure – Storage Structure – Storage Hierarchy – Hardware Protection – Network Structure – System Components – Operating System Services – System Calls – System Programs – System Structure – Virtual Machines – System design and Implementation – System generation

UNIT II

Process Concept – Process Scheduling – Operation on Processes – Cooperating Processes – Interprocess Communication – Communication in Client Server Systems – Threads – Multithreading Models – Threading Issues – Pthreads – Solaris 2 Threads – Window 2000 Threads – Linux Threads – Java Threads – Basic Concepts of CPU Scheduling – Scheduling Criteria – Scheduling Algorithms – Multiple Processor Scheduling – Real-Time Scheduling – Algorithm Evaluation – Process Scheduling Models

UNIT III

Process Synchronization – The Critical Section Problem – Synchronization Hardware – Semaphores – Classic Problems of Synchronization – Critical Regions – Monitors – OS Synchronization – Atomic Transaction – System Model – Deadlock Characterization – Methods for handling deadlocks- Deadlock Prevention – Deadlock Avoidance –Deadlock Detection – Recovery from deadlock - Memory Management Background – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with Paging.

UNIT IV

Introduction to Virtual Memory – Demand Paging – Process Creation – Page Replacement – Allocation of Frames – Thrashing – Operating System Examples – Other Considerations – File-Concept – Access Methods – Directory Structure – File-System Mounting – File Sharing – Protection.

UNIT V

File-System Structure – File-System Implementation – Directory Implementation – Allocation Methods – Free-Space Management – Efficiency and Performance – Recovery – Log-Structured File System –NFS – Overview of I/O systems – I/O Hardware – Application - I/O Interface – Kernel I/O Subsystem – Transforming I/O to Hardware Operations – Streams – Performance – Disk Structure – Disk Scheduling –Disk Management – Swap-

space Management – RAID Structure – Disk Attachment – Stable-Storage Implementation – Tertiary-Storage Structure.

Text Book:
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, O*perating System Concepts*, Sixth Edition, John Wiley and Sons, 2002. (Chapters 1-14)

CS222 JAVA PROGRAMMING

Credits: 3 : 1 : 0   **Marks: (40 + 60)**

UNIT I
The Genesis of Java - An Overview of Java - Data Types, Variables and Arrays – Operators - Control Statements - Introducing Classes

UNIT II
Methods and Classes - Inheritance - Packages and Interfaces - Exceptions Handling - Multithreaded Programming

UNIT III
I/O, Applets and Other Topics - String Handling - Exploring java.lang - java.util Part 1:The Collection Framework.

UNIT IV
java.util Part2: More Utility Classes - Input/Output: Exploring java.io - Networking - The Applet Class - Event Handling

UNIT V
Introducing the AWT: Working with Windows, Graphics and Text - Using AWT Controls, Layout Managers, and Menus - Images - New I/O, Regular Expressions and Other Packages

Text Book:
1. Herbert Schildt, *Java2 - The Complete Reference*, Fifth Edition, Tata McGraw-Hill, 2002. (Chapters 1-24)

CS223 DATA AND COMPUTER COMMUNICATION

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Data communication and networking overview: A communication model-data communication-data communication networking-protocol architecture-the need for a protocol architecture-a simple protocol architecture - OSI – TCP/IP protocol architecture.
Data transmission-Concepts and terminology-Analog and Digital data transmission-Transmission Impairments – channel capacity

Guided and Wireless transmission – guided transmission media – wireless transmission – wireless propagation.
(Chapters 1 – 4)

UNIT II
Signal encoding techniques: Digital data, Digital signals & analog signals – analog data digital signal and analog signals.
Digital data communication techniques: Asynchronous and synchronous transmission -Types of Error -Error Detection -Error Correction-Line configuration- Interfacing. Data link Control -Flow control-Error Control-HDLC.
(Chapters 5-7)

UNIT III
Multiplexing-FDM – Synchronous TDM – statistical TDM – Asymmetric DSL – xDSL Circuit Switching and packet switching: switching networks - circuit switching networks - circuit switching concepts - control signaling - soft switch architecture-Packet switching principles-X.25-Frame Relay.
Routing in Switched Networks: routing in circuit switched network – routing in packet switched network – least cost algorithms. (Chapters 8, 10, 12)

UNIT IV
Congestion control in switched Data network: Effect of congestion - Congestion control - Traffic management - Congestion control in packet switching networks - Frame Relay congestion control.
Local Area Network: Background – Topologies and transmission media – LAN protocol architecture – bridges – layer2 and layer3 switches.
High speed LANs: the emergence of High-speed LAN's – Ethernet – token ring – fibre channel.
(Chapter 13, Sections 13.1-13.5, 15, 16)

UNIT V
Internet work protocols: basic protocol functions – principles of internetworking – connectionless internetworking – Internet Protocol.
Internet work operation: multicasting – routing protocols – integrated services architecture – differentiated services.
Transport protocol: connection – oriented TCP – TCP – Congestion control - UDP.
(Chapters 18-20)

Text Book:
1. William Stallings, *Data and Computer Communication*, Seventh Edition, Prentice Hall of India, 2003.

Reference Book:
1. Behrouz A. Forouzan, *Data Communications and Networking*, Second Edition, Tata McGraw-Hill, 2000.

CS224 DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 3 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Analysis Basics: what is analysis what to count and consider – mathematical background-rates of growth – divide and conquer algorithms – recurrence relations
Searching and selection algorithms: sequential search – Binary search – Selection

UNIT II
Sorting Algorithms: Insertion sort – Bubble sort-Shell sort-Radix sort – Heap sort – Merge sort – Quick sort – External poly phase merge sort
Numeric Algorithms: Calculating polynomials – Matrix Multiplication – Linear Equations

UNIT III
Matching algorithms: String matching – approximate string matching
Graph Algorithms: Graph background and terminology – Data structure methods for graphs – Depth-First search and Breadth-First Traversal algorithms – Minimum spanning tree algorithms – Shortest-path algorithm – Bi connected component algorithm

UNIT IV
Parallel Algorithms: Parallelism Introduction – The PRAM Model – Simple parallel operations – parallel searching – parallel sorting – parallel numerical algorithms – parallel graph algorithms

UNIT V
Non-Deterministic Algorithms: NP – Typical NP Problems – What makes something NP – Testing possible solutions
Other Algorithmic Techniques

Text Book:
1. Jeffrey J.McConnell, *Analysis of Algorithms,* Narosa publishing House, 2002.

Reference Books:
1. Sara Baase and Allen Van Gelder, *Computer Algorithms – Introduction to Design and Analysis*, Pearson Education, 2000.
2. **Michael T. Goodrich and Roberto Tamassia,** *Algorithm Design: Foundations, Analysis and Internet Examples***, Johnwiley and Sons, 2002.**

CS225 JAVA PROGRAMMING LAB

Credits 0:0:2   **Marks: (50 + 50)**

12 experiments will be notified by the HOD from time to time

CS226 DATABASE SYSTEMS

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Database System Applications – Database System versus File Systems – View of Data – Data Models – Database Languages – Database Users and Administrators – Transaction Management – Database System Architecture – Application Architectures – History of Database Management Systems – ER Model Basic Concepts – Constraints – Keys – Design Issues – ER Diagram – Weak Entity Sets – Extended ER Features – Design of an ER Database Schema – Reduction of an ER Schema to Tables – UML (Chapters 1, 2)

UNIT II

Structure of Relational Databases – The Relational Algebra – Extended Relational Algebra Operations – Modification of the Databases – Views – Tuple Relational Calculus – Domain Relational Calculus – Relational Databases Basic Structure – Set Operations – Aggregate Functions – Null Values – Nested Sub queries – Views – Complex Queries – Modification of Database – Joined Relations – Data Definition Language – Embedded SQL – Dynamic SQL – Other SQL Features – Query by Example – Data log user Interfaces and Tools (Chapters 3-5)

UNIT III

Domain Constraints – Referential Integrity – Assertions – Triggers – Security and Authorization – Authorization in SQL – Encryption and Authentication – First Normal Form – Pitfalls in Relational Database Design – Functional Dependencies – Decomposition – Desirable Properties of Decomposition – Boyce Codd Normal Form – Third Normal Form – Fourth Normal Form – More Normal Forms – Overall Database Design Process (Chapters 6, 7)

UNIT IV

Need for Complex Data types – Object Oriented Data Model – Object Oriented languages - Persistent Programming languages – Persistent C++ Systems – Persistent Java Systems – Nested Relations – Complex Types –Inheritance – Reference Types – Querying with Complex Types – Functions and procedures – Object Oriented versus Object Relational (Chapters 8, 9)

UNIT V

File Organization – Organization of records in Files – Data Dictionary Storage – Storage for Object Oriented Databases – Indexing and Hashing Basic Concepts – Ordered Indicies - B+ Tree Index Files – B Tree Index Files – Static Hashing – Dynamic Hashing – Comparison of ordered Indexing and hashing – Index Definition in SQL – Multiple Key Access (Chapters 11.6-11.9, 12)

Text Book:

1. Abraham Silberschatz, Henry.F.Korth, S. Sudharshan, *Database System Concepts*, Fourth Edition, McGraw-Hill, 2002.

Reference Book:

1. Ramez Elmasri and Shamkant B. Navathe, *Fundamentals of Database Systems,* Third Edition, Pearson Education, 2000.

CS227 UNIX ARCHITECTURE

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

UNIX Operating System – History – Commands – essential Unix commands – vi editor – shell programming – The First Step – Taking Decisions – The Loop Control structure. Introduction to Kernel: Architecture of the UNIX operating system – introduction to system concepts. The buffer cache - Buffer headers - structure of the buffer pool - scenarios for retrieval of a buffer - Reading and writing disk blocks - advantages and disadvantages of the buffer cache.

UNIT II

The internal representation of Files – INODE - structure of a regular file - directories - conversion of a path name to an INODE - Super block - INODE assignment to a new file. System calls for the file system: Open - read – write – file - record locking - Adjusting the position of the file I/O-lseek – close - File creation - creation of special files - change directory change root - Change owner and change mode - Stat and fstat - pipes - DUP file Systems - link and unlink

UNIT III

The structure of processes: process states and transitions - Layout of system memory - The context of a process - saving the context of a process - Manipulation of the process address space - sleep - Process Control: Process Creation - signals - Process termination - Awaiting process termination – invoking other programs - the user ID of a process - Changing the size of a process. Process Scheduling and time: process scheduling - System calls for time- clock.

UNIT IV

Memory Management policies: Swapping - Demand Paging - The I/O subsystem: driver interfaces - Disk drivers. Terminal drivers stream.

UNIT V

Interprocess Communication: Process Tracing - System V IPC - Network Communications - Sockets.

Text Book:

1. Maruice J. Bach, *The design of the UNIX operating system*, Prentice Hall of India, 1986. (Chapters 2-11)

Reference Book:
1. Kenneth Rosen, Douglas Host, James Farber, Richard Rosinki, *Unix-The Complete Reference,* Mc-Graw Hill, 1999.

CS228 SYSTEM SOFTWARE

Credits: 3 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Introduction - Basic concepts - Machine structure - Instruction formats - Addressing modes - Typical Architectures.
(Chapter 1)

UNIT II
Assemblers: Functions - Features - Machine dependent - Machine independent - Design options - One pass – Multi pass - Implementation - Examples.
(Chapter 2)

UNIT III
Loaders and Linkers: Functions - Features - Relocation - Program Linking - Linking loader implementation -Automatic library search - Loader option - Linkage editors - Dynamic linking - Bootstrap loaders - Examples.
(Chapter 3)

UNIT IV
Macroprocessors: Functions-Macro parameters -Using labels - Conditional macro expansion - Recursive macro expansion - General-purpose macro processors - Examples. (Chapter 4)

UNIT V
Compilers and Utilities: System Software tools -Implementation of editors - Debuggers. (Sections 7.2, 7.3)

Text Book:
1. L.Beck, System *Software, An Introduction to System Programming,* Addison Wesley, 1999.

Reference Book:
1. D.M.Dhamdhere, *Systems Programming and Operating Systems,* Tata McGraw-Hill Company, 1999.

CS229 DATABASE SYSTEMS LAB

Credits: 0 : 0 : 2   **Marks: (50 + 50)**

12 experiments will be notified by the HOD from time to time

CS230 UNIX AND LINUX LAB

Credits: 0 : 0 : 2   **Marks: (50 + 50)**

12 experiments will be notified by the HOD from time to time

CS231 WEB TECHNOLOGY AND MULTIMEDIA LAB

Credits: 0 : 0 : 2   **Marks: (50 + 50)**

12 experiments will be notified by the HOD from time to time

CS232 CRYPTOGRAPHY AND NETWORK SECURITY

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Services, Mechanisms and Attacks – Block Cipher principles – Data Encryption Standard – Strength of DES – Evaluation criteria for AES – AES Cipher.
(Sections: 1.1, 3.2, 3.3, 3.4, 5.1, 5.2)

UNIT II
Principles of Public Key Cryptosystems – RSA Algorithm – Key Management – Diffie Hellman Key Exchange – Elliptic Curve Arithmetic – Elliptic Curve Cryptography.
(Sections: 9.1, 9.2, 10.1, 10.2, 10.3, 10.4)

UNIT III
MD5 Message Digest Algorithm – Secure Hash Algorithm – HMAC – Digital signature Standard – Kerberos – X.509 Authentication Service.
(Sections: 12.1, 12.2, 12.4, 13.3, 14.1, 14.2)

UNIT IV
Pretty Good Privacy – S/MIME – IP Security Overview – IP Security Architecture – Authentication Header – Encapsulating Security Payload – Combining Security Associations – Key Management.
(Sections: 15.1, 15.2, 16.1, 16.2, 16.3, 16.4, 16.5, and 16.6)

UNIT V
Web Security considerations – Secure Sockets Layer and Transport Layer Security – Secure Electronic Transactions – Intruders – Intrusion Detection – Password Management – Firewall design principles – Trusted systems.
(Sections: 17.1, 17.2, 17.3, 18.1, 18.2, 18.3, 20.1, 20.2)

Text Book:
1. William Stallings, *Cryptography and Network Security*, Third Edition, Prentice Hall, 2003.

Reference Books:
1. Bruce Schneier, *Applied Cryptography*, Second Edition, 1996.
2. Josef Piepryzyk, Thomas Hardjono and Jennifer Seberry, *Fundamentals of Computer Security*, Springer, 2003.

CS233 PRINCIPLES OF COMPILER DESIGN

Credits: 3 : 1 : 0   **Marks: (40 + 60)**

UNIT I
Compilers – Analysis of Source Program – The phases of a compiler – Cousins of the compiler – The grouping of phases – Compiler Construction tools – Overview of a Simple one-pass compiler – Syntax Definition – Syntax Directed Translation – Parsing – A translator for Simple Expressions
(Chapter 1 and Sections: 2.1-2.5)

UNIT II
Lexical Analysis – The role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Finite Automata – From a regular expression to NFA – design of a lexical analyzer generator – Optimization of DFA based pattern matchers - Incorporating a Symbol table – Symbol tables
(Sections: 2.6, 3.1-3.9)

UNIT III
Parsing – The role of a Parser – Context Free Grammar – Writing a grammar – Top down Parsing – Bottom up Parsing – Operator Precedence parsing – LR Parsers – Using Ambiguous Grammars
(Sections: 2.4, 4.1-4.8)

UNIT IV
Syntax directed definitions – Construction of Syntax trees – Bottom up Evaluation of S-attributed definitions – L attributed definitions - Top down Translation – Type systems – specification of a simple type checker - Source Language Issues – Storage Organization – Storage Allocation Strategies
(Sections: 5.1-5.5, 6.1, 6.2, and 7.1-7.3)

UNIT V
Intermediate Languages – Declarations – Assignment Statements - Issues in the design of Code generator – The target machine – Runtime storage management – Basic Blocks and Flow graphs – Introduction to Code Optimization – The principal sources of Optimization
(Sections: 8.1-8.3, 9.1-9.4, and 10.1-10.2)

Text Book:
1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, *Compiler s- Principles, Techniques and Tools,* Pearson Education Private Limited, 1986.

Reference Books:
1. Keith D.Cooper and Linda Torczon, *Engineering A Compiler*, Morgan Kauffmann Publishers, 2004.
2. Kenneth C. Louden, *Compiler Construction – Principles and Practice,* Vikas Publishing House, 1997.

CS234 SOFTWARE ENGINEERING

Credits: 3 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Software Engineering - Introduction – A system Approach – An Engineering Approach – Members of the development team - Modeling the Process and Life Cycle – the meaning – Software Process Models – Tools and Techniques - Practical Process modeling – Planning and Managing the project – tracking Progress – project personnel – Effort Estimation – Risk management – the project plan – process models and project management.

UNIT II
Capturing the requirements – The Requirements process – types – Characteristics – prototyping requirements – requirements documentation – participants in the process – requirements validation – measuring – choosing a requirements specification – Designing the system – decomposition and modularity – architectural styles – issues – characteristics – techniques – evaluation and validation – documenting

UNIT III
Concerning Objects – What is OO – the OO development process – use cases – UML – OO system design – OO program design – OO measurement – Writing the programs – standards and procedures – guidelines – documentation – Testing the programs – Software faults and failures – Testing issues – unit testing – integration testing – testing OO systems – test planning – automated testing tools .

UNIT IV
Testing the system – principles of system testing – function testing – performance testing – reliability, availability, and maintainability – acceptance testing – installation testing – automated system testing – test documentation – testing safety–critical systems – delivering the system – training – documentation – maintaining the system – the changing system – nature – problems –measuring maintenance characteristics – techniques and tools – software rejuvenation

UNIT V
Evaluating products, processes, and resources – approaches to evaluation – selecting an evaluation techniques – assessment vs prediction – evaluating products – evaluating processes – evaluating resources – Improving predictions, products, processes, and resources

– improving prediction – improving products – improving processes – general improvement guidelines

Text Book:

1. Shari Lawrence Pfleeger, *Software Engineering – Theory and Practice*, Third Edition, Pearson Education, 2001.
   (Chapters 1-13)

Reference Book:

1. James F.Peters, Witold Pedrycz, *Software Engineering – An Engineering Approach*, John Wiley and Sons, 2000.

CS235 SYSTEM SOFTWARE AND COMPILER LAB

Credits: 0 : 0 : 2   **Marks: (50 + 50)**

12 experiments will be notified by the HOD from time to time

CS236 WINDOWS PROGRAMMING LAB

Credits: 0 : 0 : 2   **Marks: (50 + 50)**

12 experiments will be notified by the HOD from time to time

CS237 CASE TOOLS AND NETWORKING LAB

Credit: 0 : 0 : 2   **Marks: (50 + 50)**

12 experiments will be notified by the HOD from time to time

CS238 ENTERPRISE JAVA (J2EE)

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I
J2EE and J2SE - The Birth of J2EE - Databases - The Maturing of Java - Java Beans and Java Message Service - Why J2EE?
J2EE Multi-Tier Architecture - J2EE Best Practices - J2EE Design Patterns and Frameworks

UNIT II
J2EE FOUNDATION - Java servlets - Java Server Pages

UNIT III

Enterprise JavaBeans - JavaMail API - Java Interface Definition Language and CORBA.

UNIT IV

Java Remote Method Invocation - Java Message Service – Security - Java Naming and Directory Interface API

UNIT V

WEB SERVICES - SOAP - Universal Description, Discovery, and Integration (UDDI) - Electronic Business XML - The Java API for XML Registries (JAXR) - Web Services Description Language (WSDL)

Text Book

1. James Keogh, "*J2EE - The complete Reference*", Mc-Graw Hill, 2002.

CS239 ENTERPRISE JAVA (J2EE) LAB

Credits: 0 : 0 : 2   **Marks: (50 + 50)**

12 experiments will be notified by HOD from time to time

CS240 PRINCIPLES OF REAL TIME SYSTEMS

Credits: 3:1:0   **Marks: (40 + 60)**

UNIT I

Introduction: Architecture of Real time Systems / Embedded Systems – Operating Systems issues – Performance Measures – Estimating Program runtimes
(Chapters 1, 2)

UNIT II

Task Assignment and Scheduling: Uniprocessor Scheduling – IRIS Tasks – Tasks Assignment Mode charges – Fault tolerant scheduling
(Chapter 3)

UNIT III

Programming Languages and Tools: Desired characteristics based on ADA – Data typing – Control Structures – Packages – Exception Handling – Overloading – Multitasking – Timing specification – Task Scheduling – Just-in-time Compilation – Runtime support
(Chapter 4)

UNIT IV

Real Time Databases: Basic Networking principles – Real time databases – Transaction processing – Concurrency control – Disk scheduling algorithms – Serialization and Consistency
(Chapter 5)

UNIT V

Fault Tolerance, Reliability and Synchronization: Fault types – Fault detection and containment – Redundancy – Data diversity – Reversal checks – Obtaining parameter values – Reliability models for hardware redundancy – Software error models – Clocks – Fault tolerant synchronization – Synchronization in software
(Chapters 7-9)

Text Book:
1. C.M. Krishna, Kang G. Shin, *Real Time Systems*, McGraw-Hill, 1997.

Reference Book:
1. Raymond J.A. Buhr, Donald L. Bailey, *An Introduction To Real Time Systems*, Prentice Hall International, 1999.

CS241 SOFT COMPUTING

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Introduction to Artificial intelligence Systems - Fundamentals of Neural Networks - Basic concepts of Neural networks - Human Brain - Model of an Artificial Neuron - Neural Network Architectures - Characteristics of Neural Networks - Learning Methods - Taxonomy of Neural Network Architectures - Early Neural Network Architectures - Back Propagation Networks - Architecture of a back Propagation Network - Single Layer Artificial Neural Network - Back propagation Learning – Applications - Effect of Tuning Parameters of the BPN - Selection of various parameters in BPN - Variations of Standard Propagation Algorithm

UNIT II

Associative Memory – Autocorrelators – HeteroCorrelators - Exponential BAM – Applications - The Hopfield Memory - Adaptive Resonance Theory – Introduction - ART1 - ART2 - Applications

UNIT III

Fuzzy Logic - Fuzzy Set Theory - Fuzzy versus Crisp - Crisp Sets - Fuzzy Sets - Crisp Relations - Fuzzy Relations - Fuzzy Systems - Crisp Logic - Predicate Logic - Fuzzy Logic - Fuzzy Rule Based System - Defuzzification Methods – Applications - Fuzzy Back propagation Networks - LR-type Fuzzy numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP - Inference by Fuzzy BP - Applications.

UNIT IV

Genetic Algorithms - Fundamentals of Genetic Algorithms - Genetic Algorithm History - Basic Concepts - Creation of Offsprings - Working Principle – Encoding - Fitness Function – Reproduction - Genetic Modeling - Inheritance operators – Crossover - Inversion and Deletion - Mutation operator - Bitwise Operators - Generational Cycle - Convergence of Genetic Algorithm – Applications - Multilevel Optimization - Real life problem - Differences and similarities between GA and other traditional methods - Advances in GA - Genetic algorithm based BPN - GA Based Weight Determination - Applications

UNIT V

Hybrid Systems - Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms - Fuzzy Associative Memories - FAM, An introduction - Single Association FAM - Fuzzy Hebb FAMs - FAM involving a Rule Base - FAM Rules with Multiple Antecedents/Consequents – Applications - Fuzzy Logic Controlled Genetic Algorithms - Soft Computing Tools - Problem Description of Optimum Design - Fuzzy Constraints - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller - Applications

Text Book:

1. S.Rajasekaran and G.A. Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic, And Genetic Algorithms Synthesis and Applications,* Prentice Hall India, 2003.
   (Chapters 1-12, 14, 15)

CS242 COMPUTER HARDWARE PERIPHERALS AND NETWORKING LAB

Credits: 0 : 0 : 2   **Marks: (50 + 50)**

12 experiments will be notified by HOD from time to time

CS243 DISTRIBUTED SYSTEMS

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Characterization of Distributed Systems: introduction – examples of distributed systems – resource sharing and the web – challenges. System Model: introduction – architectural models – fundamental models. Interprocess Communication: introduction – the API for the Internet protocol – external data representation and marshaling – client –server communication – group communication.

UNIT II

Distributed objects and remote invocation: introduction – communication between distributed objects – RPC – events and notifications. Operating system support: introduction – the operating system layer – protection – process and threads – communication and invocation - operating system architecture. Distributed file systems: introduction – file service architecture – sun network file system – the Andrew File system – recent advances.

UNIT III

Name Services: introduction – name services and the DNS – directory and discovery services. Time and Global states: introduction – clock, events and process states – synchronizing physical clocks – logical time and logical clocks – global states – distributed debugging. Co-ordination and Agreement: introduction – distributed mutual exclusion – elections – multicast communication – consensus and related problems.

UNIT IV

Transactions and Concurrency control: introduction – transactions – nested transaction – locks – optimistic concurrency control – timestamp ordering – comparison of methods for concurrency control. Distributed Transactions: introduction – flat and nested distributed transactions – atomic commit protocols – concurrency control in distributed transactions – distributed deadlocks – transaction recovery.

UNIT V

Replication: Introduction – system model and group communication – fault tolerant services – highly available services – transactions with replicate data. Distributed Shared Memory: introduction – design and implementation issues – sequential consistency and Ivy – release consistency and Munin – other consistency models.

Text Book:

1. George Coulouris, Jean Dollimore, Tim Kindberg, *Distributed Systems – Concepts and Design*, Third Edition, Pearson Education, 2001. (Chapters 1, 2, 4-6, 8-14, 16, Case Studies not included)

Reference Book:

1. Andrew S. Tanenbaum, Maartenvan Steen, *Distributed Systems – Principles and Paradigms* , Pearson Education, 2002.

CS244 NATURAL LANGUAGE PROCESSING

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Introduction: Knowledge in Speech and Language Processing-Ambiguity-Models and Algorithms-Language, Thought and Understanding-The state of the Art and the Near-Term Future-History-Regular Expressions and Automata: Regular Expressions-Finite -State Automata-Regular Languages and FSAs.

UNIT II

Word Classes And Part-of-Speech Tagging: English Word Classes-Tagsets for English- Part-of-Speech Tagging-Rule-Based Part-of-Speech Tagging-Stochastic-Part-of-Speech Tagging-Transformation-Based Tagging-Other Issues-Context-Free Grammars for English: Constituency-Context-Free Rules and Trees-Sentence level construction-The Noun Phrase-

Coordination-Agreement-The Verb phase and subcategorization-Auxiliaries-Spoken Language Syntax-Grammar Equivalence and Normal Form-Finite-State and Context-Free Grammars-Grammars and Human Processing.

UNIT III
Parsing with Context-Free Grammars: Parsing as search-Basic Top-Down Parser-Problems-The Earley Algorithm-Finite-State Parsing Methods-Features and Unification- Feature Structures- Unification of Feature Structures- Feature Structures in the Grammar-Implementing Unification-Parsing with Unification Constrains-Types and Inheritance.

UNIT IV
Representing Meaning: Computational Desiderata for Representations-Meaning Structure of language-First Order Predicate Calculus-Some Linguistically relevant concepts-Related representational Approaches-Alternative approaches to meanings-Semantic analysis-Syntax-Driven Semantic analysis-Attachments for a Fragment of English-Integrating Semantic analysis into the Early Parser-Idioms and Compositionality-Robust Semantic analysis.

UNIT V
Pragmatic: Discourse-Reference Resolution-Text Coherence-Discourse Structure-Psycholinguistic Studies of Reference and Coherence-Natural Language Generation: Introduction to Language Generation-An architecture for generation-Surface Realization-Discourse Planning-Other Issues.

Text Book:
1. Daniel Jurafsky and James H.Martin, *Speech and Language Processing,* Pearson Education, 2002. (Chapters 1, 2, 8-11, 14, 15, 18, 20)

CS245 PROGRAMMING IN C

Credits 3:1:0   **Marks (40+60)**

UNIT I
Introduction - Software, Hardware, Types of software - Computer Organization - Block diagram, Computing – Algorithms – Types - Finite & Deterministic Algorithms - Finite & Non-Deterministic Algorithms - Levels of languages - Compiler.
Introduction – **C Fundamentals:** The C Character Set – Identifiers and Keywords – Data Types – Constants – Variables – Declarations – Expressions – Statements – Symbolic Constants – **Operations and Expressions:** Arithmetic Operators – Unary Operators – Relational and Logical Operators – Assignment Operators – The Conditional Operator – Library Functions – **Data Input and Output:** Single Character Input & Output – Entering Input Data – Writing Output Data.

UNIT II
Control Statements: Branching – Looping – Nested Control Structures – The switch, break, continue, comma statements – The Goto Statement – **Functions:** Defining a Function – Accessing a Function – Function Prototypes – Passing Arguments to a Function – Recursion.

UNIT III
Program Structure: Storage Classes – Automatic Variables – External Variables.
Arrays: Defining an Array – Processing an Array – Passing Arrays to Functions – Multidimensional Arrays – Arrays and Strings.

UNIT IV
Pointers: Fundaments – Pointer Declarations – Pointers and One-Dimensional Arrays – Operations on Pointers - Dynamic Memory Allocation. **Structures & Unions:** Defining a Structure – Processing a Structure – User-Defined Data Types – Structures and Pointers – Self Referential Structures.

UNIT V
Data Files: Opening and Closing a Data File – Creating a Data File – Processing a Data File – Command Line Arguments.

Text Book
1. Karunya Notes on "*Computer Programming in C*".

References
1. Byron S. Gottfried, *Theory and Problems of Programming With C*, Second Edition, Tata McGraw Hill, 1996
2. E. Balaguruswamy, *Programming in ANSI C* , Edition 2.1, Tata McGraw Hill, 2003 Reprint.
3. Herbert Schildt*, C: complete reference* 4th Edition, Tata McGraw Hill, 2000
4. *Yaswant Kanitkat, Let us C*
5. *Venugopal & Sudeep, Programming with C*

CS311 THEORY OF COMPUTATION
Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Introduction to the Theory of computation - Finite Automata - Deterministic Finite Accepters – Non-deterministic Finite Accepters - Equivalence of Deterministic and Non- deterministic Finite Accepters - Reduction of the number of states in Finite Automata - Regular Languages and regular grammars - Regular Expressions - Connection between Regular expressions an regular languages - Regular Grammars

UNIT II
Properties of Regular Languages - Context-free Languages - Context-free Grammars - Parsing and ambiguity - Parsing an Membership - Context-Free grammars - Programming - Methods for transforming grammars - Important Normal Forms - Membership algorithm for Context-free Grammars

UNIT III

Pushdown Automata – Non-deterministic Pushdown Automata - Pushdown Automata and context - free Languages - Deterministic Pushdown Automata - Deterministic Context - Free Languages - Grammars for Deterministic Context free languages - Two pumping Lemmas - Closure properties and decision Algorithms for Context free Languages - The Standard Turing machine - Combining Turing machine for Complicated task- Turing thesis

UNIT IV

Other models of Turing machine-Recursive and Recursively enumerable Languages - Unrestricted Grammars Context-Sensitive Grammars and Languages - Chomsky Hierarchy - Limits of Algorithmic Computation.

UNIT V

Other Models of Computation - Recursive Functions - Post Systems - Rewriting Systems - Efficiency of Computation - Turing machines an Complexity - Language family and Complexity Classes - The Complexity Classes P and NP.

Text Book

1. Peter Linz, *An Introduction to Formal Languages and Automata*, Narosa Publishing House, 2001. (Chapters 1-14)

Reference Book

1. Harry R.Lewis, Christos H. Papadimitriou, *Elements of Theory of Computation*, Prentice Hall, 2002.

CS312 ADVANCED COMPUTER ARCHITECTURE

Credits: 4 : 0 : 0   **Marks: (60 + 40)**

UNIT I

Fundamentals of Computer Design: Introduction - The changing face of computing and the task of the computer designer - Technology Trends - Cost, Price and their trends - Measuring and Reporting performance - Quantitative Principles of computer design - Performance and Price

Instruction set Principles and Examples: Introduction - Classifying Instruction set Architectures - Memory Addressing - Addressing Modes for signal processing - Type and size of operands -Operands for media and signal processing - operations in the instruction set - Instruction for control flow - Encoding an instruction set (Chapter 1, 2)

UNIT II

Pipelining: Introduction - The Major Hurdle of pipelining - pipeline Hazards - Implementation - Extending the MIPS pipeline to handle multicycle operations Instruction - Level parallelism: concepts and challenges - overcoming data Hazards with Dynamic scheduling - Dynamic scheduling: Examples and the Algorithm - Reducing Branch costs with Dynamic Hardware Prediction - High Performance instruction delivery - Taking

advantage of More ILP with Multiple Issue - Hardware - Based speculation - Studies of the Limitations of ILP - Limitations of ILP for Realizable processors   (Appendix A and Chapter 3)

UNIT III
Exploiting Instruction - Level Parallelism with Software Approaches: Basic compiler Techniques for Exposing ILP - Static Branch Prediction - Static Multiple issue: The VLIW approach - advanced compiler support for Exposing and Exploiting ILP - Hardware support for Exposing more parallelism at compile Time - crosscutting issues: Hardware versus software speculation mechanisms
(Chapter 4)

UNIT IV
Multiprocessors and Thread - Level Parallelism: Introduction - Characteristics of Application domains - symmetric shared - memory architectures - performance of symmetric shared - memory multiprocessors Distributed shared - memory architectures - performance of distributed shared - memory multiprocessors - synchronization - models of memory consistency: Introduction - Multithreading: Exploiting Thread - Level parallelism within a processor (Chapter 6)

UNIT V
Memory Hierarchy Design: Introduction - Review of the ABCs of the caches - Cache Performance - Reducing Cache Miss Penalty - Reducing Miss Rate - Reducing Cache Miss Penalty or Miss Rate via Parallelism - Reducing Hit Time - Main Memory and Organizations for Improving Performance - Memory Technology - Virtual Memory - Protection and Examples of Virtual Memory (Chapter 5)

Text Book:
1. John L. Hennessy and David Patterson, *Computer Architecture*, A Quantitative Approach, Third Edition, Elsevier, 2003.

CS313 ADVANCED OPERATING SYSTEMS

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Distributed Operating Systems - Architectures of Distributed Systems - Theoretical Foundations - Distributed Mutual Exclusion - Distributed Deadlock Detection - Agreement Protocols

UNIT II
Distributed Resource Management - Distributed File Systems - Distributed Shared Memory - Distributed Scheduling

UNIT III

Failure Recovery and Fault Tolerance - Recovery - Fault Tolerance

UNIT IV

Protection and Security - Resource Security and Protection: Access and Flow Control - Multiprocessor Operating Systems - Multiprocessor System Architectures - Multiprocessor Operating Systems

UNIT V

Database Operating systems - Introduction to Database Operating Systems - Concurrency Control: Theoretical Aspects - Concurrency Control Algorithms

Text Book

1. Mukesh Singhal, Niranjan G.Shivaratri, *Advanced Concepts in Operating Systems Distributed, Database, and Multiprocessor Operating Systems,* Tata McGraw-Hill Edition 2001. (Chapters 4-14,16-20)

Reference Book:

1. Mary S. Gorman, S. Todd Stubbs, *Introduction to Operating Systems: Advanced Course*, Course Technology, 2001.

CS314 HIGH PERFORMANCE NETWORKS

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Packet - Switched Networks: OSI and IP models - Ethernet (IEEE802.5) - Token Ring - FDDI - DQDB - Frame Delay - SMDS - Internet and TCP/IP Networks: The Internet - Overview of Internet Protocols - Internet Protocol - TCP and UDP - Internet Success and Limitation - Performance of TCP/IP Network. (Chapters 3, 4)

UNIT II

Circuit Switched Networks: Performance of Circuit Switched Networks - SONET - Dense Wave Division Multiplexing (DWDM) - Fiber to the Home - Digital Subscriber Line (DSL) - Intelligent Networks - CATV (Chapter 5)

UNIT III

ATM: Main Features of ATM - Addressing Signaling & Routing - Header Structure - ATM Adaptation layer - Management control - BISDN - Internetworking with ATM
(Chapter 6)

UNIT IV

Wireless Networks: Introduction - The wireless channel - Link level design - Channel access - Network design - Wireless Networks - Future and standards
(Chapter 7)

UNIT V

Optical Networks: Optical Links - DWDM Systems - Optical Cross Connects - Optical LANs-Optical paths and Networks (Chapter 11)

Text Book:
1. Walrand. J. Varaiya, *High Performance Communication Network,* Morgan Kaufmann- Harcourt Asia Pvt., Ltd., Second Edition, 2000.

CS315 REAL TIME SYSTEMS

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Typical Real-Time Application - Hard Versus Soft Real Time System - Reference model of Real time System - Commonly used approaches to Real time scheduling

UNIT II
Clock driven Scheduling - Priority Driven Scheduling of Periodic Tasks

UNIT III
Scheduling Aperiodic and Sporadic Jobs in priority driven Systems - Resources and source access control

UNIT IV
Multiprocessor Scheduling, Resource access control - Synchronization - Scheduling flexible computations - Tasks with temporal distance constraints

UNIT V
Real time communication - Operating Systems
Text Book:
1. Jane W.S.Liu, *Real-Time Systems,* Pearson Publications, 2000. (Chapters 1-12)

Reference Book:
1. Phillip A. Laplante, *Real-Time Systems Design and Analysis*, Prentice Hall of India Pvt. Ltd., Second Edition, 2001.

CS316 COMPUTER LAB I

Credit 0:0:2   **Marks 50 + 50**

12 experiments will be notified by HOD from time to time

CS317 SPEECH AND LANGUAGE PROCESSING

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Introduction - Knowledge in Speech and Language processing – Ambiguity - Models and Algorithms - Language, Thought, and Understanding - The State of art and near term future-history - Regular Expressions and automata – Finite State Automata - Regular language and FSAs - Morphology - Finite State Transducers - English Morphology - Finite state Morphological Parsing - Combining FST lexicon and rules - Lexicon free FSTs The porter Stemmer - Human Morphological Processing
(Chapter 1-3)

UNIT II

Computational Phonology and Text to Speech – Speech sounds and Phonetic Transcription – The phoneme and Phonological Rules - Phonological Rules and Transducers - Advanced issues in computational Phonology - Machine learning of Phonological Rules - Mapping Text to phones for TTS - Prosody in TTS - Human Processing of Phonology and Morphology - Probabilistic models of pronunciation and Spelling – Dealing with spelling Errors - error patterns - non Word Errors - Probabilistic Models - Bayesian model to spelling - Minimum Edit Distance - English Pronunciation Variation - Bayesian model for Pronunciation - Weighted Automata - Pronunciation in Humans-N-Grams - Counting Words in corpora - Simple N-grams – Smoothing - Back off - Deleted Interpolation - N-grams for Spelling and pronunciation – Entropy (Chapter 4-6)

UNIT III

HMM's & Speech Recognition Speech Recognition Architecture - Overview of a Speech Recognition Architecture - Overview of Hidden Markov Models - The Viterbi Algorithms Revisited - Advanced Methods of Decoding - A Decoding Acoustic Processing of Speech - Sound Waves - How to Interpret a Waveform Spectra - Feature Extraction - Computing Acoustic Probabilities - Training a Recognizer
Word Classes and Part-of-Speech Tagging - English Word Classes - Tagsets for English - Part of Speech Tagging - Rule-Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation Based Tagging - Other Issues - Context Free Grammars for English Syntax - Constituency - Context-Free Rules and Trees - Sentence-Level Constructions - The Noun Phrase - Coordination
Conjunction - Agreement - The Verb Phrase and Sub categorization - Spoken Language Syntax - Grammar Equivalence and Normal Form - Finite-State Grammars and Context-Free Grammars - Grammars and Human Processing (Chapters 7-9)

UNIT IV

Passing with Context free grammars - Parsing as Search - Top-down Parsing - Bottom-Up Parsing - A Basic Top-Down Parser - Problems with the Simple Top-Down Parser -The Earley Algorithm - Finite-State Parsing Methods - Lexicalized and Probabilistic Parsing - Probabilistic Context-Free Grammars - Problems with PCFGs - Probabilistic Lexicalized CFGs - Dependency Grammars - Human Parsing – Semantics - Representing Meaning -

Introduction - Computational Requirements for Representations - Meaning Structure of Language - First Order Predicate Calculus - Representing Linguistically Relevant Concepts - Related Representational Approaches - Alternative Conceptions of Meaning . (Chapters 10, 12, 14)

UNIT V

Semantic Analysis – Syntax-Driven Semantic Analysis - Semantic Augmentations to CFG Rules - Quantifier Scoping and Complex Terms - Semantic Attachments for a Fragment of English - The Design of a Syntax-Driven Analyzer - Idioms and Compositionality - Robust Analysis - Dialogue &Conversational Agents - Dialog Acts -Automatic Interpretation of Dialog Acts - Dialog Structure and Coherence - Dialog Managers and Conversational Agents - Machine translation-Language Similarities and Differences - The Transfer Metaphor - The Interlingua Idea: Using Meaning - Direct Translation - Using Statistical Techniques - Usability and System Development
(Chapters 15, 19, 21)

Text Book:
1. Daniel Jurafsky, James H.Martin, *Speech and Language processing,* Pearson Publications, 2000.

CS318 PARALLEL PROCESSING

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Parallel Machines and Computations: Evolution of parallel architectures-interconnection networks-application of architectural parallelism - getting started in SIMD and MIMD programming-parallelism in algorithms.
Potential for Parallel Computations: Parameters characterizing algorithm parallelism - prefix problem - parallel prefix algorithms - characterizing algorithm behavior for large problem size-programming parallel prefix-speedup and efficiency of parallel algorithms - the performance perspective.

UNIT II

Vector Algorithms and Architecture: Vector and matrix algorithms – a vector architecture-the prime memory system-use of PE index to solve storage layout problems-SIMD language constructs-pipelined SIMD vector computers
MIMD Computers and Multiprocessors: Shared memory and message passing architecture-overview of shared memory multiprocessor programming - shared memory programming alternatives and scope-a shared memory multiprocessor programming language - the OpenMP language extension-pipelined MIMD-multithreading.

UNIT III

Distributed Memory Multiprocessors: Distributing data and operations among processor/memory pairs programming with message passing - characterization of

communication - the message - passing interface, MPI -hardware managed communication-distributed cache.

UNIT IV

Data dependence and Parallelism: Discovering parallel operations in sequential code - variables with complex names-sample compiler techniques - data flow principles-data flow architectures.

UNIT V

Implementing Synchronization and Data Sharing: The character of information conveyed by synchronization - synchronizing different kinds of cooperative computations-waiting mechanisms-mutual exclusion using atomic read and write.

Text Book:
1. Harry F. Jordan and Gita Alaghband, *Fundamentals Of Parallel Processing*, Pearson Education, 2003. (Chapters 1-5, 6, 8)

CS319 SOFTWARE AGENTS

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Introduction - Intelligent Agents - Deductive reasoning Agents - Agents as theorem provers - Agent oriented programming - concurrent MetateM

UNIT II

Practical Reasoning Agents - Reactive and Hybrid Agents – Brook's and Subsumption architecture - Limitations of reactive agents - Hybrid agents - Multiagent interactions

UNIT III

Reaching Agreements – mechanism design – auctions – negotiations – argumentation - Communication. - Speech acts - Agent communication languages - ontologies for Agent communication - coordination languages

UNIT IV

Working together cooperative distributed problem solving - task sharing and result sharing - coordination-multiagent planning and synchronization - methodologies

Unit -V

Applications - logics for multiagent system - formal methods in Agent - oriented software engineering

Text Book:
1. Michael Wooldridge, *An Introduction to Multi Agent Systems,* John Wiley & Sons Ltd, 2002. (Chapters 1-12)

Credit 0:0:2   **Marks 50 + 50**

12 experiments will be notified by HOD from time to time

CS321 C# AND •NET PLATFORM

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I
C# Language Fundamentals - Object-Oriented Programming with C#

UNIT II
Exceptions and Object Lifetime - Interfaces and Collections - Callback Interfaces, Delegates, and Events

UNIT III
Advanced C# Type Construction Techniques - Understanding .NET Assemblies

UNIT IV
Processes, AppDomains, Contexts, and Threads - Type Reflection, Late Binding, and Attribute-Based Programming

UNIT V
Object Serialization and the .NET Remoting Layer - The System.IO Namespace

Text Book:
1. Andrew Troelsen, *C# and the .NET Platform*, Second Edition, Springer (India) Private Limited, 2003. (Chapters: 3-12, 16)

CS322 C# AND •NET PROGRAMMING LAB

Credits: 0: 0: 2   **Marks: (50 +50)**

12 experiments will be notified by HOD from time to time

CS323 MOBILE COMMUNICATION AND COMPUTING

Credits: 5 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Introduction - Wireless transmission-frequencies for radio transmission – Signals – Antennas - Signal propagation – Multiplexing – Modulation - Spread Spectrum - Cellular systems - Medium access control-SDMA, FDMA, TDMA, CDMA – Comparison of S/T/F/CDMA -

Telecommunication systems – GSM - DECT – TETRA - UMTS – IMT 2000 - Satellite systems-Applications – Basics – Routing – Localization – Handover - Broadcast systems - Cyclic repetition of data - Digital audio broadcasting - Digital video broadcasting

UNIT II
Wireless LAN - Infrared Vs Radio transmission - Infrastructure and adhoc networks - IEEE 802.11 – HIPERLAN – Bluetooth - Wireless ATM - WATM services - Reference model-functions - Radio access layer – Handover - Location Management – Addressing -Mobile quality of service - Access point control protocol

UNIT III
Mobile network layer - Mobile IP - Dynamic host configuration protocol - adhoc networks - Mobile transport layer - Traditional TCP - Indirect TCP - Snooping TCP - Mobile TCP - Fast retransmit/ fast recovery - Transmission/ time-out freezing - Selective retransmission - Transaction oriented TCP - Support for mobility - File systems - World Wide Web - Wireless application protocol

UNIT IV
Pervasive Computing – Devices - Information Access Devices – Handheld Computer -Palm OS-Based Devices - Windows CE-based Handheld Computer - EPOC based – Handheld Computer-Sub-Notebooks-Phones-Data transmission Capabilities-Smart Phones - Screen Phones - Smart Identification – Smart Cards-Smart Labels - Smart tokens - Embedded Controls - Smart Sensors and Actuators - Smart Appliances - Appliances and Home Networking - Automotive Computing - Entertainment Systems – Television Systems - Game Consoles.

UNIT V
Software – Java – Language Characteristics-Java Class Library-Java Edition –Micro Edition – Personal Java and Embedded Java – Development tools for Java- Operating Systems - Windows CE – Palm OS – Symbian OS – Java card – Client Middleware-Programming APIs-Smart Card Programming - Messaging Components – Database Components-Security - Cryptographic Patterns and Methods - Cryptographic tools- Secure Socket Layer – New Services - Home Services - System View- Communication Services - Home Automation – Energy Services - Security Services - Remote Home Health Care Services - Travel And Business Services – Consumer Services - Interactive Advertisements – Loyalty - Shopping - Payments Services

Text Books:
1. 1.Jochen Schiller, *Mobile Communication*, Pearson Education, 2000. (Chapters 1-5, 6-9, 21-23)
2. Uwe Hansmann, Lothar Merk, Martin S.Nicklous and Thomas Stober, *Principles of Mobile Computing*, Second Edition, Springer International Edition, 2003.
Reference Book
1. Yi-Bing Lin and Imrich Chlamtac, *Wireless and Mobile Network Architecture*, John Wiley and Sons Inc., 2001.

CS324 NETWORK MANAGEMENT

Credits: 5 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Data Communication and Network Management Overview: Analogy of Telephone Network Management- Data and Telecommunication Network- Distributed Computing Environments- TCP/IP- Based Networks- Communication Protocols and Standards- Case Histories- Challenges of Information Technology Managers- Network Management: Goals, Organization and Functions- Network and System Management- Network Management System Platform- Current Status and Future of Network Management- Fundamental of Computer Network Technology: Network Topology, LAN, Network Node components- WAN - Transmission Technology- Integrated Services: ISDN, Frame Relay, and Broadband.

UNIT II

SNMP, Broadband and TMN Management- Basic Foundations: Network Management Standards, Network Management Model- Organization Model- Information Model- Communication model- encoding Structure- Macros- Functional Model- SNMPv1 Network Management: Organization and Information Models- Management Network- The History of SNMP Management- Internet Organizations and Standards- The SNMP Model- The Organization Model- System Overview- The Information Model. SNMPv1 Network Management: Communication Model and Functional Models.

UNIT III

SNMP Management: Major Changes in SNMPv2- SNMPv2 System Architecture- SNMPv2 Structure of Management Information- The SNMPv2 Management Information Base- SNMPv2 Protocol- Compatibility with SNMPv1- SNMPv3- SNMPv3 Documentation- SNMPv3 Documentation Architecture- Architecture- SNMPv3 Applications- SNMPv3 Management Information Base- Security- SNMPv3 User- Based Security Model- Access Control- SNMP Management: RMON- Remote Monitoring- RMON SMI and MIB- RMON1- RMON2- ATM Remote Monitoring-Case Study.

UNIT IV

Broadband Networks and services- ATM Technology- ATM Network Management- Broadband Access networks and Technologies-HFC Technology-Data over Cable Reference Architecture-HFC Management-DSL Technologies-ADSL technology-ADSL Management- Telecommunication Management Network-Operation Systems-TMN Conceptual Model- TMN Standard-TMN Architecture-TMN Management Service Architecture-An Integrated view of TMN-Implementation Issues.

UNIT V

Network Management Tools and Systems- Network Statistic Measurement Systems- History of Enterprise Management- Network Management Systems- Commercial Network Management Systems- System Management-Enterprise Management Solutions- Network Management Applications: Configuration management- Fault Management- Performance management- Event correlation Techniques- Security Management- Accounting Management- Report Management- Policy Based Management- Service level Management-

Web-Based Management- NMS with Web Interface and Web Based Management- Web Interface to SNMP Management- Embedded Web Based Management- Desktop Management Interface- Web Based Enterprise Management- WBEM: Windows Management Instrumentation- Java Management Extensions- Management of a Storage Area Network.

Text Book
1. Mani Subramanian, *Network Management - Principles and Practice*, Addison Wesley, New York, 2000.

Reference Book
1. Stephen B. Morris, *Network Management – MIBs and MPLS*, Pearson Education, 2003.

DEPARTMENT
OF
COMPUTER SCIENCE
AND TECHNOLOGY

ADDITIONAL SUBJECTS

Code	Subject Name	Credit
CS246	Data Structures	4:0:0
CS247	Operating Systems	4:0:0
CS248	Data and Computer Communication	4:0:0
CS249	Design and Analysis of Algorithms	4:0:0
CS250	System Software	4:0:0
CS251	Cryptography and Network Security	4:0:0
CS252	Software Engineering	4:0:0
CS325	Advanced Computer Architecture	4:0:0
CS326	Real Time Systems	4:0:0
CS327	Parallel Processing	4:0:0
CS328	Theory of Computation	4:0:0
CS329	Soft Computing	4:0:0
CS330	Biometrics	4:0:0
CS331	J2ME Programming	4:0:0
CS332	Software Engineering Principles	4:0:0
CS333	Software Architecture	4:0:0
CS334	Object Oriented Software Engineering	4:0:0
CS335	Requirements Engineering	4:0:0
CS336	Object Oriented Case Tools Lab	0:0:2
CS337	Software Metrics and Quality Management	4:0:0
CS338	Security in Computing	4:0:0
CS339	User Interface Design	4:0:0
CS340	Real Time System Software	4:0:0
CS341	Software Testing	4:0:0
CS342	Software Testing Lab	0:0:2
CS343	System Development Lab	0:0:2
CS344	Advanced Database Lab	0:0:2
CS345	Operating Systems and Networking Lab	0:0:2
CS346	Case Tools Lab	0:0:2
CS347	Advanced Technologies Lab	0:0:2

CS246 DATA STRUCTURES

Credits: 4: 0 : 0   **Marks: (40 + 60)**

UNIT I

Algorithms for Data Structures - Specifics of PSEUDO - Data types, constants, Variables and expressions, Program modules in PSEUDO Logic and Control structures in PSEUDO - Linked lists, arrays, singly linked lists - Insertions and deletions - variations on linked list structures, Dummy Headers, Circular linked lists, Doubly linked circular list - Fixed length string method - workspace/Index table method Processing efficiency considerations of the workspace/Index talk method - Garbage collection - Linked list method.(Chapters1,2,3)

UNIT II

Circular implementation of a queue - Linked list implementation of a queue, priority queues - stacks - Array implementations of a stack - linked list implementation of a stack - Parsing and Evaluation of Arithmetic expressions using stacks - postfix, prefix and infix notations converting to infix expressions to postfix - Evaluating post fix expressions - Recursion, Towers of Hanoi Problem - Recursive Algorithms - Implementing non –recursively – recursion - stacks and backtracking - The 8 queens problem. (Chapters 4,5)

UNIT III

Tree structures - Binary trees, implementation of Binary trees - linear representation of a binary tree - linked representation of a binary tree- binary tree traversals - pre-order, In order-post order traversals of a binary tree - Deletion algorithm for lists maintained with binary tree - Threaded binary trees - insertions into a binary tree - height - balanced trees, AVL rotations - General trees.(Chapters 6,7)

UNIT IV

Implementing a multidimensional array - sparse matrices and generalized Dope vector implementation - Linked list implementation of a sparse matrix. Graphs and networks, implementation of graphs - the adjacency matrix, Depth-first search, breadth-first search. Networks - Minimum spanning tree - The shortest path algorithm - Topological ordering. (Chapters 8,9)

UNIT V

Sorting: Internal sorts, The Bubble sort, The Insertion sort, The selection sort, The shell sort, The Quick sort, The Heap sort External sorting or File sorting:The Merge sort -- Search Strategies: Quantity-Dependent search techniques: Sequential Search, Binary Search, Binary Tree Search (Chapters 10,11)

Text Book:
Bhagat Singh and Thomas L.Naps, *Introduction to Data Structures*, Tata McGraw-Hill 1986.
Reference Book:
Robert Kruse, C.L.Tondo and Bruce Leung, *Data Structures and Program Design in C,* , Second Edition, Prentice-Hall India 1997. ISBN-81-203-2097-2

CS247 OPERATING SYSTEMS

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Introduction – Overview of different types of systems – System Components - Operating System Services – System Calls – System Programs – System Structure – Virtual Machines – System design and Implementation - Process Concept – Process Scheduling – Operation on Processes – Cooperating Processes – Interprocess Communication
(ch 1, ch 3.1-3.7, ch 4.1-4.5)

UNIT II

Threads – Multithreading Models – Threading Issues – Java Threads – Basic Concepts of CPU Scheduling – Scheduling Criteria – Scheduling Algorithms - Process Synchronization – The Critical Section Problem – Synchronization Hardware – Semaphores – Classic Problems of Synchronization – Critical Regions – Monitors – OS Synchronization (ch 5.1-5.3, ch 6.1-6.3, ch 7.1-7.8)

UNIT III

Deadlock Characterization – Methods for handling deadlocks- Deadlock Prevention – Deadlock Avoidance –Deadlock Detection – Recovery from deadlock – Memory Management Background – Swapping – Contiguous memory allocation – Paging – Segmentation – Segmentation with Paging. (ch 8, ch 9)

UNIT IV

Introduction to Virtual Memory – Demand Paging – Process Creation – Page Replacement – Allocation of Frames – Thrashing – File Concept – Access Methods – Directory Structure – File-System Mounting – File Sharing – Protection. (ch 10.1-10.6, ch 11)

UNIT V

File-System Structure – File-System Implementation – Allocation Methods – Free-Space Management – Efficiency and Performance – Recovery – I/O Hardware – Application - I/O Interface – Kernel I/O Subsystem – Disk Structure – Disk Scheduling –Disk Management – Swap-space Management. (ch 12.1-12.2, 12.4-12.7, ch 13.1-13.4, ch 14.1-14.4)

Text Book:

Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, O*perating System Concepts,* Sixth Edition, John Wiley and Sons, 2002. ISBN 9971-51-388-9 (Chapters 1-14)

CS248 DATA AND COMPUTER COMMUNICATION

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Data communication and networking overview: A communication model-data communication-data communication networking. **Protocol architecture:** The need for a protocol architecture-a simple protocol architecture - OSI – TCP/IP protocol architecture. **Data transmission:** Concepts and terminology-Analog and Digital data transmission-Transmission Impairments – channel capacity. (Chapters:1-3)

UNIT II
Signal encoding techniques: Digital data, Digital signals & analog signals – analog data digital signals and analog signals. **Digital data communication techniques:** Asynchronous and synchronous transmission -Types of Error -Error Detection -Error Correction-Line configurations- Interfacing. **Data link Control:** Flow control-Error Control-HDLC. (Chapters 5-7)

UNIT III

Multiplexing: FDM – Synchronous TDM – statistical TDM – Asymmetric DSL – xDSL
Circuit Switching and packet switching: switching networks - circuit switching networks - circuit switching concepts - control signaling - soft switch architecture-Packet switching principles-X.25-Frame Relay. **Routing in Switched Networks:** Routing in circuit switched network – Routing in packet switched network – least cost algorithms.
(Chapters 8, 10, 12)

UNIT IV

Congestion control in switched Data network: Effect of congestion - Congestion control - Traffic management - Congestion control in packet switching networks - Frame Relay congestion control.
Local Area Network Overview: Background – Topologies and transmission media – LAN protocol architecture – bridges – layer2 and layer3 switches. (Chapters 13, Sections 13.1-13.5, 15)

UNIT V

Internet work protocols: Basic protocol functions – principles of internetworking – connectionless internetworking – Internet Protocol. **Transport protocols:** Connection – oriented TCP – TCP – Congestion control - UDP. (Chapters 18,20)

Text Book:
1. William Stallings, *Data and Computer Communication*, Seventh Edition, Prentice Hall of India, 2003. ISBN: 81-203-2355-6

Reference Book:
1. Behrouz A. Forouzan, *Data Communications and Networking*, Third Edition, Tata McGraw-Hill, 2004. ISBN: 0-07-058408-7.

CS249 DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Analysis Basics: what is analysis- what to count and consider – mathematical background-rates of growth – divide and conquer algorithms – recurrence relations Searching and selection algorithms: sequential search – Binary search – Selection

UNIT II

Sorting Algorithms: Insertion sort – Bubble sort-Shell sort-Radix sort – Heap sort – Merge sort – Quick sort – External poly phase merge sort Numeric Algorithms: Calculating polynomials – Matrix Multiplication – Linear Equations

UNIT III

Matching algorithms: String matching - Graph Algorithms: Graph background and terminology – Data structure methods for graphs – Depth-First search and Breadth-First Traversal algorithms – Minimum spanning tree algorithms – Shortest-path algorithm – Bi connected component algorithm

UNIT IV

Parallel Algorithms: Parallelism Introduction – The PRAM Model – Simple parallel operations – parallel searching – parallel sorting – parallel numerical algorithms – parallel graph algorithms

UNIT V

Non-Deterministic Algorithms: NP – Typical NP Problems – What makes something NP – Testing possible solutions Other Algorithmic Techniques

Text Book:
1. Jeffrey J.McConnell, *Analysis of Algorithms,* Narosa publishing House, 2002.

Reference Books:
1. Sara Baase and Allen Van Gelder, *Computer Algorithms – Introduction to Design and Analysis*, Pearson Education, 2000.
2. Michael T. Goodrich and Roberto Tamassia, *Algorithm Design: Foundations, Analysis and Internet Examples,* Johnwiley and Sons, 2002.

CS250 SYSTEM SOFTWARE

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Background: Introduction – System Software and Machine Architecture – The Simplified Instructional Computer (SIC) – Traditional (CISC) Machines – RISC Machines. (Chapter 1)

UNIT II
Assemblers: Basic Assembler Functions – Machine Dependent Assembler Features – Machine Independent Assembler Features – Assembler Design Options – Implementation Examples. (Chapter 2)

UNIT III
Loaders and Linkers: Basic Loader Functions – Machine Dependent Loader Features – Machine Independent Loader Features – Loader Design Options – Implementation Examples. (Chapter 3)

UNIT IV
Macro Processors: Basic Macro Processor Functions – Machine Independent Macro Processor Features – Macro Processor Design Options – Implementation Examples. (Chapter 4)

UNIT V

Other System Software: Text Editors – Interactive Debugging Systems. (Chapter 7 : Sections 7.2,7.3)

Text Book:

L.Beck, System *Software, An Introduction to System Programming,* Addison Wesley, 1999. ISBN : 81-7808-036-2.

Reference Book:

D.M.Dhamdhere, *Systems Programming and Operating Systems,* Tata McGraw-Hill Company, 1999. ISBN : 0-07-463579-4.

CS251 CRYPTOGRAPHY AND NETWORK SECURITY

Credits 4:0:0 **Marks(40+60)**

UNIT I
Services, Mechanisms and Attacks – Block Cipher principles – Data Encryption Standard – Strength of DES – Evaluation criteria for AES – AES Cipher.
[Sections: 1.1,3.2,3.3,3.4,5.1,5.2]

UNIT II
Principles of public Key Cryptosystems – RSA Algorithm – Key Management – Diffie Hellman Key Exchange – Basics of Elliptic Curve Cryptography.
[Sections: 9.1,9.2,10.1,10.2,10.4]

UNIT III
MD5 Message Digest Algorithm – Secure Hash Algorithm – HMAC – Digital signature Standard – Kerberos Version 5 – X.509 Authentication Service.
[Sections: 12.1,12.2,12.4,13.3,14.1,14.2]

UNIT IV
Pretty Good Privacy – S/MIME – IP Security Overview – IP Security Architecture – Authentication Header – Encapsulating Security Payload – Combining Security Associations – Key Management.
[Sections: 15.1,15.2,16.1,16.2,16.3,16.4,16.5,16.6]

UNIT V
Web Security considerations – Secure Sockets Layer and Transport Layer Security – Secure Electronic Transactions – Intruders – Intrusion Detection – Password Management – Firewall design principles – Trusted systems.
[Sections: 17.1,17.2,17.3,18.1,18.2,18.3,20.1,20.2]

Text Book:
1. William Stallings, *Cryptography and Network Security*, Third Edition, Prentice Hall, 2003, ISBN No: 81-7808 - 902-5

Reference Book:
1. Charlie Kaufman,Radia Perlman,Mike Speciner, *Network security*, Second edition, Prentice-hall, 2002.ISBN:81-203-2213-4.

CS252 SOFTWARE ENGINEERING

Credits: 4: 0: 0   **Marks: (40 + 60)**

UNIT I
Software Engineering – A system Approach – An Engineering Approach – Members of the development team - Modeling the Process and Life Cycle – the meaning – Software Process Models – Tools and Techniques - Practical Process modeling – Planning and Managing the project – tracking Progress – project personnel – Effort Estimation – Risk management – the project plan – process models and project management.

UNIT II
Capturing the requirements – The Requirements process – types – Characteristics – prototyping requirements – requirements documentation – participants in the process – requirements validation – measuring – choosing a requirements specification Technique – Designing the system – What is Design? - decomposition and modularity – architectural styles – issues – characteristics – techniques – evaluation and validation – documenting the design.

UNIT III
Concerning Objects – What is OO – the OO development process – use cases – UML – OO system design – OO program design – OO measurement – Writing the programs – standards and procedures – guidelines – documentation – Testing the programs – Software faults and failures – Testing issues – unit testing – integration testing – testing OO systems – test planning – automated testing tools.

UNIT IV
Testing the system – principles of system testing – function testing – performance testing – reliability, availability, and maintainability – acceptance testing – installation testing – automated system testing – test documentation –– delivering the system – training – documentation – maintaining the system – the changing system – nature – problems – measuring maintenance characteristics – techniques and tools.

UNIT V
Evaluating products, processes, and resources – approaches to evaluation – selecting an evaluation techniques – assessment vs prediction – evaluating products – evaluating processes – evaluating resources – Improving predictions, products, processes, and resources

– improving prediction – improving products – improving processes- The future of software engineering.

Text Book:
1. Shari Lawrence Pfleeger, *Software Engineering – Theory and Practice*, Third Edition, Pearson Education, 2001 .ISBN 81-7808-459-7(Chapters 1-13,14.4)

Reference Book:
1. James F.Peters, Witold Pedrycz, *Software Engineering – An Engineering Approach*, John Wiley and Sons, 2000. ISBN 9971-51-309-9

CS325 ADVANCED COMPUTER ARCHITECTURE

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I
Fundamentals of Computer Design: Introduction - Measuring and Reporting performance - Quantitative Principles of computer design. Instruction set Principles and Examples: Introduction - Classifying Instruction set Architectures - Memory Addressing - Addressing Modes for signal processing - Type and size of operands -Operands for media and signal processing - operations in the instruction set - Instruction for control flow - Encoding an instruction set – the role of compiler. (Chapter 1, 2)

UNIT II
Pipelining: Introduction - The Major Hurdle of pipelining - pipeline Hazards - Implementation - Extending the MIPS pipeline to handle multicycle operations - crosscutting issues. (Appendix A)

UNIT III
Instruction - Level parallelism: concepts and challenges - overcoming data Hazards with Dynamic scheduling - Dynamic scheduling: Examples and the Algorithm - Reducing Branch costs with Dynamic Hardware Prediction - High Performance instruction delivery - Taking advantage of More ILP with Multiple Issue - Hardware - Based speculation - Studies of the Limitations of ILP - Limitations of ILP for Realizable processors – thread level parallelism – crosscutting issues. (Chapter 3)

UNIT IV
Exploiting Instruction - Level Parallelism with Software Approaches: Basic compiler Techniques for Exposing ILP - Static Branch Prediction - Static Multiple issue: The VLIW approach - advanced compiler support for Exposing and Exploiting ILP - Hardware support for Exposing more parallelism at compile Time - crosscutting issues: Hardware versus software speculation mechanisms. (Chapter 4)

UNIT V

Memory Hierarchy Design: Introduction - Review of the ABCs of the caches - Cache Performance - Reducing Cache Miss Penalty - Reducing Miss Rate - Reducing Cache Miss Penalty or Miss Rate via Parallelism - Reducing Hit Time - Main Memory and Organizations for Improving Performance - Memory Technology - Virtual Memory - Protection and Examples of Virtual Memory. (Chapter 5)

Text Book:

1. John L. Hennessy and David Patterson, *Computer Architecture, A Quantitative Approach*, Third Edition, Elsevier, 2003. ISBN : 1-55860 – 596 – 7.

CS326 REAL TIME SYSTEMS

Credits: 4:0:0   **Marks: (40+60)**

UNIT I

Typical Real Time Applications - Hard Versus Soft Real Time Systems - A Reference model of Real Time Systems. (Chapters 1,2 and 3)

UNIT II

Commonly used approaches to Real time scheduling - Clock driven Scheduling. (Chapters 4 and 5)

UNIT III

Priority Driven Scheduling of Periodic Tasks. (Chapter 6)

UNIT IV

Scheduling Aperiodic and Sporadic Jobs in priority driven Systems. (Chapter 7)

UNIT V

Resources and source access control. (Chapter 8)

(NOTE: Derivations / Proofs of algorithms not included)

Text Book:

1. Jane W.S.Liu, *Real-Time Systems,* Pearson Education, 2000, ISBN NO: 81-7808-463-5 (Chapters 1-8).

Reference:

1. Phillip A. Laplante, *Real –Time Systems Design and Analysis* – Prentice Hall of India, 2nd Edition, 2001, ISBN NO: 81-203-1684-3.

CS327 PARALLEL PROCESSING

Credits: 4 : 0 : 0   **Marks: (40 + 60)**

UNIT I

Parallel Machines and Computations: Evolution of parallel architectures-interconnection networks-application of architectural parallelism - getting started in SIMD and MIMD programming-parallelism in algorithms. Potential for Parallel Computations: Parameters characterizing algorithm parallelism - prefix problem - parallel prefix algorithms - characterizing algorithm behavior for large problem size-programming parallel prefix-speedup and efficiency of parallel algorithms - the performance perspective.

UNIT II

Vector Algorithms and Architecture: Vector and matrix algorithms – a vector architecture-the prime memory system-use of PE index to solve storage layout problems-SIMD language constructs-pipelined SIMD vector computers. MIMD Computers and Multiprocessors: Shared memory and message passing architecture-overview of shared memory multiprocessor programming - shared memory programming alternatives and scope-a shared memory multiprocessor programming language - the OpenMP language extension-pipelined MIMD-multithreading.

UNIT III

Distributed Memory Multiprocessors: Distributing data and operations among processor/memory pairs programming with message passing - characterization of communication - the message - passing interface, MPI -hardware managed communication-distributed cache. Interconnection Networks : network characteristics – permutations – static networks – dynamic networks – combining networks – performance.

UNIT IV

Data dependence and Parallelism: Discovering parallel operations in sequential code - variables with complex names-sample compiler techniques - data flow principles-data flow architectures.

UNIT V

Implementing Synchronization and Data Sharing: The character of information conveyed by synchronization - synchronizing different kinds of cooperative computations-waiting mechanisms-mutual exclusion using atomic read and write. Temporal behaviour of parallel programs: temporal characterization of cache behaviour – read sharing in multiprocessors with distributed caches – message waiting in message passing multiprocessors – conclusion.

Text Book:

Harry F. Jordan and Gita Alaghband, *Fundamentals Of Parallel Processing*, Pearson Education, 2003.

CS328 THEORY OF COMPUTATION

Credits: 4: 0: 0   **Marks: (40 + 60)**

UNIT I

Introduction to the Theory of computation - Finite Automata: Deterministic Finite Accepters – Non-deterministic Finite Accepters - Equivalence of Deterministic and Non- deterministic Finite Accepters - Reduction of the number of states in Finite Automata - Regular Languages and regular grammars: Regular Expressions - Connection between Regular expressions an regular languages - Regular Grammars. (Chapters 1,2,3)

UNIT II

Properties of Regular Languages - Context-free Languages : Context-free Grammars - Parsing and ambiguity - Parsing an Membership - Context-Free grammars - Programming – Simplification of Context Free Grammars: Methods for transforming grammars - Important Normal Forms - Membership algorithm for Context-free Grammars. (Chapters 4,5,6)

UNIT III

Pushdown Automata: Non-deterministic Pushdown Automata - Pushdown Automata and context - free Languages - Deterministic Pushdown Automata - Deterministic Context - Free Languages - Grammars for Deterministic Context free languages –Properties of Context Free Languages. (Chapters 7,8)

UNIT IV

Turing Machines: The Standard Turing machine. - Combining Turing machine for complicated task- Turing thesis - Other models of Turing machine. (Chapters 9,10)

UNIT V

A Hierarchy of Formal Languages and Automata – An Introduction to Computational Complexity: Efficiency of Computation – Turing Machines and Complexity - Language family and Complexity Classes - The Complexity Classes P and NP. (Chapters 11,14)

Text Book:
1. Peter Linz, *An Introduction to Formal Languages and Automata*, Narosa Publishing House, 2001 ISBN: 81-7319-460-2.

CS329 SOFT COMPUTING

Credits: 4: 0: 0   **Marks: (40 + 60)**

UNIT I

Introduction to Artificial intelligence Systems - Fundamentals of Neural Networks - Basic concepts of Neural networks - Human Brain - Model of an Artificial Neuron - Neural Network Architectures - Characteristics of Neural Networks - Learning Methods - Taxonomy of Neural Network Architectures - Early Neural Network Architectures - Back Propagation Networks - Architecture of a back Propagation Network - Single Layer Artificial Neural Network - Back propagation Learning – Applications - Effect of Tuning Parameters of the

BPN - Selection of various parameters in BPN - Variations of Standard Propagation Algorithm.

UNIT II

Associative Memory – Autocorrelators – HeteroCorrelators - Exponential BAM – Applications - The Hopfield Memory - Adaptive Resonance Theory – Introduction - ART1 - ART2 - Applications

UNIT III

Fuzzy Logic - Fuzzy Set Theory - Fuzzy versus Crisp - Crisp Sets - Fuzzy Sets - Crisp Relations - Fuzzy Relations - Fuzzy Systems - Crisp Logic - Predicate Logic - Fuzzy Logic - Fuzzy Rule Based System - Defuzzification Methods – Applications - Fuzzy Back propagation Networks - LR-type Fuzzy numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP - Inference by Fuzzy BP - Applications.

UNIT IV

Genetic Algorithms - Fundamentals of Genetic Algorithms - Genetic Algorithm History - Basic Concepts - Creation of Offsprings - Working Principle – Encoding - Fitness Function – Reproduction - Genetic Modeling - Inheritance operators – Crossover - Inversion and Deletion - Mutation operator - Bitwise Operators - Generational Cycle - Convergence of Genetic Algorithm – Applications - Multilevel Optimization - Real life problem - Differences and similarities between GA and other traditional methods - Advances in GA - Genetic algorithm based BPN - GA Based Weight Determination - Applications

UNIT V

Hybrid Systems - Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms – Simplified fuzzy ART map-Working of Simplified fuzzy ART map-Application-Recent trends- Fuzzy Associative Memories - FAM, An introduction - Single Association FAM - Fuzzy Hebb FAMs - FAM involving a Rule Base - FAM Rules with Multiple Antecedents/Consequents – Applications - Fuzzy Logic Controlled Genetic Algorithms - Soft Computing Tools - Problem Description of Optimum Design - Fuzzy Constraints - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller - Applications

Text Book:
1. S.Rajasekaran and G.A. Vijayalakshmi Pai, *Neural Networks, Fuzzy Logic, And Genetic Algorithms Synthesis and Applications,* Prentice Hall India, 2003.ISBN-81-203-2186-3. (Chapters 1- 15)

CS330 BIOMETRICS
Credit 4:0:0   **Marks (40+60)**

Unit –I
Introduction to biometrics – Fingerprint verification – Face recognition. (Chapters 1 - 3)

Unit – II

Hand geometry based verification - Recognizing persons by their Iris pattern – Retina identification. (Chapters 4 – 6)

Unit – III

Automatic online signature verification- Speaker recognition - Infrared identification of faces and body parts – Keystroke dynamics based authentication. (Chapters 7 - 10)

Unit – IV

Automatic gait recognition – Objective odour measurements - Ear biometrics – DNA based identification. (Chapters 11 - 14)

Unit – V

Large scale systems – Multimodal biometrics – Smartcard based authentication. (Chapters 15, 16 and 18)

Text Book:

1. Anil Jain, Ruud Bolle, Sharath Pankanti, *Biometrics – Personal Identification in Networked Society*, Kluwer Academic Publishers, 1999, ISBN: 0-7923-8345-1 (Chapters 1-16, 18).

Reference:

1. Samir Nanavati, Micheal Thieme, Raj Nanavati, *Biometrics – Identity Verification in a Networked World*, Wiley, 2002, ISBN: 81- 265- 0273 – 8.

CS331 J2ME PROGRAMMING

Credit: 4:0:0 **Marks (40+60)**

UNIT I

J2ME Overview – Small Computing Technology – J2ME Architecture and Development Environment

UNIT II

J2ME User Interface – Command, Items and Event Processing – High Level Display Screens – Low Level Display: Canvas

UNIT III

J2ME Data Management – Record Management System – J2ME Database Concepts

UNIT IV

JDBC and Embedded SQL – J2ME Personal Information Manger Profile

UNIT V

J2ME Networking and Web Services – Generic Connection Framework – Web Services

Text Book:

1. James Koegh, *J2ME – The Complete Reference*, Tata McGraw Hill Edition, 2003. ISBN: 0-07-053415-2

Reference Book:

1. Kim Topley, *J2ME – In a Nutshell*, O'Reilly publications, 2002. ISBN: 81-7366-343-2

CS332 SOFTWARE ENGINEERING PRINCIPLES

Credits 4:0:0   **Marks (40+60)**

UNIT I

Introduction to Software Engineering Management: Planning and Controlling a Software Development project. The Software Life Cycle Revisited: Waterfall model- Prototyping – Incremental Development-Rapid Application Development-Intermezzo- Spiral Model-towards a Software factory-Process modeling. Configuration Management: Tasks and Responsibilities- Configuration Management Plan.

UNIT II

People Management and Team Organization. On Managing Software Quality: Measures and Numbers- Taxonomy of Quality Attributes-Perspectives on Quality-Quality system-Software Quality Assurance-Capability Maturity Model. Cost Estimation: How not to estimate cost-Early Algorithmic models- Later Algorithmic Models- distribution of Manpower over time. Project Planning and Control: System view of Project control – Taxonomy of Software Development projects-Risk Management-Techniques for Project planning and Control.

UNIT III

Requirements Engineering: Requirement Elicitation- Requirements Specification Document-Requirements Specification Techniques-A Modeling Framework- Verification and Validation. Software Architecture: An Example- Producing a KWIC-Index-Architectural Styles- Design Patterns- Verification and Validation. Software Design: Design Considerations – Design Methods- Notations that support the Design Process- Design Documentation - Verification and Validation.

UNIT IV

Software Testing: Test Objectives- Testing and the Software Life Cycle-Verification and Validation Planning and Documentation- Manual test Techniques- Coverage Based Test Techniques- Fault Based Test Techniques-Error Base Test Techniques-Comparison of test techniques – Different test Stages. Software Maintenance: Major Causes of Maintenance Problems – Reverse Engineering and Restructuring- Organizational and Managerial issues. Formal Specification: Informal Specification Techniques – Model Oriented Specifications – Algebraic Specifications- Specification by Pre – and Post Conditions- Thou Shalt Formalize.

UNIT V

User interface design: What/Where is User Interface? - Human Factors in Human–Computer Interaction –Role of Models in Human–Computer Interaction – Design of Interactive

Systems – Task analysis- Specifications of the User Interface details-Evaluation. Software Reusability: Reuse Dimensions – Reuse of Intermediate products- Reuse and the software life cycle- Reuse Tools and Techniques-perspectives of Software reuse- Non-Technical Aspects of Software Reuse. Software Reliability: An Example – Fault – Tolerant Disks-Estimating Software Reliability. Software Tools: Toolkits – Language Centered Environments- Process Centered Environments.

Text Book:

1. Hans van Vliet, *Software Engineering Principles and Practice,* John Wiley and Sons, Second Edition, 2002.ISBN: 9971-51-51-357-9. (Chapters 1-11, 13-19).

CS333 SOFTWARE ARCHITECTURE

Credit: 4:0:0   **Marks: 40+60**

UNIT I
Introduction: what is software architecture-why architect-other software architecture approaches. Roles of software architect: Relationship to other key roles in development organization-skills and background for the architect-Injecting architecture experience Structuring the architecture team-Traps and pitfalls associated with the role of software architect. Software architecture and development process: Overview of iterative development-Requirements management-Management of technology road map-Effective technical meetings-Traps and pitfalls of software architecture process activities-computer-aided software engineering. (Chapters 1-3)

UNIT II
Example system Overview: System overview-overview of system interfaces-constraints-major operational requirements and software requirements .UML Quick tour: UML diagram summary-General diagramming conventions-The diagram-managing complexity. (Chapters 4 – 5)

UNIT III
System context and domain analysis: Conceptual diagram-context view points-domain analysis techniques-analysis view points Component design and modeling: overview-component viewpoint-component interaction viewpoint-component state modeling-modeling highly configurable component architectures. (Chapters 6-7)

UNIT IV
Subsystem Design: Terminology- Modeling subsystems, interface, and layers-Mapping subsystem and layers to implementation. Transactionn and data design: Logical data architecture-logical data viewpoint-data model design-transaction design. Process and deployment design: Physical data viewpoint-process viewpoint-deployment viewpoint. (Chapters 8-10).

UNIT V

Architecture techniques: Architecture development techniques-software partitioning strategies-separation of concerns-software changeability and dependency management-using architectural patterns-integration strategies-establishing architecture to support development. Applying the viewpoints: Bottom-up architecture development-top-down architecture development-message protocol and interface development-reengineering existing systems-documenting the architecture-conclusion. (Chapters 11- 12).

Text book:
1. Jeff Garland and Richard Anthony, *Large – Scale Software Architecture-A Practical Guide Using UML*, Wiley, 2003. ISBN-81-265-0363-7.

Reference Book:
1. Len Bass, Paul Clements and Rick Kazman, *Software Architecture in Practice*, Pearson Education, Edition 1998, ISBN 81 - 7808 – 546 - 1

CS334 OBJECT-ORIENTED SOFTWARE ENGINEERING

Credit 4:0:0   **Marks (40+60)**

UNIT I
Introduction to Software Engineering: Introduction: Software Engineering Failures-What is Software Engineering? -Software Engineering Concepts-Software Engineering Development Activities-Managing Software Development. **Modeling with UML:** Introduction-An Overview of UML-Modeling Concepts-A Deeper View into UML. **Project Organization and Communication:** Introduction: A Rocket Example-An Overview of Projects-Project Organization Concepts-Project Communication Concepts-Organizational Activities. **Requirements Elicitation:** Introduction: Usability Examples-An Overview of Requirements Elicitation-Requirements Elicitation Concepts-Requirements Elicitation Activities-Managing Requirements Elicitation. (Chapters: 1-4.)

UNIT II
Analysis: Introduction: An Optical Illusion-An Overview of Analysis-Analysis Concepts-Analysis Activities: From Use Cases to Objects-Managing Analysis. **System Design: Decomposing the System:** Introduction: A Floor Plan Example-An Overview of System Design-System Design Concepts-System Design Activities: From Objects to Subsystems. **System Design: Addressing Design Goals:** Introduction: A Redundancy Example-An Overview of System Design Activities-Concepts: UML Deployment Diagrams-System Design Activities: Addressing Design Goals-Managing System Design. (Chapters: 5-7.)

UNIT III
Object Design: Reusing Pattern Solutions: Introduction: Bloopers-An Overview of Object Design-Reuse Concepts: Solution Objects Inheritance and Design Patterns-Reuse Activities: Selecting Design Patterns and Components-Managing Reuse. **Object Design: Specifying**

Interfaces: Introduction: A Railroad Example-An Overview of Interface Specification-Interface Specification Concepts-Interface Specification Activities-Managing Object Design. **Mapping Models to Code:** Introduction: A Book Example-An Overview of Mapping-Mapping Concepts-Mapping Activities-Managing Implementation. (Chapters: 8-10.)

UNIT IV
Testing: Introduction: Testing the Space Shuttle-An Overview of Testing-Testing Concepts-Testing Activities-Managing Testing. **Rationale Management:** Introduction: Slicing Ham-An Overview of Rationale-Rationale Concepts-Rationale Activities: From Issues to Decisions-Managing Rationale. **Configuration Management:** Introduction: An Aircraft Example-An Overview of Configuration Management-Configuration Management Concepts-Configuration Management Activities-Managing Configuration Management. (Chapters: 11-13.)

UNIT V
Project Management: Introduction: The STS-51L Launch Decision-An Overview of Project Management-Project Management Concepts-Project Management Activities. **Software Life Cycle:** Introduction: Polynesian Navigation-IEEE 1074 Standard for Developing Life Cycle Processes-Characterizing the Maturity of Software Life Cycle Models-Life Cycle Models. **Methodologies: Putting It All Together:** Introduction: The First Ascent of K2-Project Environment-Methodology Issues-A Spectrum of Methodologies. (Chapters: 14-16.)

Text Book:
1. Bernd Bruegge, Allen H.Dutoit, *Object-Oriented Software Engineering,* Second Edition, Pearson Education, 2004. ISBN: 81-297-0433-1.

Reference Book:
1. Craig Larman, *Applying UML and Patterns*, Second Edition, Pearson Education, and 2003.ISBN: 81-7808-549-6.

CS335 REQUIREMENTS ENGINEERING

Credits 4:0:0   **Marks (40+60)**

UNIT I
Introduction- The State of the Industry Today –The Need to use Effective Requirements Practices- Requirements Process –Benefits of a Process Approach-Pitfalls of using a Process Approach Commited to the approach- Commitment and Recommendations (Chapter 1- 2)

UNIT II
Establish and utilize : A joint Team Responsible for the Requirements -What is a Joint team-Created – Joint team meet –Metrics-ROI-Customer and supplier roles.Define the Real Customer Needs -Recommendations- Train Developers –Variety of techniques –Train Requirements-Document-automated tools –collect requirements –Formal methods
Chapter (3-4)

UNIT III

Use and Continually improve a Requirements Process -Process- Process Designed ,Needed-Goals –sample requirements-Organizations create or tailor – Tailoring of process –web support -Iterate the system requirements and architecture repeatedly-The System Engineering Process -Recommendations –Guidelines Chapter (5-6)

UNIT IV

Use A Mechanism To Maintain Project Communication -Select Familiar methods and maintain a set of work products-Perform Requirements Verification and validation Chapter (7-9)

UNIT V

Provide an Effective Mechanism to Accommodate Requirements Changes -Perform the Development Effort Using Known, Familiar Proven industry , Organizational and Project best practices-How to proceed (Chapter 10-12)

Text Book:
1. Ralph R.Young, *Effective Requirements Practices*, Addison Wesley, 2001.
2. ISBN :0-201-70912-0.

CS336 OBJECT ORIENTED CASE TOOLS LAB

Credits 0:0:2 **Marks (50+50)**

12 experiments will be notified by the HOD from time to time.

CS337 SOFTWARE METRICS AND QUALITY MANAGEMENT

Credits: 4:0:0 **Marks: (40+60)**

UNIT I

Software Quality: Total Quality Management. **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 cleanroom Methodology – The Defect Prevention Process – Process Maturity Framework and Quality Standards. **Fundamentals of Measurement Theory:** Definition – Level of Measurement – Some Basic Measures – Reliability and Validity – Measurement Errors - Criteria for causality **(Ch :1-3)**

UNIT II

Software Quality Metrics Overview: Product Quality Metrics - In-Process Quality Metrics – Metrics for Software Maintenance – Collecting software Engineering Data. **Applying the Seven Basic Quality Tools in Software Development:** Ishikawa's Seven Basic tools – Checklist – Pareto Diagram – Histogram – Run charts – Scatter Diagram – Control chart – Cause-and-Effect Diagram – Relations Diagram. **Defect Removal Effectiveness:** A closer Look at defect removal Effectiveness – Defect Removal Effectiveness and Quality Planning

– Cost Effectiveness of Phase Defect Removal – Defect Removal Effectiveness and Process Maturity Level **(Ch :4-6)**

UNIT III
The Rayleigh Model: Reliability Models – The Rayleigh Model – Basic assumptions – Implementation – Reliability and Predictive Validity. **Exponential Distribution and Reliability Growth Models:** The Exponential Model –Reliability Growth Models – Model Assumptions – Criteria for Model Evaluation – Modeling Process – Test Compression Factor – Estimating the distribution of total defects over time. **Quality Management Models:** The Rayleigh Model Framework – The code Integration pattern – The PTR Submodel – The PTR Arrival / Backlog Projection Model – Reliability Growth Models – criteria for model evaluation. **(Ch :7-9)**

UNIT IV
In-Process Metrics and Reports: Orthogonal defeat classification – In-Process Metrics for Software Testing – Quality management – Possible metrics for acceptance testing to evaluate vendor developed software. **Complexity Metrics and Models:** Lines of Code - Halstead's Software Science - Cyclomatic Complexity - Syntactic Constructs - Structure Metrics. **Metrics and Lessons Learned for Object-Oriented Projects:** Object-Oriented Concepts and Constructs - Design and Complexity Metrics - Productivity Metrics - Quality and Quality Management Metrics - Lessons learned for OO projects. **Availability Metrics:** Definition and Measurements of System Availability - Reliability, Availability, and Defect Rate - Collecting Customer Outage Data for Quality Improvement - In-Process Metrics for Outage Availability. **Measuring and Analyzing Customer Satisfaction:** Customer Satisfaction Surveys - Analyzing Satisfaction Data - Satisfaction with Company. **(Ch :10-14)**

UNIT V
Conducting In-Process Quality Assessments: Preparation Phase -Evaluation Phase - Summarization Phase - Recommendations and Risk Mitigation. **Conducting Software Project Assessments:** Audit and Assessment - Software Process Maturity Assessment and Software Project Assessment - Software Process Assessment Cycle - A Proposed Software Project Assessment Method. **Do's and Don'ts of Software Process Improvement:** Measuring Process Maturity - Measuring Process Capability - Staged versus Continuous - Debating Religion - Establishing the Alignment Principle - Take Time Getting Faster - Keep It Simple—or Face Decomplexification - Measuring the Value of Process Improvement - Measuring Process Adoption. Measuring Process Compliance - Celebrate the Journey, not just the destination. **Function Point Metrics to Measure Software Process Improvement:** Software Process Improvement Sequences - Process Improvement Economics – Measuring Process improvements at activity levels. Concluding Remarks.   **(Ch :15-19)**

Text Book:
1. Stephen H.Kan, *Metrics and Models in Software Quality Engineering,* Second Edition, Pearson Education, 2003. ISBN: 81-297-0175-8.

Reference Book:

1. Alan C. Gillies, *Software Quality Theory and Management*, Second Edition, Thomson, 2003. ISBN: 981-243-859-9.

CS338 SECURITY IN COMPUTING

Credits : 4:0:0   **Marks: (40+60)**

UNIT I
Program Security: Secure Programs - Nonmalicious Program Errors - Viruses and Other Malicious Code - Targeted Malicious Code - Controls Against Program Threats.
(Chapter: 3)

UNIT II
Protection in General - Purpose Operating Systems: Protected Objects and Methods of Protection - Memory and Address Protection - Control of Access to General Objects - File Protection Mechanisms - User Authentication (Chapter: 4)

UNIT III
Designing Trusted Operating Systems: What Is a Trusted System? - Security Policies - Models of Security - Trusted Operating System Design - Assurance in Trusted Operating Systems - Implementation Examples. (Chapter: 5)

UNIT IV
Database Security: Introduction to Databases - Security Requirements - Reliability and Integrity - Sensitive Data – Inference - Multilevel Databases - Proposals for Multilevel Security.   (Chapter : 6)

UNIT V
Administering Security: Security Planning - Risk Analysis - Organizational Security Policies - Physical Security. (Chapter : 8)

Text Book:

1. Charles P. Pfleeger & Shari Lawrence Pfleeger, *Security in Computing,*Third Edition,Pearson Education, 2003. ISBN : 81-297-0042-5.

CS339 USER INTERFACE DESIGN

Credits 4:0:0   **Marks (40+60)**

UNIT I
Human Factors of Interactive Software: Introduction - Goals of System Engineering - User Interface Design Goals - Motivations for Human Factors in Design - Accommodating Human Diversity – Goal for our Profession - Theories, Principles, and Guidelines: High-Level

Theories - Object/Action Interface Model – Principles - Guidelines for Data Display - Guidelines for Data Entry - Balance of Automation and Human Control. (Chapters 1, 2)

UNIT II

Managing Design Processes: Introduction - Organizational Design to Support Usability - The Three Pillars of Design - Development Methodologies - Ethnographic Observation - Participatory Design Scenario Development - Social Impact Statement for Early Design Review - Legal Issues Expert Reviews, Usability Testing, Surveys, and Continuing Assessments: Introduction - Expert Reviews - Usability Testing and Laboratories -Surveys - Acceptance Tests - Evaluation During Active Use - Controlled Psychologically-Oriented Experiments - Software Tools: Specification Methods - Interface-Building Tools - Evaluation and Critiquing Tools. (Chapters 3 - 5)

UNIT III

Direct Manipulation and Virtual Environments: Introduction - Examples of Direct-Manipulation Systems - Explanations of Direct Manipulation - Visual Thinking and Icons - Direct-Manipulation Programming - Home Automation -Remote Direct Manipulation - Virtual Environments Menu Selection, Form Fillin, and Dialog Boxes: Task-Related Organization - Item Presentation Sequence - Response Time and Display Rate - Fast Movement Through Menus - Menu Layout - Form Fillin - Dialog Boxes. (Chapters 6,7)

UNIT IV

Multiple-Window Strategies:Introduction – Individual -Window Design -Multiple-Window Design -Coordination by Tightly-Coupled Windows - Image Browsing and Tightly-Coupled Windows -Personal Role Management and Elastic Windows - Computer-Supported Cooperative Work: Introduction - Goals of Cooperation - Asynchronous Interactions: Different Time, Different Place - Synchronous Distributed: Different Place, Same Time - Face to Face: Same Place, Same Time - Applying CSCW to Education. (Chapters 13,14)

UNIT V

Information Search and Visualization: Introduction - Database Query and Phrase Search in Textual Documents – Multimedia Document Searchs-Information Visualization – Advanced Filtering - Hypermedia and the World Wide Web: Introduction - Hypertext and Hypermedia - World Wide Web - Genres and Goals for Designers - Users and Their Tasks - Object-Action Interface Model for Web Site Design. (Chapters 15,16)

Text Book:
1. Ben Shneiderman, *Designing the User Interface*, Pearson Education ,Third Edition, 2004, ISBN : 81-7808-262-4 (Chapters 1-7, 13-16).

Reference:
1. Jenny Le Peuple, Robert Scane, *User Interface Design*, Rain Tree , 2004, ISBN :1 903337 19 4.

CS340 REAL TIME SYSTEM SOFTWARE

Credits 4:0:0   **Marks (40+60)**

UNIT I
The World of Real Time Systems-Software Architecture-Process and State Based Systems Model-Cyclic Executives. (Chapters 1,2)

UNIT II
Requirements and Design Specifications-Survey and Classifications of Notations-Data Flow Diagrams-Tabular Languages-State Machines-Systems of State Machines-Communicating Real Time State Machines-State chart. (Chapters 3,4)

UNIT III
Declarative Specifications-Regular Expressions and Extensions-Traditional Logics-Real-Time Logic-Deterministic Scheduling –Assumptions and Candidate Algorithms-Basic RM and EDF Results-Relaxing the Assumptions-Process Interactions. (Chapters 5,6)

UNIT IV
Execution Time Prediction-Measurement of Software by software-Program Analysis with Timing Schema-Prediction by optimization-System Interferences and architectural-Keeping Time on computers-Timer applications-properties of real and Ideal Clocks-Clock Servers-Clock synchronization. (Chapters 7,8)

UNIT V
Programming Languages- Real time Language features-Ada-Java and real time extensions-CSP and Occam-Estherel Concepts-Operating Systems Real time functions and services-OS architectures-Issues in Task Management-Interrupts and the OS. (Chapters 9,10)

Text Book:
1. Alan C. Shaw, *Real–Time Systems and Software*, Wiley , 2001, ISBN :9814-12-657-8. Chapters (1-10).

Reference Book:
1. Jane W.S.Liu, *Real-Time Systems,* Pearson Education, 2000, ISBN : 81-7808-463-5.

CS341 SOFTWARE TESTING
Credits 4:0:0   **Marks (40+60)**

UNIT I
Introduction to testing as an Engineering activity – Testing Fundamentals – Defects, Hypotheses, and tests – Strategies and methods for test case design I. (Chapters 1 - 4)

UNIT II

Strategies and methods for test case design II – Levels of testing – Test goals, policies plans, and documentation. (Chapters 5 - 7)

UNIT III

The test organization – Controlling and monitoring the testing process – Reviews as a testing activity. (Chapters 8 - 10)

UNIT IV

A measurement program to support product and process quality – Evaluating software quality: A quantitative approach – Defect analysis and prevention. (Chapters 11 - 13)

UNIT V

The testers' workbench – Process control and optimization – The testing maturity model and test process assessment. (Chapters 14 -16)

Text Book:
1. Ilene Burnstein, *Practical Software Testing*, Springer , 2003, ISBN NO: 81-8128-089-X (Chapters 1-16).

CS342 SOFTWARE TESTING LAB

Credits 0:0:2   **Marks (50+50)**

12 experiments will be notified by the HOD from time to time.

CS343 SYSTEM DEVELOPMENT LAB

Credits 0:0:2   **Marks (50+50)**

12 experiments will be notified by the HOD from time to time.

CS344 ADVANCED DATABASE LAB

Credits 0:0:2   **Marks (50+50)**

12 experiments will be notified by the HOD from time to time.

CS345 OPERATING SYSTEMS AND NETWORKING LAB

Credits 0:0:2   **Marks (50+50)**

12 experiments will be notified by the HOD from time to time.

CS346 CASE TOOLS LAB

Credits 0:0:2   **Marks (50+50)**

12 experiments will be notified by the HOD from time to time.

CS347 ADVANCED TECHNOLOGIES LAB

Credits 0:0:2   **Marks (50+50)**

12 experiments will be notified by the HOD from time to time.

ADDITIONAL SUBJECTS

Code	Subject Name	Credit
CS253	Real Time Systems	4:0:0
CS254	Web Services	4:0:0
CS255	C# Programming	4:0:0
CS256	Database Systems	4:0:0
CS257	Introduction to Database Management Systems	4:0:0
CS258	Database Management systems Lab	0:0:2
CS259	Introduction to Algorithms	4:0:0
CS260	Object oriented Programming – C++ and Java	4:0:0
CS261	Data mining and warehousing	4:0:0
CS262	Machine learning In Bioinformatics	4:0:0
CS263	C++ and Java Lab	0:0:2
CS348	Windows Programming (CS210)*	3:1:0
CS349	Java Programming (CS222)*	3:1:0
CS350	Windows Programming Lab (CS236)*	0:0:2
CS351	Data and Computer Communication (CS223)*	4:0:0
CS352	Advanced Database Technologies	4:0:0
CS353	Advanced Operating Systems	4:0:0
CS354	Cryptography and Network Security	4:0:0
CS355	Distributed Systems	4:0:0

* new codes only

CS253 REAL TIME SYSTEMS

Credits: 4:0:0   **Marks: 40 + 60**

UNIT I
Introduction: Architecture of Real time Systems / Embedded Systems – Operating Systems issues – performances Measures - Estimating Program runtime
(Chapter 1, 2)

UNIT II
Task Assignment and Scheduling: Uniprocessor Scheduling - IRIS Tasks - Task Assignment Mode Charges - Fault Tolerant Scheduling
(Chapter 3)

UNIT III
Programming Languages and Tools: Desired Characteristics based on ADA - Data Typing - Control Structures – Packages - Exception Handling – Overloading – Multitasking - Timing Specification - Task Scheduling - Runtime Support.
(Chapter 4)

UNIT IV
Real Time Databases - Transaction Processing - Concurrency Control - Disk Scheduling

Algorithms - Serialization and Consistency
(Chapter 5)

UNIT V

Fault Tolerance, Reliability and Synchronization: Fault Types - Fault Detection and Containment – Redundancy - Data Diversity - Reversal Checks - Obtaining Parameter values - Reliability models for Hardware Redundancy - Software Error Models
(Chapter 7 & 8)

Text Book

C.M. Krishna, Kang G. Shin, *Real Time Systems*, McGraw-Hill,1997., ISBN 0-07-114243-6
Note: Theorems and proofs are not included.

CS254 WEB SERVICES

Credits: 4: 0: 0   **Marks: 40 + 60**

UNIT I

Introduction-What are Web services? Why Web Services Are Important, Web Services and Enterprises, Moving Forward.XML Fundamentals-XML:The Lingua Franca of Wed Services,XML Documents, XML Namespaces, XML Schema, Processing XML (Chapters 1 and 2)

UNIT II

SOAP and WSDL-The SOAP Model, SOAP, SOAP Messages, SOAP Encoding, SOAP RPC, Using Alternative SOAP Encodings, Document, RPC, Literal, Encoded, SOAP Web Services, and the REST Architecture, looking back to SOAP 1.1, WSDL Structure, Using SOAP and WSDL, UDDI-Universal Description, Discovery, and Integration-UDDI at a glance, The UDDI Business Registry, UDDI Under the Covers, Accessing UDDI, How UDDI Is Playing out. (Chapters 3 and 4)

UNIT III

Conversations-Conversation Overview, web Services Conversation language, WSCL Interface Components, The Bar Scenario conversation, relationship Between WSCL and WSDL, Workflow-Business process Management, Workflows and Workflow management Systems, Business process Execution language for Web Services (BPEL), BPEL 1.1 and OASIS WSBPEL, BPEL and Its Relation to BPML, WSCI, WSFL, Xlang, and others. (Chapters 5 and 6)

UNIT IV

Transactions-ACID Transaction, Distributed Transactions and Two-Phase Commit, Dealing with Heuristic Outcomes, scaling transactions to Web Services, OASIS Business transaction Protocol, other Web Services Transaction Protocols, Security-Everyday Security Basics, Security Is An End-to-End Process, Web Service Security Issues, Types of Security Attacks and Threats, Web Services Security Roadmap, WS-security. (Chapters 7 and 8)

UNIT V

Quality of Service-What Is QoS? Why Is QoS Important for Web Services?, QoS Metrics foe Web Services, Where Are the Holes?, Design Patterns and Best practices, Building QoS into Web Services and Applications, QoS-Enabled Web Services, QoS-Enabled Applications, Mobile and Wireless- Mobile Web Services, Challenges with Mobile, Proxy-Based Mobile Systems, Direct Mobile Web Service Access, J2ME Web Services, Portals and Services Management-Portals, Web Services management.
(Chapters 9, 10 and 11)

Text Book:

Sandeep Chatterjee, James Webber, *Developing Enterprise Web Services*, Pearson Education, 2004. ISBN: 81-297-0491-9 (Chapters 1 – 11).

Reference Book:

Ramesh Nagappan, Robert Skoczylas and Rima Patel Sriganesh, *Developing Java Web Services*, Wiley Publishing Inc., 2004.ISBN: 81-265-0499-4.

CS255 C# PROGRAMMING

Credits: 4: 0: 0   **Marks: 40 + 60**

UNIT I

Essential C#: Visual C#.net – data types – operators – statements. C# programming: loops – creating methods – exception handling – working with strings – working with regular expressions. C# object oriented programming: creating classes - creating objects – using access modifiers – creating fields, methods, properties, constructors – structs – static members – destructors – overloading (Chapter 1 - 3)

UNIT II

Handling inheritance and delegates: working with inheritance – overriding virtual methods – abstract classes – polymorphism – boxing and unboxing – nested classes and interfaces – delegates. Collection and indexers: collections – arrays – array list – queues – stacks – hash tables. (Chapters: 4, 6)

UNIT III

Windows applications: basic windows controls – advanced controls – multi window applications. Web applications: web applications – web programming skills – web server controls – advanced windows control. (Chapters: 7,8)

UNIT IV

ADO.NET and Databases: Connections – Data Adapters – Datasets – Data Application – Working with relational databases – Multiple tables in a single dataset – Data views – Data Binding – Complex Binding – Navigating through datasets using bound controls. (Chapter 9)

UNIT V

Assemblies: Creating an assembly – multiple modules in an assembly – Creating Shared assembles- Security in c#. Multithreading & Remoting: multiple threads – sleeping, aborting, suspending, resuming and joining threads – Synchronizing threads – Remoting – SOAP for remoting (Chapter 13,15)

Text Book:

Steven Holzner, *Microsoft Visual C#.NET 2003*, Pearson Education, First Indian reprint, 2004, ISBN: 81-297-0235-5.

Reference Book:

Andrew Troelson, *"C# and the .Net Platform"*, Intertech Instructor Series, Second Edition, 2005. ISBN: 81-8128-062-8.

CS256 DATABASE SYSTEMS

Credits: 4: 0: 0   **Marks: 40 + 60**

UNIT I

Databases and Database Users: Introduction – An Example – Characteristics of the database approach – Actors on the scene – Workers behind the scene – Advantages of using the DBMS approach. **Database Systems Concepts and Architecture:** Data models, Schemas and instances – Three Schema architecture and data independence – Database languages and interfaces – The Database System Environment – Centralized and Client/Server architecture for DBMSs – Classification of DBMS. **Data modeling using the Entity- Relationship model:** Using high level conceptual data models for database design – Entity types, Entity sets, Attributes and keys – Relationships types, relationship sets, Roles and Structural Constraints – Weak entity sets – Refining the ER design for the COMPANY database. (Chapters : 1,2, 3.1 –3.7)

UNIT II

The Relational Data model and Relational database constraints: Relational model concepts - Relational model constraints and Relational database schemas –Update operations and dealing with constraint violations. **The relational algebra and Relational calculus:** Unary relational operations: SELECT and PROJECT – Relational Algebra operations from set theory – Binary relational operations : JOIN and DIVISION – Additional relational operations – Examples of queries in relational algebra – The tuple Relational calculus – The Domain relational calculus (Chapters: 5,6).

UNIT III

SQL 99: Schema Definition, Basic Constraints and Queries: SQL data definition and data types – Specifying basic constraints in SQL – Schema change statements in SQL – Basic queries in SQL – More Complex SQL queries – Insert, Delete and Update statements in SQL – Additional Features of SQL. **More SQL: Assertions, Views and Programming Techniques:** Specifying general constraints as Assertions – Views in SQL – Database

Programming: Issues and Techniques – Database Stored Procedures (Chapter 8, 9.1 – 9.4,9.6)

UNIT IV
Functional dependencies and Normalization for Relational databases: Informal design guidelines for relation schemas – Functional dependencies – Normal forms based on primary keys – General definitions of Second and Third Normal Forms – Boyce-Codd Normal Forms. **Relational Database Design Algorithms and Further dependencies:** Properties of Relational decompositions- Algorithms for relational database Schema design – Multi valued dependencies and Fourth Normal form – Join dependencies and Fifth Normal form – Inclusion dependencies- Other dependencies and normal forms. (Chapters : 10,11)

UNIT V
Disk Storage, Basic File structures and Hashing: Introduction – Secondary Storage devices – Buffering of Blocks – Placing file records on Disk – Operations on Files – Files of unordered records - Files of ordered records – Hashing Techniques – Other Primary File organizations – Parallelizing disk access using RAID – Storage Area Networks. **Indexing Structures for Files:** Types of single level indexed ordered indexes – Multilevel indexes – Dynamic Multilevel indexes using B-Trees and B^+ Trees – Indexes on multiple keys – Other Types of Indexes (Chapter 13,14).

Text Book:
Ramez Elmasri and Shamkant B. Navathe, *Fundamentals of Database Systems,* Forth Edition, Pearson Education, 2004. ISBN: 81-297-0228-2

Reference Book:
Abraham Silberschatz, Henry.F.Korth, S. Sudharshan, *Database System Concepts*, Fourth Edition, McGraw-Hill, 2002. ISBN:0072283637

CS257 INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

Credit : 4:0:0   **Marks (40+60)**

UNIT I : Introduction
Purpose of Database systems - overall system structure - Entity relationship model: entities and entity sets relationships - mappings constraints - primary keys - E.R diagram.

UNIT II : Relational Model
Structure - Formal Query languages - Relational Algebra - Commercial Query languages – SQL, QUEL.

UNIT III : Relational Database Design

Pitfalls - Normalisation using functional dependencies - Decomposition - Boyce-codd Normal form - third normal form - fourth normal form, normalisation using join dependencies - domain-key normal form.

UNIT IV : Query Processing and Query Optimisation

Query processing - Overview, selection, operation, sorting, join operation, other operation, evaluation of operations
Query optimisation - Estimating statistics of expression, Transformation, materialised views Distributed data base.

UNIT V : Oracle

ORACLE - Database design and querying tool, SQL variation and extension, storage and indexing, concurrency control and recovery, system architecture, replication, distribution and external data

Text book

Abraham Silberschatz, Henry K Korth, Sudarshan S, *Database concepts*, Fourth edition, Mc Graw Hill International publications.

Reference book

Ramesh Elmasri, Shamkant B. Navathe, *Fundamentals of Database systems*, Fourth edition, Addison – Wesley Publications,2004.

CS258 DATABASE MANAGEMENT SYSTEMS LAB

Credit : 0:0:2   **Marks (50+50)**

12 experiments will be notified by the HOD from time to time

CS259 INTRODUCTION TO ALGORITHMS

Credit : 4:0:0   **Marks (40+60)**

UNIT I

Introduction and Divide and Conquer: Algorithm - Complexity analysis - Introduction to random algorithms - General Method - Finding maximum and minimum - Strassens's matrix multiplication - Quick sort - selection sort

UNIT II

Greedy method: General method - Tree vertex splitting - Job sequencing with dead lines - Shortest path - Knapsack

UNIT III

Dynamic Programming: General method - Multistage graphs - String matching algorithm - The Rabin - Karp algorithm - String matching with finite automation - The Knutter - Morris Pratt - algorithm, The Boyer- Moore algorithm

UNIT IV

Back Tracking : General Method - Sum of Subsets - Graph coloring - Depth First search - Breadth first search

UNIT V

Branch and Bound: General Method - 0/1 knapsack Problem - Travelling Salesperson.

Text Book

E.Horowitz, S.Sahni and S.Rajasekaran – *Fundamentals of Computer Algorithms* – Galgotia publications - 1999

Reference books

1. Pevzner PA, *Computational Molecular Biology – An Algorithmic Approach*, PHI 2004
2. G.Brassard and P.Bratley - *Fundamentals of Algorthmics* – Prentice Hall India -1997

CS260 OBJECT ORIENTED PROGRAMMING - C++ AND JAVA

Credit : 4:0:0   **Marks (40+60)**

UNIT I

Object oriented programming - Introduction, Basic concepts, Object oriented Languages, Applications. Object oriented programming system – C++ - Key concepts, classes, features , functions, operators, variables, C++ program, structures

UNIT II

Tokens, expressions, control structures – tokens, keywords, Identifiers and constants, Data types, Functions, classes and objects, Constructors and Destructors
String manipulation – creating string objects, manipulation, relational operation, accessing character in strings

UNIT III

Operator overloading – Defining unary and binary operators
Inheritance – Defining derived class, single inheritance, Multiple inheritance, constructors in derived class
Pointers – to objects, to derived classes, to virtual functions
Working with files – File stream operation, file pointers and their manipulation, File updation

UNIT IV
Java features, Java program structures, constants, variables, & data types, classes &J Objects, Packages, Arrays, string and vectors

UNIT V
Managing errors and exception handling, Java applets programming, Multithreading,
I / O streams, Sample Java program in Bioinformatics

Text book
1. E.Balaguruswamy, *Object oriented programming with C++*, Second edition, Tata Mc Graw Hill publications,2001
2. E.Balaguruswamy, *Programming with Java*, second edition, Tata McGraw Hill publications,2000

Reference Book
Robert Lafore, *OOPS in C++*, Third edition, Galgotia publications

CS261 DATAMINING AND WAREHOUSING
Credit : 4:0:0   **Marks (40+60)**

UNIT I
Data warehouse- Overall Architecture of Data warehouse , Access tools, Data marts. Data warehouse administration & management. Mapping the Data warehouse to a multiprocessor architecture – relational database technology, database architecture for parallel processing

UNIT II
Metadata - Definition, repository, management and trends.
From data warehousing to Data mining

UNIT III
OLAP – need guidelines, categorization, OLAP tools and internet, Patterns and models. Statistics – Data counting and probability, hypothesis testing, contingency tables, Prediction

UNIT IV
Data mining models - Introduction – Decision trees – nearest neighbor and clustering, selecting and using right technique, Data visualization

UNIT V
Applications of Data warehousing and Data Mining in Bioinformatics

Text book
Alex Berson, Stephen J.Smith, *Data warehousing , data mining & OLAP*, , Tata McGraw Hill Publications,2004

Reference book

Sushmita Mitra, Tinku Acharya, *Data mining – Multimedia, Soft computing and Bioinformatics*, John Wiley & Sons,2003.

CS262 MACHINE LEARNING IN BIOINFORMATICS

Credit : 4:0:0   **Marks (40+60)**

UNIT I
Machine-Learning Foundations: The Probabilistic Framework -Introduction: Bayesian modeling
The Cox Jaynes axioms - Bayesian inference & induction -Model structures: graphical models & other tricks - Probabilistic Modeling & Inference: Examples -The simplest sequence models - Statistical mechanics

UNIT II
Machine Learning Algorithms - Introduction -Dynamic programming -Gradient descent - EM/GEM algorithms –Markov chain Monte-Carlo methods - Simulated annealing – Evolutionary & genetic algorithms. Learning algorithms: miscellaneous aspects

UNIT III
Neural Networks: The Theory -Introduction - Universal approximation properties – Priors & likelihoods - Learning algorithms: backpropagation - Neural Networks: Applications - Sequence encoding & output interpretation- Sequence correlations & neural networks – Prediction of protein secondary structure - Prediction of signal peptides & their cleavage sites - Applications for DNA & RNA nucleotide sequences - Prediction performance evaluation - Different performance measures

UNIT IV
Hidden Markov Models: The Theory - Introduction -Prior information & initialization - Likelihood & basic algorithms - Learning algorithms -Applications of HMMs: general aspects -Protein applications - DNA & RNA applications - Advantages & limitations of HMMs

UNIT V
Probabilistic Graphical Models in Bioinformatics - Markov models & DNA symmetries - Markov models & gene finders - Hybrid models & neural network parameterization of graphical models -The single-model case - Bi-directional recurrent neural networks for protein secondary structure prediction

Reference books
1. Pierre Baldi and Søren Brunak, *Bioinformatics: the Machine Learning Approach* – Publisher: MIT Press,1998.
2. David W. Mount, *Bioinformatics: Sequence and Genome Analysis*

Credit : 0:0:2   **Marks (50+50)**

12 experiments will be notified by the HOD from time to time

CS352 ADVANCED DATABASE TECHNOLOGIES

Credits: 4 : 0 : 0   **Marks: 40 + 60**

UNIT I
Overview of Transaction Management: The ACID Properties-Transactions and Schedules-Concurrent Execution of Transaction-Lock-Based Concurrency Control-Performance of Locking-Transaction Support in SQL-Introduction to Crash Recovery **Concurrency Control**: 2PL, Serializability and Recoverability-Introduction to Lock Management-Lock Conversion-Dealing with Deadlock-Specialized Locking Techniques-Concurrency Control without Locking. **Crash Recovery:** Introduction To ARIES –The Log: Other Recovery-Related Structures-The Write-ahead Log Protocol –Check Pointing-Recovering from a System Crash –Media Recovery. (Chapter 16-18).

UNIT II
Physical Database Design and Tuning : Introduction to Physical Database Design – Guidelines for Index Selection-Clustering and Indexing –Tools to Assist Index Selection – Overview of Database Tuning –Choices in Tuning the Conceptual Schema-Choices in Tuning Queries and Views –Impact of Concurrency- Case Study: The Internet Shop. **Security and Authorization:** Introduction to Database Security-Access Control-Discretionary and Mandatory Access Control-Security for Internet Application –Additional Issues Related to Security. (Chapter 20, 21).

UNIT III
Parallel and Distributed Databases: Architecture for Parallel Databases-Parallel Query Evaluation- Parallelizing Individual Operations-Parallel Query Optimization-Types of Distributed Databases –Distributed DBMS Architecture-Storing Data in Distributed DBMS-Distributed Catalog Management-Distributed Query Processing-Updating Distributed Data-Distributed Transaction-Distributed Concurrency Control-Distributed Recovery. (Chapter 22).

UNIT IV
Information retrieval and XML Data: Colliding Worlds: Databases, IR and XML – Introduction to Information retrieval –Indexing for Text Search-Web Search Engines-Managing Text in a DBMS-A Data Model for XML –X Queries: Querying XML Data – Efficient Evaluation of XML Queries. (Chapter 27).

UNIT V
Spatial Data Management: Types of Spatial Data and Queries-Application involving Spatial Data-Introduction to Spatial Indexes-Indexing Based on Space Filling Curves-Grid files –R-Trees –Issues in High Dimensional Indexing. **Further Reading:** Advanced Transaction Processing-Data Integration-Mobile Databases –Main Memory Databases-Multimedia Databases-Geographic Information System-Temporal Databases –Biological Databases –Information Visualization.   (Chapter 28,29).

Text Book:
   Raghu Ramakrishnan & Johannes Gehrke, *Database Management Systems,* third edition TataMcGrawHill, 2003. ISBN : 0-07-115110-9(ISE)

Reference Book:
   Elmasri & Navathae, *Fundamentals of Database Systems*, Third Edition, Pearson Education, 2004, ISBN: 81-297-0228-2w.

CS353 ADVANCED OPERATING SYSTEMS
Credits: 4 : 0 : 0   **Marks: 40 + 60**

UNIT I
Synchronization Mechanisms (upto 2.5.4 only).
Distributed Operating Systems-Architectures of Distributed Systems, Theoretical Foundations(upto 5.5 only), Distributed Mutual Exclusion(upto 6.7 only), Distributed Deadlock detection(upto 7.7.1 only), Agreement Protocols(upto 8.4.3 only).

UNIT II
Distributed Resource Management-Distributed File Systems(upto 9.4.7 only), Distributed Shared memory(upto 10.5.1 only), Distributed Scheduling(upto 11.6.3 only).

UNIT III
Failure Recovery and Fault Tolerance-Recovery(upto 12.9 only), Fault Tolerance(upto 13.7 only).

UNIT IV
Protection and Security-Resource Security and protection(upto 14.4.3 only). Multiprocessor Operating systems-Multiprocessor System Architectures.

UNIT V
Database Operating Systems-Introduction to Database Operating systems, Concurrency Control, Theoretical Aspects, Concurrency Control Algorithms.

Text Book:

Mukesh Singhal, Niranjan G.Shivaratri, *Advanced Concepts in Operating Systems Distributed, Database, and Multiprocessor Operating Systems,* Tata McGraw-Hill, 1994. (Chapters 4-14,16,18-20) ISBN : 0-07-047268-8

Reference Book:

Mary S. Gorman, S. Todd Stubbs, *Introduction to Operating Systems: Advanced Course*, Course Technology, 2001.

CS354 CRYPTOGRAPHY AND NETWORK SECURITY

Credits 4:0:0   **Marks (40+60)**

UNIT I

Services, Mechanisms and Attacks – Block Cipher principles – Data Encryption Standard – Strength of DES – Evaluation criteria for AES – AES Cipher- RC4 Stream Cipher.[Sections: 1.1,3.2,3.3,3.4,5.1,5.2,6.5.]

UNIT II

Principles of Public Key Cryptosystems – RSA Algorithm – Key Management – Diffie Hellman Key Exchange – Basics of Elliptic Curve Cryptography [Sections: 9.1,9.2,10.1,10.2,10.4.]

UNIT III

MD5 Message Digest Algorithm – Secure Hash Algorithm – HMAC – Digital signature Standard – Kerberos Version 5 – X.509 Authentication Service.
[Sections: 12.1,12.2,12.4,13.3,14.1,14.2 .]   .

UNIT IV

Pretty Good Privacy – S/MIME – IP Security Overview – IP Security Architecture – Authentication Header – Encapsulating Security Payload – Combining Security Associations – Key Management.
 [Sections: 15.1,15.2,16.1,16.2,16.3,16.4,16.5,16.6.]

UNIT V

Web Security considerations – Secure Sockets Layer and Transport Layer Security – Secure Electronic Transactions – Intruders – Intrusion Detection – Password Management – Firewall design principles – Trusted systems.
[Sections: 17.1,17.2,17.3,18.1,18.2,18.3,20.1,20.2.]

Text Book:

William Stallings, *Cryptography and Network Security*, Third Edition, Prentice Hall, 2003, ISBN 81-7808-902-5.

Reference Book:

Charlie Kaufman, Radia Perlman**,** Mike Speciner, *Network Security*, Second Edition, Prentice Hall, 2002. ISBN 81-203-2213-4.

CS355 DISTRIBUTED SYSTEMS

Credits: 4: 0: 0   **Marks: (40 + 60)**

UNIT I

Characterization of Distributed Systems: introduction – examples of distributed systems – resource sharing and the web – challenges. System Model: introduction – architectural models – fundamental models. Inter process Communication: introduction – the API for the Internet protocol – external data representation and marshaling – client –server communication – group communication.

UNIT II

Distributed objects and remote invocation: introduction – communication between distributed objects – RPC – events and notifications. Operating system support: introduction – the operating system layer – protection – process and threads – communication and invocation - operating system architecture. Distributed file systems: introduction – file service architecture – sun network file system – the Andrew File system – recent advances.

UNIT III

Name Services: introduction – name services and the DNS – directory and discovery services. Time and Global states: introduction – clock, events and process states – synchronizing physical clocks – logical time and logical clocks – global states – distributed debugging. Co-ordination and Agreement: introduction – distributed mutual exclusion – elections – multicast communication – consensus and related problems.

UNIT IV

Transactions and Concurrency control: introduction – transactions – nested transaction – locks – optimistic concurrency control – timestamp ordering – comparison of methods for concurrency control. Distributed Transactions: introduction – flat and nested distributed transactions – atomic commit protocols – concurrency control in distributed transactions – distributed deadlocks – transaction recovery.

UNIT V

Replication: Introduction – system model and group communication – fault tolerant services – highly available services – transactions with replicate data. Distributed Shared Memory: introduction – design and implementation issues – sequential consistency and Ivy – release consistency and Munin – other consistency models. **Distributed Multimedia Systems:** Introduction – Characteristics of Multimedia data – Quality of service management – Resource management – Stream adaptation.

Text Book:

George Coulouris, Jean Dollimore, Tim Kindberg, *Distributed Systems – Concepts and Design*, Third Edition, Pearson Education, 2001. (Chapters 1,2,4-6, 8-16, Case Studies not included)

Reference Book:

Andrew S. Tanenbaum, Maartenvan Steen**, *Distributed Systems – Principles and Paradigms,*** Pearson Education, 2002.

ADDITIONAL SUBJECTS

CS101	Programming in C	4:0:0
CS264	Programming in C++	4:0:0
CS265	Windows Programming	4:0:0
CS266	Java Programming	4:0:0
CS267	Database Systems	4:0:0
CS268	Operating Systems	4:0:0
CS269	Analysis of Algorithms	4:0:0
CS270	C# Programming	4:0:0
CS356	Real Time Systems	4:0:0
CS357	Design and Analysis of Algorithms	4:0:0
CS358	Cryptography and Network Security	4:0:0
CS359	Parallel Processing	4:0:0

CS101 PROGRAMMING IN C

Credits: 4:0:0 **Marks (40+60)**

Unit I
Introductory Concepts **-** Introduction to Computers– What is a Computer – Block Diagram of Computer – Computer Characteristics – Hardware vs Software – How to Develop a Program – Modes of Operation – Types of Programming Languages – Introduction to C – Desirable Program Characteristics -
Introduction to C Programming **-** The C Character Set – Writing First Program in C - Identifiers and Keywords – A More Useful C Program – Entering the Program into the Computer – Compiling and Executing the Program - Data Types – Constants – Variables and Arrays – Declarations – Expressions – Statements – Symbolic Constants (Chapters 1,2)

Unit II
Operators and Expressions **-** Arithmetic Operators – Unary Operators – Relational and Logical Operators – Assignment Operators – The Conditional Operator – Library Functions – Data Input and Output **–** Preliminaries - Single Character Input & Output – Entering Input Data – More About scanf Function - Writing Output Data – More About printf Function – The Gets and Puts Functions – Interactive Programming – Preparing and Running a Complete C Program **–** Planning a C Program- Writing a C Program – Error Diagnostics – Debugging Techniques (Chapters 3-5)

Unit III
Control Statements – Preliminaries - Branching – Looping – More Looping – Still More Looping - Nested Control Structures – The switch, break, continue, comma statements – The Goto Statement – Functions Defining a Function – Accessing a Function – Function Prototypes – Passing Arguments to a Function – Recursion (Chapters 6,7)

Unit IV
Program Structure - Storage Classes – Automatic Variables – External Variables – Static Variables – Multifile Programs – More About Library Functions Arrays: Defining an Array – Processing an Array – Passing Arrays to Functions – Multidimensional Arrays – Arrays and

Strings- Pointers - Fundamentals – Pointer Declarations – Passing Pointers to Functions – Pointers and One-Dimensional Arrays – Dynamic Memory Allocation - Operations on Pointers – Pointers and Multidimensional Arrays – Arrays of Pointers – Passing Functions to other Functions (Chapters 8-10)

Unit V

Structures & Unions - Defining a Structure – Processing a Structure – User-Defined Data Types – Structures and Pointers – Passing Structures to Functions – Self Referential Structures – Unions. Data Files – Why Files - Opening and Closing a Data File – Reading and Writing a Data File – Processing a Data File – Unformatted Data Files – Concept of Binary Files - Additional Features of C – Enumerations – Command Line Parameters (Chapters 11, 12, 14.1,14.2)

Text Book:

Byron S. Gottfried, *Programming with C*, Second Edition, 1996 (Indian Adapted Edition 2006), Tata McGraw Hill, ISBN 0-07-059369-8.

CS264 PROGRAMMING IN C++

Credits: 4:0:0 **Marks: (40+60)**

Unit I

Objects, classes, inheritance, reusability, creating new data types, polymorphism and overloading. Basic program construction, data types: integer, character, float, double, long double and Boolean. Input output statements: cin, cout, comments, escape sequence, manipulators, type conversion, arithmetic logical and relational operators, and library function. (Chapters 1, 2)

Unit II

For loop, while loop & do loop and if, if…else, switch & other control statements. Structures, Enumeration, Functions: passing arguments to functions, returning values from functions, reference arguments, overloaded functions, inline functions, default arguments, variables and storage class and returning by reference. (Chapters 3-5)

Unit III

 A simple class, c++ objects as physical objects, c++ objects and data types, object as function argument, constructors, as function argument, overloaded constructors, copy constructors, returning objects from functions, structures and classes, static class data, const and classes, Arrays and Strings. (Chapters 6,7)

Unit IV

Overloading unary and binary operator, data conversion, and pitfalls. Inheritance: derived class and base class, derived class constructors, overloading member functions, class hierarchies, public and private inheritance, level of inheritance, multiple inheritance. Pointers: address and pointers, pointers and arrays, pointer and c-type strings, new and delete operator, pointers to pointer. (Chapters 8-10)

Unit V

Virtual functions, friend functions, static functions, this pointer. Streams and files: stream classes, stream errors, disk file I/O with streams, file pointers, error handling in file I/O. Templates and exception: function templates, class templates, exceptions. (Chapters 11, 12, 14)

Text Book:

1. Robert Lafore, *Object Oriented Programming In C++,* Fourth Edition, Tech Media, 2002. ISBN 0-672-32308-7.

Reference Book:

1. Herbert Schildt, *C++: The Complete Reference*, Fourth Edition, Tata McGraw – Hill, 2003 ISBN 0-07-053246-X.

CS265 WINDOWS PROGRAMMING

Credits: 4:0:0   **Marks: (40 + 60)**

Unit I

Windows & Messages: Architectural overview, registering the window class, creating & displaying window, message loop, window procedure, processing the windows, playing a sound file, WM_PAINT, WM_DESTROY messages, queued and non-queued messages, valid and invalid rectangles. GDI: Introduction, scrollbars, structure of GDI, device context drawing dots and lines, drawing filled areas, GDI mapping mode, rectangles, regions and clipping. (Chapters 3, 4, 5)

Unit II

Keyboard: Basics, keystroke messages, character messages, caret. Mouse: Basics, client area mouse messages, capturing the mouse, mouse wheel. Timer: Basics, using the timer. (Chapters 6, 7, 8)

Unit III

Child window controls: button class, controls and colors, static class, scrollbar class, edit class, list box class. Menus and Resources: Icons, cursors, strings, custom resources, menus, keyboard accelerators. (Chapters 9, 10)

Unit IV

Dialog boxes: Modal, modeless and common dialog boxes. Clipboard: Use of clipboard. (Chapters 11, 12)

Unit V

MDI:Concepts, implementation. Multitasking and Multithreading: modes of multitasking, windows multithreading, thread synchronization, event signaling. (Chapters 19, 20, 21)

Text Book:

1. Charles Petzold, *Programming Windows*, 5th Edition, Microsoft press, 1998.

Reference Book:
1. James L.Conger, Windows *API Bible* – Programmer's reference, Galgotia Publications Ltd., 1996.

CS266 JAVA PROGRAMMING

Credits: 4:0:0   **Marks: (40 + 60)**

Unit I
The History and evolution of Java - An Overview of Java - Data Types, Variables and Arrays – Operators - Control Statements (Chapters 1-5)

Unit II
Introducing Classes –A Closer look at Methods and Classes - Inheritance - Packages and Interfaces - Exceptions Handling (Chapters 6-10)

Unit III
Multithreaded Programming –Enumerations, Autoboxing and Metadata- Generics (Chapters 11,12,14)

Unit IV
String Handling - Input/Output: Exploring java.io - Networking - The Applet Class. (Chapters 15,19-21)

Unit V
Event Handling-Introducing the AWT: Working with Windows, Graphics and Text - Using AWT Controls, Layout Managers, and Menus. (Chapters 22-24)

Text Book:
1. Herbert Schildt, *Java - The Complete Reference*, J2SE, Fifth Edition, Tata McGraw-Hill, 2005. ISBN-0-07-059878-9

CS267 DATABASE SYSTEMS

Credits: 4:0:0   **Marks: (40 + 60)**

Unit I
Introduction: Database-System Application, Purpose of Database System, View of Data, Database Language, Relational Database, Database Design, Object-Based and Semi structured Databases, Data Storage and Querying, Transaction Management, Data mining and Analysis, 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. (Chapters 1.1-1.12, 2.1-2.6)

Unit II
SQL: 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. (Chapters 3.1-3.10, 4.1-4.5)

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. Database-System Architecture: Centralized and Client-Server Architecture, Server System Architecture. (Chapters 6.1-6.9, 20.1, 20.2)

Unit IV
Relational Database Design: Features of good Relational Design, Atomic Domains and First Normal Form, Decomposition Using Functional dependencies, Functional- Dependency Theory, Decomposition Using Functional Dependencies, Multivalued Dependencies, More Normal form, Database-Design Process, Modeling Temporal data.
Application Design and Development: Triggers, Authorization in SQL. Storage and File Structure: File organization, Organization of records in files, Data Dictionary Storage.
(Chapters 7.1-7.9, 8.6, 8.7,11.6-11.8)

Unit V
Indexing and Hashing: Basic Concept, Ordered Indices, B+ Tree Index Files, B-Tree Index Files, Multiple-Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing. Transaction: Transaction concepts, Transaction State, Implementation of atomicity and durability, Concurrent executions, Serialization.
(Chapters 12.1-12.8, 15.1-15.5)

Text Book:
1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, *Database System Concepts*, Fifth Edition, Mc Graw-Hill International Edition, 2006. ISBN 007-124476-X.

Reference Book:
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

CS268 OPERATING SYSTEMS

Credits: 4:0:0   **Marks: (40 + 60)**

Unit I
Introduction - What Operating Systems Do – Computer System Organization Computer System Architecture – Operating System Structure – Operating System Operations – Process Management – Memory Management – Storage Management – Protection and Security – Distributed Systems – Special Purpose Systems - Computing Environments – 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.(Chapters 1,2)

Unit II

Process Concept – Process Scheduling – Operation on Processes – Interprocess Communication –Communication in Client Server Systems – Multithreaded Programming – Multithreading models – Thread Libraries - Threading Issues – Process Scheduling - Basic concepts – Scheduling Criteria – Scheduling Algorithms – Multiple Processor Scheduling – Thread Scheduling – Operating System Examples – Algorithm Evaluation. (Chapters 3.1-3.4, 3.6, 4.1-4.4, 5)

Unit III

Synchronization – The Critical Section Problem – Peterson's Solution - Synchronization Hardware – Semaphores – Classic Problems of Synchronization – Monitors - Synchronization Examples – Atomic Transactions – System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlock – Memory management Strategies – Swapping – Contiguous memory Allocation – Paging – Structure of the Page Table – Segmentation. (Chapters 6, 7, 8.1-8.6)

Unit IV

Virtual Memory Management – Demand Paging – Copy-on-Write - Page Replacement – Allocation of Frames – Thrashing – Memory-mapped Files – Allocating Kernel Memory - Other Considerations – Storage Management - File Concepts – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection – Implementing File Systems - File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free Space Management – Efficiency and Performance – Recovery – Log Structured File Systems – NFS. (Chapters 9.1-9.9, 10, 11.1-11.9)

Unit V

Secondary Storage Structure – Overview of Mass Storage Structure – Disk Structure – Disk Attachment - Disk Scheduling – Disk Management – Swap-Space Mnagement – RAID Structure – Stable-Storage Implementation – Tertiary Storage Structure - I/O Systems – I/O Hardware – Application I/O interface – Kernel I/O Subsystem – Transforming I/O Requests to Hardware Operations – Streams – Performance. (Chapters 12,13)

Text Book:
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, *Operating System Principles*, John Wiley & Sons, Seventh Edition, 2006 ISBN 9812-53-176-9.

CS269 ANALYSIS OF ALGORITHMS

Credits: 4:0:0   **Marks: (40 + 60)**

Unit I

Introduction – Notion of algorithm, Fundamentals of algorithmic problem solving, Important problem types

Fundamentals of The Analysis of Algorithm Efficiency – Analysis framework, Asymptotic notations and basic efficiency classes, Mathematical analysis of non-recursive algorithms, Mathematical analysis of recursive algorithms. (Chapters: 1.1 – 1.3, 2.1 – 2.4)

Unit II

Brute Force – Selection sort and bubble sort, Sequential search and brute-force string matching.

Divide-and-Conquer – Merge sort, Quick sort, Binary search, Binary tree traversals and related properties. (Chapters: 3.1, 3.2, 4.1 – 4.4)

Unit III

Decrease-and-Conquer – Insertion sort, Depth-first search and breadth-first search, Topological sorting.

Transform-and-Conquer – Presorting, Balanced search trees, Heaps and heap sort. (Chapters: 5.1 – 5.3, 6.1, 6.3, 6.4)

Unit IV

Space and Time Tradeoffs – Sorting by counting, Input enhancement in string matching, Hashing, B-trees.

Dynamic Programming – Computing a binomial coefficient, Warshall's and Floyd's algorithms. (Chapters: 7.1 – 7.4, 8.1, 8.2)

Unit V

Greedy Technique – Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm, Huffman trees.

Limitations of Algorithm Power – P, NP and NP- complete problems. (Chapters: 9.1 – 9.4, 10.3)

Text Book:

1. Anany Levitin, *Introduction to the Design & Analysis of Algorithms*, Pearson Education, 2003. ISBN: 81-7808-984-X.

CS270 C# PROGRAMMING

Credits 4: 0: 0   **Marks: (40 + 60)**

Unit I

The Philosophy of .NET – C# Language Fundamentals – Object Oriented Programming. (Chapters 1, 3 and 4)

Unit II

Understanding Object Life Time-Understanding Structured Exception Handling-Interfaces and Collections-Callback Interfaces Delegates, and Events-Advanced C# Type Construction Techniques-Introducing .NET Assemblies (up to Configuring Shared Assemblies). (Chapters 5, 6,7,8,9 and 11)

Unit III

Processes, AppDomains, Contexts and CLR Hosts and Building Multithreaded Applications-Understanding Object Serialization-The .NET Remoting Layer (up to Building Your First Distributed Application) (Chapters 13, 14, 17 and 18)

Unit IV

Building a Better Window with System.Windows.Forms- Programming with Windows Forms Controls. (Chapters 19 and 21)

Unit V

Database Access with ADO.NET (Chapter 22)

Text Book:

1. Andrew Troelsen, *Pro C# 2005 and the .NET 2.0 Platform*, Springer Private Limited, 2005. ISBN: 81-8128-376-7

CS356 REAL TIME SYSTEMS

Credits 4: 0: 0   **Marks: (40 + 60)**

Unit I

Typical Real Time Applications: Digital Control – High level controls – Signal Processing – Other Real Time Applications – Hard Versus Soft Real time Systems: Jobs and Processors – Real times, Deadlines and Timing constraints – Hard and Soft timing constraints – Hard Real time systems – Soft Real time systems – A reference model of Real time systems: Processors and resources – Temporal parameters of Real time workload – Periodic task model – Precedence constraints and data dependency – Other types of dependencies – Functional Parameters – Resource Parameters of Jobs and Parameters of resources – Scheduling hierarchy. (Chapters 1, 2, and 3)

Unit II

Commonly used approaches to Real time scheduling: Clock driven approach – Weighted round robin approach – Priority Driven approach – Dynamic versus Static systems – Effective Release times and Deadlines – Optimality of EDF and LST – Challenges in validating timing constraints in Priority driven systems – Offline versus Online scheduling – Clock driven scheduling: Notations and assumptions – Static Timer driven scheduler – General structure of Cyclic schedules – Cyclic executives – Improving average response time of Aperiodic jobs – Scheduling Sporadic jobs – Practical considerations – Algorithm for constructing Static schedules – Pros and Cons of Clock driven scheduling. (Chapters 4 and 5)

Unit III

Priority driven scheduling of Periodic jobs: Static assumptions – Fixed priority versus Dynamic priority algorithms – Maximum schedulable utilization – Optimality of RM and DM algorithms – Schedulability test for Fixed priority tasks with Short response times – Schedulability Test for Fixed priority tasks with arbitrary response times – Sufficient Schedulability conditions for RM and DM algorithms – Practical factors. (Chapter 6)

Unit IV

Scheduling Aperiodic and Sporadic Jobs in Priority Driven Systems: Assumptions and Approaches – Deferrable servers – Sporadic servers – Constant Utilization, Total bandwidth and weighted fair – queuing servers. (Sections: 7.1 – 7.4)

Unit V

Resources and Resource Access Control: Assumptions on resources and their usage – Effects of resource contention and resource access control – Nonpreemptive Critical Sections – Basic Priority Inheritance Protocol – Basic Priority Ceiling Protocol - Stack Based Priority ceiling Protocol – Use of Priority Ceiling Protocol in Dynamic Priority System – Preemption Ceiling Protocol – Controlling Access to Multiple Unit Resources – Controlling Concurrent Access to Data Objects. (Chapter 8)

Text Book:
1. Jane W.S. Liu, *Real-Time Systems*, Pearson Education, 2000, ISBN NO: 81–7758–575-4 (Chapters 1-8)

Reference Book:
1. Phillip A. Laplante, *Real-Time Systems Design and Analysis*, Prentice Hall of India, Second Edition, 2001, ISBN NO: 81-203-1684-3

CS357 DESIGN AND ANALYSIS OF ALGORITHMS
Credits 4: 0: 0   **Marks: (40 + 60)**

Unit I
Introduction – Notion of algorithm, Fundamentals of algorithmic problem solving, Important problem types
Fundamentals of the Analysis of Algorithm Efficiency – Analysis framework, Asymptotic notations and basic efficiency classes, Mathematical analysis of non-recursive algorithms, Mathematical analysis of recursive algorithms, Example. (Chapters: 1.1 -1.3, 2.1 – 2.5)

Unit II
Brute Force – Selection sort and bubble sort, Sequential search and brute-force string matching, Exhaustive search.
Divide-and-Conquer – Merge sort, Quick sort, Binary search, Binary tree traversals and related properties.
Decrease-and-Conquer – Insertion sort, Depth-first search and breadth-first search, Topological sorting, Decrease-by-a-constant-factor algorithms, Variable-size-decrease algorithms. (Chapters: 3.1, 3.2, 3.4, 4.1 – 4.4, 5.1 – 5.3, 5.5, 5.6)

Unit III
Transform-and-Conquer – Presorting, Gaussian elimination, Balanced search trees, Heaps and heapsort, Horner's rule and binary exponentiation, Problem reduction.
Space and Time Tradeoffs – Input enhancement in string matching, Hashing, B-trees. (Chapters: 6.1 – 6.6, 7.2 – 7.4)

Unit IV
Dynamic Programming – Computing a binomial coefficient, Warshall's and Floyd's algorithms, The knapsack problem and memory functions.
Greedy Technique – Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm, Huffman trees. (Chapters: 8.1, 8.2, 8.4, 9.1 – 9.4)

Unit V

Limitations of Algorithm Power – Lower-bound arguments, Decision trees, P,NP and NP-complete problems, Challenges of numerical algorithms.

Coping with the Limitations of Algorithm Power – Backtracking, Branch-and-bound, Approximation algorithms for NP-hard problems. (Chapters: 10.1 – 10.4, 11.1 – 11.3)

Text Book:

1. Anany Levitin, *Introduction to the Design & Analysis of Algorithms*, Pearson Education, 2003. ISBN: 81-7808-984-X.

Reference Book:

1. Sara Baase & Allen Van Gelder, Computer *Algorithms – Introduction to Design & Analysis*, Pearson Education, 2000. ISBN: 81-7808-171-7.

CS358 CRYPTOGRAPHY AND NETWORK SECURITY

Credits 4: 0: 0   **Marks: (40 + 60)**

Unit I

Security trends – OSI Security Architecture – Security Attacks – Security Services – Security mechanisms – A Model for Network Security – Symmetric Cipher Model – Block Cipher Principles – The Data Encryption Standard – The Strength of DES – The AES Cipher. [Sections: Ch 1, 2.1, 3.1 – 3.3, 5.2]

Unit II

Multiple Encryption and Triple DES – Block Cipher Modes of Operation – Stream cipher and RC4 – Principle of Public Key Cryptosystems – The RSA Algorithm – Diffie Hellman Key Exchange – Elliptic curve cryptography. [Sections: 6.1 – 6.3, 9.1, 9.2, 10.2, 10.4]

Unit III

Secure hash Algorithm – Whirlpool – HMAC – CMAC – Digital Signature Standard – Kerberos version 5(Only) – X.509 Authentication Service – Public Key Infrastructure. [Sections: 12.1 – 12.4, 13.3, 14.1(Version 5 only), 14.2, 14.3]

Unit IV

Pretty Good Privacy – S/MIME – IP Security Overview - IP Security Architecture – Authentication Header – Encapsulating Security Payload – Combining Security Associations. [Sections: 15.1, 15.2, 16.1 – 16.5]

Unit V

Web Security Considerations – Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction – Intruders – Intrusion Detection – Password Management – Viruses and related threads – Virus countermeasures – Distributed denial of services attack - Firewall Design principles – Trusted System – Common Criteria for Information Technology Security Evaluation. [Sections: 17.1 – 17.3, 18.1 – 18.3, 19.1 – 19.3, 20.1 – 20.3]

Text Book:
1. William Stallings, *Cryptography and Network Security*, Fourth Edition, Prentice Hall, 2006, ISBN No: 81-203-3018-8

Reference Book:
1. Man Young Rhee, *Internet Security*, Wiley, 2003, ISBN 0-470-85285-2.

CS359 PARALLEL PROCESSING

Credits: 4:0:0   **Marks: (40 + 60)**

Unit I
Parallel Machines and Computations: Evolution of parallel architectures-interconnection networks-application of architectural parallelism - getting started in SIMD and MIMD programming-parallelism in algorithms. Potential for Parallel Computations: Parameters characterizing algorithm parallelism - prefix problem - parallel prefix algorithms. (Chapter 1, 2.1-2.3.2)

Unit II
Vector Algorithms and Architecture: A vector architecture - A SIMD Instruction Set - the prime memory system – use of the PE Index to solve storage layout problems. . MIMD Computers or Multiprocessors: Shared memory and message passing architecture-overview of shared memory multiprocessor programming - shared memory programming alternatives and scope. (Chapter 3.1 –3.5, 4.1-4.3)

Unit III
Distributed Memory Multiprocessors: Distributing data and operations among processor/memory pairs - programming with message passing - characterization of communication - hardware managed communication-distributed cache – conclusion Shared versus distributed memory multiprocessor. Interconnection Networks : network characteristics – permutations – static networks – dynamic networks . (Chapter 5.1 – 5.3.3, 5.5-5.6, 6)

Unit IV
Data dependence and Parallelism: Discovering parallel operations in sequential code - variables with complex names - sample compiler techniques - data flow principles-data flow architectures – systolic arrays. (Chapter 7)

Unit V
Implementing Synchronization and Data Sharing: The character of information conveyed by synchronization - synchronizing different kinds of cooperative computations - waiting mechanisms - mutual exclusion using atomic read and write - Proving a synchronization implementation correct – alternative implementation of synchronization - barrier. (Chapter 8)

Text Book:
1. Harry F. Jordan and Gita Alaghband, *Fundamentals of Parallel Processing*, Pearson Education, 2003.

ADDITIONAL SUBJECTS

Code	Name of Course	Credits
CS271	Introduction to UNIX & LINUX	3:0:0
CS272	Unix & Linux Lab	0:0:1
CS273	Database Management Systems Lab	0:0:1
CS274	C++ and Data Structures	4:0:0
CS360	Graphs Random Processes and Queues	4:0:0
CS361	Communication and Switching Techniques	4:0:0
CS362	Advanced Digital Signal Processing	4:0:0
CS363	Optical Fiber Communication	4:0:0
CS364	Digital Signal Processing lab	0:0:2
CS365	Internetworking lab	0:0:2
CS366	Computer Communication lab	0:0:2
CS367	ASP .NET	4:0:0
CS368	Mainframe Systems	4:0:0
CS369	Data Warehouse	4:0:0
CS370	Advanced Data Mining	4:0:0
CS371	Parallel Computing	4:0:0
CS372	Digital Image Processing	4:0:0
CS373	Web Technology	4:0:0
CS374	Pervasive Computing	4:0:0
CS375	Microwave Engineering	4:0:0

CS271 INTRODUCTION TO UNIX & LINUX

Credits: 3 : 0 : 0

Unit I
UNIX Operating System – History – Commands – essential Unix commands – vi editor – shell programming – The First Step – Taking Decisions – The Loop Control structure. Introduction to Kernel: Architecture of the UNIX operating system - introduction to system concepts. The buffer cache - Buffer headers - structure of the buffer pool - scenarios for retrieval of a buffer - Reading and writing disk blocks -advantages and disadvantages of the buffer cache.

Unit II
The internal representation of Files – INODE - structure of a regular file - directories - conversion of a path name to an INODE - Super block - INODE assignment to a new file. System calls for the file system: Open - read – write – file - record locking - Adjusting the position of the file I/O-lseek – close - File creation - creation of special files - change directory change root - Change owner and change mode - Stat and fstat - pipes - DUP file Systems - link and unlink

Unit III
The structure of processes: process states and transitions - Layout of system memory - The context of a process - saving the context of a process - Manipulation of the process address space

- sleep - Process Control: Process Creation - signals - Process termination - Awaiting process termination – invoking other programs - the user ID of a process - Changing the size of a process. Process Scheduling and time: process scheduling - System calls for time- clock.

Unit IV
Linux Administration – GNOME and KDE – Managing users – The command line – Booting and Shutting down - File systems – Compiling the Linux Kernel

Unit V
Linux Internet services – DNS – Setting up web server using Apache – the secure shell. Intranet services in Linux – NFS and NIS, Printing – Network configuration.

Text Books:
1. Maruice J. Bach, *The Design of the UNIX operating system*, Prentice Hall of India, 1986. (Chapters 2-11)
2. Steven Graham & Steve Shah, *Linux Administration*, Third Edition, Dreamtech, NewDelhi, 2003.

Reference Books:
1. Kenneth Rosen, Douglas Host, James Farber, Richard Rosinki, *Unix-The Complete Reference,* Mc-Graw Hill, 1999.
2. Roderick W Smith, *Linux in a Windows world*, Oreilly, 2005.

CS 272 UNIX & LINUX LAB

Credit: 0:0:1

6 experiments will be notified by the HOD from time to time

CS273 DATABASE MANAGEMENT SYSTEMS LAB

Credit: 0:0:1

6 experiments will be notified by the HOD from time to time

CS274 C++ AND DATA STRUCTURES
Credits 4:0:0

Unit I: Introduction To Data Structures
Linked list, Single linked list, Doubly linked list, Circular Linked list, Stack, Queue, Trees

Unit II: Sorting And Searching Techniques
Sorting, Bubble sort, Insertion Sort, Selection Sort, Quick Sort, Heap Sort, Merge Sort. Searching, Binary Tree Search, Linear Search, Binary Search.

Unit III: Objects And Classes

A Simple class, C++ objects as physical objects, C++ Objects and Data types, Object as function argument, constructors, as function argument, Overloaded Constructors, Copy Constructors, Returning objects from functions, structures and classes, Static class data, const and classes, Arrays and Strings.

Unit IV: Operator Overloading
Overloading Unary and Binary Operator, data conversion, and Pitfalls, Inheritance: derived class and base class, derived class constructors, Overloading member functions, class hierarchies, public and private inheritance, level of inheritance, multiple inheritance. Pointers: address and pointers, pointers and arrays, pointer and c-type strings, new and delete operator, pointers to pointer.

Unit V: Virtual Functions
Virtual functions, Friend functions, Static functions, this pointer. Streams and files: stream classes, stream errors, disk file I/O with streams, file pointers, error handling in file I/O. Templates and exception: function templates, class templates, exceptions.

Text Books
1. Robert Lafore, Object Oriented Programming in C++, Third Edition, Galgotia Publishers, Pune, 1999.
2. Jean-Paul Tremblay and Paul G Sorenson, An Introduction to Data Structures with Applications, McGraw- Hill Publishing Company Limited, New Delhi, 1994.

References
1. Herbert Schmidt, C++, The Complete Reference, McGraw-Hill Publishing Company Limited, New Delhi, 1999.
2. 2. Sartaj Sahni, "Data Structures, Algorithms and Applications in C++", McGraw-Hill Publishing Company Limited, New York, 1998.

CS360 GRAPHS RANDOM PROCESSES AND QUEUES
Credits 4:0:0

Unit I
Trees: Trees-Labeled Trees-Tree Searching-Undirected Trees-Minimal Spanning Trees. Topics in Graph Theory: Graphs-Euler Paths and Circuits-Hamiltonian Paths and Circuits-Transport Networks-Matching Problems-Coloring Graphs. (Chapters 7 and 8 of Text Book 1)

Unit II
Probability Theory: Random Experiment- Definitions of Probability- Conditional Probability-Independent Events-Theorem of Total Probability-Baye's Theorem -Bernoulli's Trials - DeMoivre - Laplace Approximation-Generalisation of Bernoulli's Theorem Multinomial Distribution. Random Variables: Discrete Random Variable-Probability Function-Continuous Random Variable-Probability Density Function (PDF)-Cumulative Distribution Function (CDF) and its Properties –Special Distributions-Discrete Distributions-Continuous Distributions- Two Dimensional Random Variables-Probability Function of (X, Y)-Joint PDF- CDF- Properties-

Marginal Probability Distribution- Conditional Probability Distribution-Independent RVs-Random Vectors-Marginal Probability Distribution of X: $\{i, p_{i*}\}$ and Y: $\{j, p_{j*}\}$ (Chapters 1 and 2 of Text Book 2)

Unit III

Some Special Probability Distribution: Special Discrete Distribution-Mean & Variance for Binomial, Poisson, Geometric, Hyper Geometric, Erlang, Weibull and Exponential Distribution, Recurrence Formula for Binomial and Poisson Distribution -Poisson Distribution as Limiting Form of Binomial Distribution- Binomial Distribution as Limiting Form of Hyper Geometric Distribution-M.G.F. of Negative Binomial Distribution-Special Continuous Distribution-Moments of Uniform Distribution - Memoryless Property of Exponential Distribution-Reproductive Property of gamma Distribution-Relation Between Distribution Function of Erlang Distribution -Density Function of Weibull Distribution- Standard Normal Distribution-Normal Probability Curve-Properties and Importance of Normal Distribution (Chapter 5 of Text Book 2)

Unit IV

Random Processes: Classification -Methods of Description -Special Classes -Average Values -Stationary-Example of a SSS Process- Analytical Representations -Wiener Process Function - Autocorrelation - Properties of $R(\tau)$-Cross correlation - Properties-Ergodicity-Mean Ergodic Process, Mean Ergodic Theorem- Correlation and Distribution of Ergodic Process-Power Spectral Density and its Properties -System in the Form of Convolution-Unit Impulse Response - Properties (Chapter 6 of Text Book 2)

Unit V

Queueing Theory: Symbolic Representation of Queueing Model-Difference Equations Related to Poisson Queue Systems-Values of P_o and P_n for Poisson Queue Systems-Characteristics of Infinite Capacity, Single Server Poisson Queue Model I , Relations Among $E(N_s)$, $E(N_q)$, $E(W_s)$ and $E(W_q)$ -Characteristics of Infinite Capacity, Multiple Server Poisson Queue Model II - Characteristics of Finite Capacity, Single Server Poisson Queue Model III - Characteristics of Finite Queue, Multiple Server Poisson Queue Model IV -Non Markovian Queuing Model V (Chapter 8 of Text Book 2)

Text Books:
1. Bernad Kolman, Robert C, Busby and Sharon Ross, *Discrete Mathematical Structures*, 5th Edition, Pearson Education, 2004. ISBN: 81-297-0465-X
2. T. Veerarajan, *Probability, Statistics and Random Processes*, 2nd Edition, Tata McGraw-Hill, 2006. ISBN: 0-07-060170-4.

CS361 COMMUNICATION AND SWITCHING TECHNIQUES
Credits 4:0:0

Unit I
Introduction: The development of telecommunications-Network structures-Network services-Regulation-Standards-The OSI reference model for open systems interconnection. **Telecommunications Transmission:** Power levels-Four wire circuits-Digital transmission-

Frequency division multiplexing-Time division multiplexing-Transmission performance-Transmission systems

Unit II
Evolution of Switching systems: Message switching-Circuit switching-Manual systems-Functions of a switching system-The Strowger step by step system-Register translator senders-Distribution frames-Crossbar systems-A general trunking –Electronic switching-Reed electronic systems-Digital switching systems. **Telecommunications traffic:** The unit of traffic-Congestion-Traffic measurement-A mathematical model-Lost call systems-Queuing systems-Simulation.

Unit III
Switching Networks: Single stage networks-Gradings-Link systems-Grades of service of link systems-Application of graph theory to link systems-Use of expansion-Call packing-Rearrangeable networks-Strict sense nonblocking networks-Sectionalized switching networks. **Time division switching:** Space and time switching-Time division switching networks-Grades of service of time division switching networks-Non blocking networks-Synchronization.

Unit IV
Control of switching systems: Call processing functions-common control-Reliability, availability and security-Stored program control. **Signalling:** Customer line signaling-Audio frequency junctions and trunk circuits-FDM carrier systems-PCM signaling-Inter register signaling-Common channel signaling principles-CCITT signaling system no. 6-CCITT signaling system no. 7-Digital customer line signaling.

Unit V
Packet switching: Statistical multiplexing-Local area and wide area networks-Large scale networks-Broadband networks. **Networks:** Analog networks-Integrated digital networks-Integrated services digital networks-Cellular radio networks-Intelligent networks-Private networks-Numbering-Charging-Routing-Network Management.

Text Book
J.E.Flood, *Telecommunications Switching, Traffic and Networks,* Pearson Education, 1999, ISBN 81-7808-457-0.

Reference Book
Thiagarajan Viswanathan, *Telecommunication Switching Systems and Networks*, Prentice Hall of India, 1992, ISBN 81-203-0713-5.

CS362 ADVANCED DIGITAL SIGNAL PROCESSING
Credits 4:0:0

Unit I

Discrete-Time Signal Processing - Random Processes – Filtering Random Processes – Spectral Factorization – Special Types of Random Processes – Least Squares Method - Pade' Approximation .(Text book 1 chapters 2.2, 3.3-3.6, 4.1 - 4.3)

Unit II

The Levinson - Durbin Recursion - The Levinson Recursion - The Split Levinson Recursion. (Text book 1 Chapters 5.1-5.4)

Unit III

The FIR Wiener Filter - The IIR Wiener Filter - Discrete Kalman Filter - FIR Adaptive Filters - Adaptive Recursive Filters. (Text book 1 Chapters 7.1-7.4, 9.1-9.3)

Unit IV

Non-Parametric Methods - Minimum Variance Spectrum Estimation - The Maximum Entropy Method - Parametric Methods - Frequency Estimation.(Text Book1 Chapters 8.1-8.6)

Unit V

Decimation by a Factor D - Interpolation by a Factor I - Sampling Rate Conversion by a Rational Factor I/D - Implementation of Sampling Rate Conversion - Multistage Implementation of - Sampling Rate Conversion - Sampling Rate Conversion of Bandpass Signals - Sampling Rate conversion by an Arbitrary Factor - Applications of Sampling Rate Conversion. (Text Book 2 Chapters 11.1-11.9)

Text books:
1. Monson H. Hayes, *Statistical Digital Signal Processing and Modeling*, John Wiley and Sons, 2002. ISBN 9814-12-646-2.
2. J.G. Proakis and D.G. Manolakis, *Digital Signal Processing: Principles, Algorithms, and Applications*, Fourth Edition, Prentice-Hall, 2007. ISBN 0-13-187374-1.

CS363 OPTICAL FIBER COMMUNICATION

Credits 4:0:0

Unit I
Overview of Optical Fiber Communication: Basic Network Information Rates – The Evolution of Fiber Optic Systems – Elements of an Optical Fiber Transmission Link – Simulation and Modeling Tools. **Optical Fibers: Structures, Wave guiding, and Fabrication**: The Nature of Light – Basic Optical laws and definitions – Optical fiber modes and configurations –Mode theory for circular waveguides – single –mode fibers – Graded-Index fiber structure.[1.1 -1.4, 2.1-2.6]

Unit II
Signal Degeneration in Optical Fibers- Attenuation – Signal distortion in optical waveguides – Pulse broadening in graded-index waveguides-Mode coupling. **Optical Sources** –Light – Emitting Diodes (LEDs)-Laser Diodes [3.1-3.4, 4.2-4.3]

Unit III

Photodetectors: Physical principles of photodiodes-Photodetector Noise-Detector response time-Avalanche multiple noise. **Optical Receiver Operation:** Fundamental receiver operation – Digital receiver performance –Preamplifier Types – Analog receivers.[6.1-6.4, 7.1, 7.2, 7.4, 7.5]

Unit IV

Digital Transmission Systems: Point-to-Point links – Line coding- Noise Effects on System Performance **WDM Concepts and Components:** Operational principles of WDM-Passive Components – Tunable sources – Tunable Filters. [8.1, 8.4, 10.1-10.4,]

Unit V

Optical Amplifiers: Basic Applications and Types of Optical Amplifiers – Semiconductor Optical Amplifiers – Erbium-Doped Fiber Amplifiers **Optical Networks:** Basic Networks – SONET/SDH- Broadcast-and-Select WDM Networks- Wavelength-Routed Networks-Optical CDMA.[11.1-11.3, 12.1-12.4, 12.8]

Text Book:

G. Keiser, *Optical Fiber Communications*, 3rd Edition, McGraw Hill, 2000, ISBN 0-07-116468-5.

Reference Book:

G.P. Agarwal, *Fiber Optic Communication Systems*, Second Edition, John Wiley & Sons, New York, 1997, ISBN: 0-471-21571-6.

CS364 DIGITAL SIGNAL PROCESSING LAB

Credit: 0:0:2

12 Experiments will be notified by the HOD from time to time

CS365 INTERNETWORKING LAB

Credit: 0:0:2

12 Experiments will be notified by the HOD from time to time

CS366 COMPUTER COMMUNICATION LAB

Credit: 0:0:2

12 Experiments will be notified by the HOD from time to time

CS367 ASP.NET

Credits 4:0:0

Unit I
Hello ASP.Net2.0 – Applications and Page Frameworks. (Chapter 1, 3)

Unit II
ASP.NET Server Controls and Client- Side Scripts - ASP.NET Web Server controls - ASP.NET 2.0 Web Server controls. (Chapters 4, 5, 6)

Unit III
Validation Server Controls - Working with Master Pages. (Chapters 7, 8)

Unit IV
Themes and Skins – Collections and Lists. (Chapters 9, 10)

Unit V
Data Binding in ASP.NET 2.0: Data Source Controls, Using Bound List Controls with Data Source Controls - Working with XML: The Basics of XML, XmlReader and XmlWriter. (Chapters 11, 13)

Text Book:
Bill Evjen, Scott Hanselman, Farhan Muhammad, Srinivasa Sivakumar, Devin Rader, *Professional ASP.NET 2.0*, Wiley Dreamtech India(P) Ltd., First Edition, 2006, ISBN: 81–265–0669–5 .

Reference Book:
Chris Ullman, John Kauffman, Chris Hart, *Beginning ASP.NET 2.0*, Wiley Dreamtech, 2006, ISBN 81-265-0672-5.

CS368 MAINFRAME SYSTEMS
Credits :4:0:0

Unit - I
(Z/VM Basics)
Introduction to Mainframe hardware systems - Introduction to virtualization & z/vm - History of z/vm - z/vm basic concepts. (Chapters 1,2,3,4 of Text Book 1)

Unit II
(Z/VM Basics)
 System administration tasks - Performance - z/vm security (Chapters 9,10, 11of Text Book 1)

Unit III
(NETWORKING)
Introduction to Mainframe networking - Hardware connectivity- Sample configuration
(Chapters 1, 3, 4 of Text Book 2)

Unit IV
(SECURITY)
System z architecture & security - System z virtualization & its challenges - z/OS
system integrity (Chapters 5,6,9 of Text Book 3)

Unit V
(SECURITY)
z/OS System Authorization Facility & security managers - Security in z/OS UNIX

(Chapters 10, 11 of Text Book 3)

Text Books:
1. Lydia Parziale,Edi Lopes Alves,Eli M. Dow,Klaus Egeler,Jason J. Herne, *Introduction to the New Mainframe*: *Z/VM Basics*, IBM RedBooks, November, 2007 .
2. Mike Ebbers, Christopher Hastings, Matt Nuttall, Micky Reichenberg, *Introduction to the New Mainframe: Networking,* IBM RedBooks, August 2006.
3. Rica Weller, Ross Clements,Ken Dugdale, Per Fremstad, *Introduction to the New Mainframe: Security*, IBM RedBooks, March 2007.

CS369 DATA WAREHOUSE

Credits :4:0:0

Unit I
Evolution of Decision Support Systems - The Data Warehouse Environment – The Data Warehouse and Design. (Chapters 1, 2, 3)

Unit II
Granularity in the Data Warehouse - The Data Warehouse and Technology – The Distributed Data Warehouse. (Chapters 4, 5, 6)

Unit III
Executive Information Systems and The Data Warehouse – External Data and The Data Warehouse – Migration to the architectural Environment. (Chapters 7, 8, 9)

Unit IV
The Data Warehouse and the Web – Unstructured Data and The Data Warehouse – The Really Large Data Warehouse. (Chapters 10, 11, 12)

Unit V
The Relational and the Multidimensional Models as a Basis for Database and design – Advanced Topics in the Data Warehouse. (Chapters 13, 14)

Text Book:
William H.Inmon, *Building the datawarehouse*, Wiley Dreamtech (P) Ltd, Fourth Edition, 2005, ISBN:81-265-0645-8. (Chapters 1 – 14).

Reference Book:
Sam Anahory, Dennis Murray, *Data Warehousing in the Real World*, Pearson Education (P) Ltd., First Edition 1997, Fifteenth Indian Reprint 2005, ISBN: 81-7808-387-6.

CS370 ADVANCED DATA MINING

Credits: 4:0:0

Unit I

Data mining and machine learning - Simple examples - Fielded applications - machine learning and statistics - Generalization as search - Data mining and ethics. Input: Concepts, instances, and attributes. Output: Knowledge representation. (Chapters 1, 2, 3)

Unit II

Algorithms: Inferring rudimentary rules - Statistical modeling - Divide-and-conquer - Covering algorithm - Mining association rules - Linear model - Instance-based learning - clustering. (Chapter 4)

Unit III

Credibility: Training and testing - predicting performance, - cross-validation - other estimates - comparing data mining methods - predicting probabilities - counting cost - evaluating numeric prediction - The minimum description length principle - Applying the MDL principle to clustering. (Chapter 5)

Unit IV

Implementations: Real machine learning schemes: Decision trees - Classification rules – Clustering - Bayesian networks. Extension and applications. (Chapter 6.1, 6.2, 6.6, 6.7, 8).

Unit V

The Weka Machine Learning Workbench: Introduction to Weka – The Explorer – The Knowledge Flow Interface (Chapters 9, 10, 11)

Text Book:

Ian H. Witten, Eibe Frank, *Data Mining Practical Machine Learning Tools and Techniques*, Elsevier, Second Edition, 2005, ISBN 81 – 312 – 0050 – 7.

Reference Book:

Jiawei Han, Micheline Kamber, *Data Mining Concepts and Techniques*, Chris Ullman, Morgan Kaufmann Publishers, 2001, ISBN 81 – 8147 – 049 – 4.

CS371 PARALLEL COMPUTING

Credits: 4:0:0

Unit I

Introduction to Parallel Computing: Motivating Parallelism -Scope of Parallel Computing. Parallel Programming Platforms: Implicit Parallelism: Trends in Microprocessor Architectures - Limitations of Memory System Performance- Dichotomy of Parallel Computing Platforms - Physical Organization of Parallel Platforms -Communication Costs in Parallel Machines - Routing Mechanisms for Interconnection Networks. (Chapters 1.1,1.2,2.1 - 2.6)

Unit II

Principles of Parallel Algorithm Design - Preliminaries - Decomposition Techniques - Characteristics of Tasks and Interactions - Mapping Techniques for Load Balancing - Methods for Containing Interaction Overheads - Parallel Algorithm Models-Basic Communication Operations :One-to-All Broadcast and All-to-One Reduction -All-to-All Broadcast and

Reduction - Linear Array and Ring- All-Reduce and Prefix-Sum Operations - Scatter and Gather - All-to-All Personalized Communication-Circular Shift - Improving the Speed of Some Communication Operations (Chapters 3,4)

Unit III

Programming Using the Message-Passing: Principles of Message-Passing Programming - The Building Blocks: Send and Receive Operations - MPI: the Message Passing Interface - Topologies and Embedding - Overlapping Communication with Computation. Collective Communication and Computation Operations - Groups and Communicators (Chapter 6)

Unit IV

Programming Shared Address Space: Thread Basics -Why Threads? The POSIX Thread API - Thread Basics: Creation and Termination - Synchronization Primitives in Pthreads - Controlling Thread and Synchronization Attributes - Thread Cancellation - Composite Synchronization Constructs - Tips for Designing Asynchronous Programs OpenMP: a Standard for Directive Based Parallel Programming. (Chapter 7)

Unit V

Sorting: Issues in Sorting on Parallel Computers - Sorting Networks - Bubble Sort and its Variants - Quicksort - Bucket and Sample Sort - Other Sorting Algorithms
Graph Algorithms: Definitions and Representation - Minimum Spanning Tree: Prim's Algorithm - Single-Source Shortest Paths: Dijkstra's Algorithm – All-Pairs Shortest Paths- Transitive Closure- Connected Components - Algorithms for Sparse Graphs.(Chapter 9,10)

Text Book

Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, *Introduction to Parallel Computing*, Second Edition, Pearson Education, 2003.ISBN 81-297-0407-2

CS372 DIGITAL IMAGE PROCESSING

Credits: 4:0:0

Unit I

Introduction- Fundamental Steps in Digital Image Processing -Components of an Image Processing System - A Simple Image Formation Model-Image Sampling and Quantization-Basic Relationships between Pixels-Image Enhancement in the spatial domain. (Chapters1.1, 1.4, 1.5, 2.3.4, 2.4, 2.5, 3)

Unit II

Image enhancement in the Frequency Domain: Introduction to the fourier transform and Frequency Domain –Smoothing Frequency Domain Filters - Sharpening Frequency Domain Filters-Homomorphic filtering (Chapters 4.1, 4.2, 4.3, 4.4, 4.5)

Unit III

Image Restoration – Introduction to Wavelets and Multiresolution Processing - Image compression: Fundamentals - Image compression models-Error free compression-Lossy compression. (Chapters 5, 7.1, 8.1, 8.2, 8.3, 8.4, 8.5)

Unit IV

Image Segmentation: Detection of discontinuities-Edge Linking and Boundary Detection - Thresholding -Region-Based Segmentation -The Use of Motion in Segmentation (Chapters 10.1, 10.2, 10.3, 10.4, 10.6)

Unit V

Representation and Description: Representation - Boundary Descriptors - Regional Descriptors. (Chapter 11.1, 11.2, 11.3)

Text Book:

Rafael .C.Gonzalez and Richard.E.Woods, *Digital Image Processing*, Second Edition, Addison Wesley, 2002. ISBN 81-7758-168-6.

Reference Book:

William K.Pratt, *Digital Image Processing*, Third Edition, John Wiley, 2002. ISBN 9-814-12620-9.

CS373 WEB TECHNOLOGY

Credits: 4:0:0

Unit I

VBScript Language Elements: Constants - Variables and Data Types - Mathematical Operations - Logical Operators - Looping and Decision Structures. VBScript Functions and Objects: Data Conversion Functions - Mathematical Functions - Data Formatting Functions - Text Manipulation Functions - Date and Time Functions - Built-in Objects. (Chapters: 2 and 3 of Textbook 1)

Unit II

ASP fundamentals: Using Server – Side Includes- Learning the SSI Directives – Creating Modular ASP Code. Using the Request Object: Using Form Information - Using Query String Information – Using Server Variables. Using the Response Object: Create Output – Managing Output – Managing the Connection. (Chapters: 4, 5 and 6 of Textbook 1)

Unit III

Using Cookies: Introduction to Cookies – Cookies and Your Browser – Creating a Cookie – Modifying and removing Cookies – Tracking Preferences with Cookies.Using the Application, Session, and Server Objects: The application Object - The Session Object – The Server Object – Using the global .asa file. Active Data Objects Essentials: Microsoft's Universal Data Access Strategy – The Connection Object – The Record set and Field Objects – The Command and Parameter Objects – Using the Errors Collection. (Chapters: 7, 8 and 10 of Textbook1)

Unit IV

Know your JavaScript: What Is JavaScript's Place in Ajax?- A Brief History of JavaScript-Getting Started with JavaScript-Creating JavaScript Functions-Storing Your Data in Variables-Operating on Your Data with Operators-Making Decisions with the If Statement-Executing different Code in Different Browsers-Working with Loops-Connecting JavaScript to HTML

Buttons. Creating Ajax Applications: Writing Ajax-Interacting with Server-Side Code-Passing Data to Server- Side Scripts-Using Ajax with XML. Serious Ajax Programming: Working with Multiple Concurrent XMLHttpRequest Requests-Handling JavaScript Sent from the Server- Connecting to Google Suggest-Calling Another Domain in Ajax-A Login Example-Working with Ajax and Head Requests-Eliminate Caching. (Chapters: 2, 3 and 4 of Textbook2)

Unit V
XML and Ajax: Creating XML-Handling XML with JavaScript-Retrieving Data from an XML Document-Handling White Space in the Mozilla, Netscape, and Firefox Web Browsers-Handling White Space in a Cross-Browser Way-Accessing XML Data Directly-Accessing XML Attributes Values-Validating Your XML. Cascading Style Sheets and Ajax: Ajax-Enabled Menus-Getting Text Noticed in Ajax Applications-Scrolling Text- Styling Text Using CSS- Styling Colors and Backgrounds Using CSS-Styling Locations in Web Pages. Dynamic HTML and Ajax. Creating Mouseovers-Using Dynamic Styles-Using document.write- Using Dynamic HTML Methods to Update Part of a Page -Using Dynamic HTML Properties to Update Part of a Page-Using Text Ranges to Update Part of a Page-Using createElement to Create New Elements on the Fly-Creating Dynamic Tables-Catching the User's Attention with Animation. (Chapters: 9, 10 and 11 of Textbook 2)

Text Books:
1. Eric A. Smith, *ASP 3 Programming Bible*, Wiley-Dreamtech, 2002. ISBN 81-265-0049-2
2. Steve Holzner, *Ajax Bible*, Wiley India Pvt. Ltd, 2007. ISBN 81-265-1217-2

CS374 PERVASIVE COMPUTING
Credits: 4:0:0

Unit I
What Pervasive Computing is all About: Times are Changing-Decentralization continues-Applied Pervasive computing-Pervasive computing principles-Pervasive Information Technology. Devices: Information Access Devices-Handheld Computers-Sub-Notebooks-Phones. Smart Identification**:** Smart Cards-Smart Labels. Embedded Controls: Smart sensors and Actuators-Smart Appliances-Appliances and Home Networking-Automotive Computing. (Chapters: 1 - 4)

Unit II
Entertainment Systems**:** Television Systems-Game Consoles. Operating Systems**:** Windows CE-Palm OS-Symbian EPOC-Java Card-Windows for Smart Cards. Middleware Components**:** Programming Consumer Devices-Smart Card Programming-Messaging Components-Database Components. (Chapters: 5, 7, 8)

Unit III
WAP**:** The WAP Architecture-Wireless Application Environment. Connectivity**:** Wireless Wide Area Networks-Short Range Wireless Communication-Home Networks. Service Discovery: Universal Plug and Play-Jini-Salutation. (Chapters: 11 - 13)

Unit IV

Gateways: Connectivity Gateway-Wireless Gateway-Transcoding-Residential Gateway.
Web Application Servers: Architecture and Components-WebSphere Application Server-WebSphere Everyplace Suite-Oracle Portal-to-Go. Device Management**:** Tasks of Device Mangement Systems-Tivoli Device Support Infrastructure-User Profiles and Directory Services. Synchronization: What Synchronization is all About-The Challenge of Synchronizing Data-Industry Data Synchronization Standards-Today's Synchronization Solution. (Chapters: 14 - 17)

Unit V

Portals and Access Services: Internet Portals-Wireless Portal-Broadcasting Portal. Home Services: The System View-Communication Services-Home Automation-Energy Services-Security Services-Remote Home Healthcare Services. Travel and Business Services: Travel Services-Business Services**.** Consumer Services: Interactive Advertisement-Loyalty-Shopping-Payment Services. (Chapters: 18 - 21)

Text Book:

Uwe Hansmann, Lothar Merk, Martin S. Nicklous, Thomas Stober, *Pervasive Computing Handbook,* Springer, 2001, ISBN 3-540-6712

CS375 MICROWAVE ENGINEERING

Credits 4:0:0

Unit I
Introduction to Microwave-Basic Transmission Line theory: Transmission Line Equations-Characteristic and Input Impedances – Reflection and Transmission Coefficients – Standing Wave – Mismatch Losses in Transmission Lines - Smith Chart – High Frequency Lines; **Propagation of Electromagnetic Waves:** Wave Impedance and Propagation – Electromagnetic Wave - Equation, Energy and Power Flow – Poynting Theorem – Equivalent Circuit Parameters of Propagation Lines – Boundary Conditions – Polarization of Waves – Plane Waves in Unbounded medium – Lossy Dielectric – Lossless Dielectric – Good Conductor – Plane Waves at the Interface of two Media – Propagation of Microwaves in Ferrite – Faraday Rotation in Ferrites. (Chapters 1 – 3)

Unit II
Microwave Transmission Lines: Ideal Coaxial Line – Planar Transmission Lines – Wave Guides Types: Rectangular, Circular, Ridge, Surface – Power Handling Capability of Microwave Transmission Lines; **Impedance Transformations for Matching:** General Condition- Narrow Band and Broad Band Matching – Tapered Transmission Lines. (Chapters 4 and 5)

Unit III
Microwave Network Theory and Passive Devices: Symmetrical Z and Y Matrices for Reciprocal Network – Scattering or S Matrix Representation of Multiport Network – Microwave Passive Devices. (Chapter 6)

Unit IV

Microwave Resonators: Coaxial Resonators – Waveguide Cavity Resonators – Cavity Excitation and Tuning – Q-Factor of Microwave Cavities – Loaded and External Q – Coupled Cavities – Re-Entrant Cavity – Hole and Slot Cavity – Microstrip Resonators. (Chapter 7)

Unit V
Microwave Filter: Filter Parameters – Mismatch Effects – Microwave Realization of the Filter Elements – Filter Design – Microwave filters: Low-pass, High-pass, Band-pass and Band-stop filters; **Applications of Microwaves:** Microwave Radar Systems – Microwave Communication Systems – Industrial Application of Microwaves. (Chapter 8 and 11)

Text Book:
Annapurna Das and Sisir K Das, *Microwave Engineering*, Tata McGraw Hill Publishing Company Ltd, 2000, ISBN 0-07-463577-8.

Reference Books:
1. David M. Pozar, *Microwave Engineering*, Third Edition, John Wiley, 2005, ISBN 0-471-17096-8.
2. Robert E. Collin, *Foundations for Microwave Engineering,* Second Edition, McGraw Hill International Edition, 1992, ISBN 0-07-112569-8.

SCHOOL OF

COMPUTER SCIENCE AND TECHNOLOGY

ADDITIONAL SUBJECTS

Code	Subject Name	Credit
09CS201	Database Systems	3:0:0
09CS202	Object Oriented Analysis and Design Credits:	3:0:0
09CS203	Programming in C++	3:0:0
09CS204	Programming in Java	3:0:0
09CS205	Software Engineering	3:0:0
09CS206	Unix Architecture	3:0:0
09CS207	Analysis of Algorithms	3:0:0
09CS208	Data Structures Credits:	3:0:0
09CS209	System Software	3:0:0
09CS210	Programming in J2ee	3:0:0
09CS211	Programming in J2me	3: 0:0
09CS212	Operating System	3:0:0
09CS213	Intelligent Systems	3:0:0
09CS214	Principles of Compiler Design	3:0:0
09CS215	Fundamentals of Computer Algorithms	3:0:0
09CS216	Visual Programming	3:0:0
09CS217	Programming in C Lab	0:0:2
09CS218	Programming in C++ Lab	0: 0:2
09CS219	Unix and Linux Lab	0: 0:2
09CS220	System Software and Compiler Lab	0: 0:2
09CS221	Database Systems Lab	0: 0:2
09CS222	Java Programming Lab	0: 0:2
09CS223	Programming in J2ee Lab	0: 0:2
09CS224	c# and . net programming lab	0: 0:2
09CS225	Datastructures in C++ Lab	0: 0:2
09CS226	Visual Programming Lab	0: 0:2
09CS227	Programming in J2me Lab	0: 0:2
09CS301	Theory of Computation	4: 0:0
09CS302	Software Agents	4: 0:0
09CS303	Software Architecture	4: 0:0
09CS304	Object Oriented Software Engineering	4: 0:0
09CS305	Requirements Engineering	4: 0:0
09CS306	Security in Computing	4: 0:0
09CS307	Real Time System Software	4: 0:0
09CS308	Digital Speech and Image Processing	4: 0:0
09CS309	Mainframe Systems	4: 0:0
09CS310	Data Warehousing And Mining	4: 0:0
09CS311	Advanced Java	4: 0:0
09CS312	Evolutionary Computing	4: 0:0
09CS313	Quantum Computing	4: 0:0
09CS314	Software Testing	4: 0:0
09CS315	Software Metrics and Quality Management	4: 0: 0

09CS316	Advanced Computer Architecture	4 : 0 : 0
09CS317	Modern Digital Communication Techniques	4: 0: 0
09CS318	Advanced Database Lab	0: 0: 2
09CS319	Operating Systems and Networking Lab	0: 0: 2
09CS320	Software Engineering Lab	0: 0: 2
09CS321	Software Testing Lab	0: 0: 2
09CS322	System Development Lab	0: 0: 2
09CS323	Object Oriented Case Tools Lab	0: 0: 2
09CS324	Web Technology Lab	0: 0: 2

09CS201 DATABASE SYSTEMS

Credits: 3: 0: 0

Course Objective:
1. To develop an enterprise data model that reflects the organization's fundamental business rules.
2. To be able to create databases and pose complex SQL queries of relational databases.
3. To develop and refine the conceptual data model, including all entities, relationships, attributes, and business rules.
4. To integrate and merge database views into conceptual model.
5. To apply normalization techniques.
6. To identify data integrity and security requirements.
7. To derive a physical design from the logical design taking into account application, hardware, operating system, and data communications networks requirements.

UNIT I
Introduction: Database-System Application – Purpose of Database System – View of Data, Database Language – Relational Database – Database Design – Object-Based and Semi structured Databases – Data Storage and Querying – Transaction Management – Data mining and Analysis – 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
SQL: 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. Application Design and Development: Triggers – Authorization in 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. Database-System Architecture: Centralized and Client-Server Architecture – Server System Architecture.

UNIT IV

Relational Database Design: Features of good Relational Design – Atomic Domains and First Normal Form – Decomposition Using Functional dependencies – Functional Dependency Theory – Decomposition Using Functional Dependencies – Multivalued Dependencies – More Normal form – Database-Design Process – Modeling Temporal data.

UNIT V

Storage and File Structure: File organization – Organization of records in files – Data Dictionary Storage. Indexing and Hashing: Basic Concept – Ordered Indices – B+ Tree Index Files – B-Tree Index Files – Multiple-Key Access – Static Hashing – Dynamic Hashing – Comparison of Ordered Indexing and Hashing. Transaction: Transaction concepts – Transaction State – Implementation of atomicity and durability – Concurrent executions – Serialization.

Text Book:
1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, *Database System Concepts*, Fifth Edition, Mc Graw-Hill International, 2006. ISBN 007-124476-X.

Reference Book:
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.

09CS202 OBJECT ORIENTED ANALYSIS AND DESIGN
Credits: 3: 0: 0

Course Objective:
1. To Design an Application Using Object Management groups UML for Modeling, Describing, Analyzing and Designing an application
2. To develop a proven successful system by applying the best practices and works done by Booch, Rumbaugh, and Jacobson.

UNIT I

Object Basics – Object oriented philosophy – objects, classes, and attributes – object behavior and methods – encapsulation and information hiding – class hierarchy – polymorphism – object relationships and associations – aggregations and object containment – case study – object identity – persistence. Object oriented systems development life cycle: Software development process – building high quality software – use- case driven approach – reusability.

UNIT II

Rumbaugh et al.'s object modeling technique – Booch methodology – Jacobson et al. methodologies, patterns, frameworks, the unified approach – Unified modeling language: Static and dynamic models – UML diagrams – UML class diagrams – use-case diagrams – UML dynamic modeling, packages– UML extensibility and UML metamodel.

UNIT III
Business object analysis – use-case driven object oriented analysis – business process modeling – use-case model – developing effective documentation - case study. Classification: Classification theory – noun phrase approach – common class patterns approach – use-case driven approach, classes, responsibilities, and collaborators– naming classes.

UNIT IV
Association – super-subclass relationships – a-part of relationships - case study, class responsibility – defining attributes for vianet bank objects – object responsibility – defining methods for vianet bank objects –Design process and design axioms: Corollaries, design patterns.

UNIT V
UML object constraint languages – designing classes – class visibility – refining attributes for the vianet bank objects – designing methods and protocols – designing methods for the vianet bank objects – packages and managing classes – Designing Access Layer Classes – Case Study: Designing – The Access Layer for the vianet Bank ATM – Designing View Layer Classes – Macro Level Process – Micro Level Process.

Text Book:
1. Ali Bahrami, *Object Oriented Systems Development using the Unified Modeling* L*anguage*, McGraw Hill, 1999. ISBN: 0-256-25348-X

Reference Books:
1. Simon Benett, *Objec*t *Oriented Analysis and Design Using UML*, Second Edition, McGraw-Hill, 2002. ISBN: 0-07-709864-1.
2. Atul Kahate, *Object Oriented Analysis And Design,* First Edition, McGraw-Hill, 2004. ISBN:0070583765
3. Joseph Schmuller, *UML*, Third Edition, Pearson Education, 2004. ISBN: 81-297-0609-1.

09CS203 PROGRAMMING IN C++

Credits: 3: 0: 0

Course Objective:
This course provides in-depth coverage of object-oriented programming principles and techniques using C++.

Prerequisite: C programming Knowledge

UNIT I
Objects – classes – inheritance – reusability – creating new data types – polymorphism and overloading. Basic program construction – data types: integer, character, float, double, long, double and Boolean. Input output statements: cin – cout – comments – escape sequence – manipulators – type conversion – arithmetic logical and relational operators – and library function.

UNIT II

For loop – while loop & do loop and if- if…else, switch & other control statements – Structures – Enumeration – Functions: passing arguments to functions – returning values from functions – reference arguments – overloaded functions – inline functions – default arguments – variables and storage class and returning by reference.

UNIT III

A simple class – c++ objects as physical objects – c++ objects and data types – object as function argument – constructors – as function argument – overloaded constructors – copy constructors – returning objects from functions – structures and classes – static class data – const and classes – Arrays and Strings.

UNIT IV

Overloading unary and binary operators – data conversion – and pitfalls. Inheritance: derived class and base class – derived class constructors – overloading member functions – class hierarchies – public and private inheritance – level of inheritance – multiple inheritance. Pointers: address and pointers – pointers and arrays – pointer and c-type strings – new and delete operator – pointers to pointer.

UNIT V

Virtual functions – friend functions – static functions – this pointer. Streams and files: stream classes – stream errors – disk file I/O with streams – file pointers – error handling in file I/O. Templates and exception: function templates – class templates – exceptions.

Text Book:
1. Robert Lafore, *Object Oriented Programming in C++*, Fourth Edition, Tech Media, 2002. ISBN 0-672-32308-7.

Reference Book:
1. Herbert Schildt, *C++: The Complete Reference*, Fourth Edition, Tata McGraw-Hill, 2003. ISBN 0-07-053246-X.

09CS204 PROGRAMMING IN JAVA

Credits: 3: 0: 0

Course Objective:
1. To learn the Java programming language fundamentals: its syntax, idioms, patterns, and styles.
2. To learn object oriented programming concepts.
3. To learn the essentials of the Java class library.

UNIT I

The History and evolution of Java – An Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements.

UNIT II
Introducing Classes – A Closer look at Methods and Classes – Inheritance – Packages and Interfaces – Exceptions Handling.

UNIT III
Multithreaded Programming – Enumerations – Autoboxing and Metadata – Generics.

UNIT IV
String Handling – Input/Output: Exploring java.io – Networking – The Applet Class.

UNIT V
Event Handling-Introducing the AWT: Working with Windows – Graphics and Text – Using AWT Controls – Layout Managers – Menus.

Text Book:
1. Herbert Schildt, *Java - The Complete Reference*, Tata McGraw- Hill, Seventh Edition, 2008. ISBN 13: 978-0-07-063677-4

Reference Books:
1. Kathy Sierra, Bert Bates, *Head First Java*, Second Edition, O'Reilly Media, 2005. ISBN:10-0596004656, ISBN-13:9780596004651.
2. Harvey M. Dietel, *Java How to Program*, Seventh Edition, Prentice Hall, 2007. ISBN:10-0132222205, ISBN:13-978-0132222204
3. Bruce Eckel, *Thinking in Java,* Fourth Edition, Prentice Hall, 2006. ISBN: 978-0131872486.
4. Ivor Horton, *Beginning Java 2 JDK*, Fifth Edition, Wiley, 2004. ISBN: 978-0-7645-6874-9.
5. Ken Arnold, James Gosling, David Holmes, *The Java Programming Language,* Fourth Edition, Prentice Hall Professional Technical Reference. ISBN-13:9780321349804
6. E. Balagurusamy, *Programming with Java: A primer,* Third Edition, Tata McGraw-Hill, 2007.

09CS205 SOFTWARE ENGINEERING

Credits: 3: 0: 0

Course Objective:
To learn
1. Different life cycle models.
2. Requirement dictation process.
3. Analysis modeling and specification.
4. Architectural and detailed design methods.
5. Implementation and testing strategies.
6. Verification and validation techniques.
7. Project planning and management.
8. Use of CASE tools

UNIT I
Introduction: A Generic View of Process – Process Models-The Waterfall Model-Incremental Model-Evolutionary Model-Specialized Model-The Unified Process–Agile Process – Agile Models – Software Cost Estimation – Planning – Risk Analysis – Software Project Scheduling.

UNIT II
Requirement Analysis: System Engineering Hierarchy – System Modeling – Requirements Engineering: Tasks- Initiating The Process-Eliciting Requirements-Developing Use Cases-Negotiating Requirements-Validating Requirements – Building the Analysis Models: Concepts.

UNIT III
Software Design : Design Concepts – Design Models – Pattern Based Design – Architectural Design – Component Level Design – Component – Class Based And Conventional Components Design – User Interface – Analysis And Design.

UNIT IV
Software Testing : Software Testing – Strategies: Conventional - Object Oriented – Validation Testing – Criteria – Alpha – Beta Testing- System Testing – Recovery – Security – Stress – Performance - Testing Tactics – Testing Fundamentals-Black Box – While Box – Basis Path-Control Structure.

UNIT V
SCM And Quality Assurance : Software Configuration And Management-Features-SCM Process-Software Quality Concepts – Quality Assurance – Software Review–Technical Reviews – Formal Approach To Software Quality Assurance – Reliability – Quality Standards – Software Quality Assurance Plan

Text Book:
1. Roger Pressman.S., *Software Engineering: A Practitioner's Approach*, Sixth Edition, McGraw- Hill, 2005. ISBN: 007-124083-7.

Reference Books:
1. Sommerville, *Software Engineering*, Eighth Edition: Addison Wesley, 2007. ISBN: 032-131379-8.
2. Carl Dichter, Mark Pease, *Software Engineering with Perl,* Prentice Hall, 2007. ISBN: 013-016965-X.
3. James F Peters, Witold Pedryez, *Software Engineering-An Engineering Approach,* John Witold Pedrycz, 2004. ISBN: 997-1513099.
4. P. Fleeger, *Software Engineering*, Third Edition, Prentice Hall, 1999. ISBN: 013-146913-4.
5. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli, *Fundamentals Of Software Engineering*, Prentice Hall Of India 1991. ISBN: 013-820432-2.

09CS206 UNIX ARCHITECTURE

Credits: 3: 0: 0
Course Objective:

1. This course describes the algorithms, memory architecture, process management, system calls, interrupts and exceptions, and system startup.
2. To learn the internal working of Unix Kernel its Data Structures and System calls.

Pre Requisites: Operating System and Data Structure

UNIT I
UNIX Operating System – History – Commands – essential Unix commands – vi editor –shell programming – The First Step – Taking Decisions – The Loop Control structure. Introduction to Kernel: Architecture of the UNIX operating system – introduction to system concepts. The buffer cache – Buffer headers – structure of the buffer pool – scenarios for retrieval of a buffer – Reading and writing disk blocks – advantages and disadvantages of the buffer cache.

UNIT II
The internal representation of Files – INODE - structure of a regular file – directories – conversion of a path name to an INODE – Super block – INODE assignment to a new file. System calls for the file system: Open – read – write – file - record locking – Adjusting the position of the file I/O-lseek - close – File creation – creation of special files – change directory change root – Change owner and change mode – Stat and fstat – pipes – DUP file Systems – link and unlink

UNIT III
The structure of processes: process states and transitions – Layout of system memory – The context of a process – saving the context of a process – Manipulation of the process address pace - sleep – Process Control: Process Creation - signals – Process termination – Awaiting process termination – invoking other programs – the user ID of a process – Changing the size of a process – Process Scheduling and time: process scheduling – System calls for time- clock.

UNIT IV
Memory Management policies: Swapping – Demand Paging – The I/O subsystem: driver interfaces – Disk drivers. Terminal driver's stream.

UNIT V
Inter process Communication: Process Tracing – System V IPC – Network Communications – Sockets.

Text Book:
1. Maruice J. Bach, *The design of the UNIX operating system***,** Prentice Hall of India, i990. ISBN 0-13-201799-7.

Reference Books:
1. Kay A. Robbins, Steve Robbins, UNIX Systems Programming, Pearson Education, 2004. ISBN: 0-13-042411-0
2. Kenneth Rosen, Douglas Host, James Farber, Richard Rosinki, UNIX-The Complete Reference, McGraw- Hill, 1999. ISBN: 007211892X, 9780072118926.
3. Prabhat K. Andleigh, UNIX System Architecture, Prentice Hall, 1990. ISBN: 0139498435, 9780139498435.

4. Ed Dunphy, The UNIX Industry: Evolution, Concepts, Architecture, Applications and Standards, QED Technical Pub, 2007. ISBN: 089435390X, 9780894353901.
5. Andleigh, UNIX System Architecture, Prentice Hall, 1991. ISBN: 0139233016, 9780139233012.

09CS207 ANALYSIS OF ALGORITHMS

Credits: 3: 0: 0

Course Objective:
1. To provide an introduction to asymptotic algorithm analysis.
2. To develop algorithms for sorting, searching, insertion and matching.
3. To introduce the concept of computational intractability and NP completeness.

UNIT I
Introduction – Notion of algorithm – Fundamentals of algorithmic problem solving – important problem types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis framework – Asymptotic notations and basic efficiency classes – Mathematical analysis of non-recursive algorithms – Mathematical analysis of recursive algorithms.

UNIT II
Brute Force – Selection sort and bubble sort – Sequential search and brute –force string matching. Divide-and-Conquer – Merge sort – Quick sort – Binary search – Binary tree traversals and related properties.

UNIT III
Decrease-and-Conquer – Insertion sort, Depth-first search and breadth-first search – Topological sorting. Transform-and-Conquer – Presorting, Balanced search trees – Heaps and heap sort.

UNIT IV
Space and Time Tradeoffs – Sorting by counting – Input enhancement in string matching, Hashing – B-trees. Dynamic Programming – Computing a binomial coefficient – Warshall's and Floyd's algorithms.

UNIT V
Greedy Technique – Prim's algorithm – Kruskal's algorithm – Dijkstra's algorithm – Huffman trees – Iterative Improvement: The simplex method – The maximum matching in Bipartite Graph – Limitations of Algorithm Power – P, NP and NP- complete problems.

Text Book:
Anany Levitin, *Introduction to the Design & Analysis of Algorithms*, Pearson Education, 2007. ISBN-10: 0321358287.

Reference Books:
1. S. K. Basu, *Design Methods and Analysis of Algorithms*, Prentice-Hall India, 2005. ISBN: 81-203-2637-7.
2. Jeffrey Mcconnell, *Analysis of Algorithm,* Jones and Battlet, 2008. ISBN-10: 0-7637-0782-1.
3. Jon Bentley, *Programming Pearls*, Second Edition, Pearson Education, 2000.

4. Cormen, Leiserson, Rivest, Stein, *Introduction to Algorithms*, Second Edition, Prentice Hall, 2001.
5. A.V. Aho, J. E. Hopcroft and J. D. Ullman, *The Design and Analysis of Computer Algorithms*, Pearson Education Asia, 2003.
6. Sara Baase and Allen Van Gelder, *Computer Algorithms - Introduction to Design and Analysis*, Pearson Education Asia, 2003.

09CS208 DATA STRUCTURES

Credits: 3: 0: 0

Course Objective:
To introduce the fundamentals of Data Structures, abstract concepts and to expose the students to problem solving.

UNIT I
Introduction to data structures – Stack - definition and examples – specification and implementation, Polish notation – Idea, Infix to Postfix conversion – Postfix expression evaluation – Recursion – Divide and Conquer – Towers of Hanoi problem.

UNIT II
Queues – definition, implementation – circular queue – priority queue – simulation, Lists – contiguous implementation – singly linked lists – doubly linked lists – circular lists – linked stacks – linked queues.

UNIT III
Tables and Information Retrieval – Rectangular arrays – Tables of various shapes – Searching – Linear and Binary search methods – Sorting - Bubble sort – Selection sort – Shell sort – Insertion sort – Quick sort – Heap sort – Merge sort – Radix sort – Hashing.

UNIT IV
Trees – Binary trees - definition, traversals, linked implementation – Binary Search Trees– Height Balanced Trees – Comparison trees – Multiway Trees – External searching – B-trees.

UNIT V
Graphs – mathematical background, representation – Graph traversals (DFS & BFS) – Shortest path algorithm – Minimum spanning trees.

Text book:
1. R. Kruse, C. L. Tondo, B. P. Leung, *Data Structures and Program Design*, Third Edition, Pearson Education, 1999. ISBN 81-203-0884-0.

Reference books:
1. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, *Data Structures Using C & C++*, Second Edition, PHI/Pearson Education, 1996. ISBN 978-81-203-1177-0.
2. Mark Allen Wiss, *Data Structures and Algorithm Analysis in C++*, Third Edition, Addison Wesley, 2006. ISBN: 032144146X.

3. Alfred V. Aho, J. D. Ullman, J. E. Hopcroft, *Data structures and algorithms*, Second Edition, Pearson Education, 1999. ISBN: 81-7758-826-5.
4. Bhagat Singh, Thomas L. Naps, *Introduction to Data Structures*, Tata McGraw-Hill, 1986.

09CS209 SYSTEM SOFTWARE

Credits: 3:0:0

Course Objective:
To view some of the major tasks of the system software of a computer system, focusing on internal working of the hardware and software interface of a typical system.

UNIT I
Background: Introduction – System Software and Machine Architecture – The Simplified Instructional Computer (SIC) – Traditional (CISC) Machines – RISC Machines.

UNIT II
Assemblers: Basic assembler functions: A simple SIC assembler – Assembler algorithms and data structures – Machine dependent assembler features: Instruction formats and addressing modes – Program relocation – Machine independent assembler features: Literals – Symbol-defining statements – Expressions – Program Blocks – Control Sections and Program Linking – One Pass Assembler and Multipass Assemblers – Implementation examples: 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 examples: 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 Processor Design Options – Recursive Macro Expansion – Algorithm – General Purpose Macro Processors – Macro Processing within Language Translators – Implementation examples: MASM Macro Processor – ANSI C Macro language.

UNIT V
Other System Software: Database Management System: Basic concepts of a DBMS Level – Levels of a data description – Use of a DBMS. Text editors: Overview of Editing Process – User Interface – Editor Structure. Interactive Debugging systems: Debugging functions and capabilities – Relationships with Other parts of the system – User Interface Criteria.

Text Book:
1. L. Beck, System *Software, An Introduction to System Programming,* Addison Wesley, 1999. ISBN: 81-7808-036-2.

Reference Books:
1. D. M. Dhamdhere, *Systems Programming and Operating Systems,* Tata McGraw-Hill Company, 1999. ISBN: 0-07-463579-4.
2. John J. Donovan, *Systems Programming*, Tata McGraw Hill-Edition, 1972.
3. D. M. Dhamdhere, *Operating Systems: A Concept-based Approach*, Second Edition, Tata McGraw-Hill, 2006. ISBN 0070611947.

<div align="center">

09CS210 PROGRAMMING IN J2EE

</div>

Credits: 3:0:0

Course Objective:
To develop the enterprise applications with cross platform capabilities.

Prerequisites: Java Programming

UNIT I
J2EE and J2SE - The Birth of J2EE - Databases - The Maturing of Java - Java Beans and Java Message Service - Why J2EE? J2EE Multi-Tier Architecture - J2EE Best Practices - J2EE Design Patterns and Frameworks.

UNIT II
JDBC Objects - Java servlets - Java Server Pages.

UNIT III
Enterprise JavaBeans: The New Enterprise JavaBean – Introduction to Session Beans – Java Persistence: Entity Beans – Introduction to Message-Driven Beans.

UNIT IV
Java Remote Method Invocation – Java Mail API - Java Interface Definition Language and CORBA - Java Message Service – Security - Java Naming and Directory Interface API.

UNIT V
Web Services - SOAP - Universal Description, Discovery, and Integration (UDDI) - Electronic Business XML - The Java API for XML Registries (JAXR) - Web Services Description Language (WSDL).

Text Books:
1. James Keogh, *J2EE - The Complete Reference*, McGraw-Hill, 2002. ISBN-10: 007222472X ISBN-13: 978-0072224726
2. Rima Patel, Gerald Brose, Micah Silverman, *Mastering Enterprise JavaBeans 3.0,* Wiley-India Edition, 2008. ISBN-10: 0471785415, ISBN-13: 978-0471785415.

Reference Books:

1. Bryan Basham, Kathy Sierra, Bert Bates, *Head First Servlets and JSP,* O'Reilly Media, 2008. ISBN: 0596516681, ISBN-13: 9780596516680.
2. Esmond Pitt, Kathleen McNiff, *java.rmi: The Remote Method Invocation Guide*, Addison-Wesley Professional, 2001. ISBN-10: 0201700433, ISBN-13: 978-0201700435.
3. Kathy Sierra, Bert Bates, *Head First EJB,* O'Reilly Media, 2005. ISBN-10: 0596005717, ISBN-13: 978-0596005719.

09CS211 PROGRAMMING IN J2ME

Credits: 3: 0 : 0

Course Objective:
To understand the J2ME architecture and to learn how to build applications and services for cell phones and PDAs with J2ME.

Prerequisite: Basic Java programming.

UNIT I
J2ME Basics: J2ME Overview – Small Computing Technology – J2ME Architecture and Development Environment.

UNIT II
J2ME User Interface: Command, Items and Event Processing – High Level Display: Screens – Low Level Display: Canvas.

UNIT III
J2ME Data Management: Record Management System – J2ME Database Concepts- J2ME Personal Information Manger Profile.

UNIT IV
J2ME JDBC Concepts: JDBC Objects – JDBC and Embedded SQL.

UNIT V
J2ME Networking and Web Services: Generic Connection Framework – Web Services.

Text Book:
1. James Koegh, *J2ME – The Complete Reference*, Tata McGraw-Hill, 2003. ISBN: 0-07-053415-2.

Reference Books:
1. Vartan Piroumian, ***Wireless J2ME Platform Programming*, The Sun Microsystems Press, JAVA SERIES.** ISBN-10: 0130449148.
2. Sing Li, Jonathan Knudsen, *Beginning J2ME from Novice to Professional*, Third Edition Springer (India) Private Limited publications, 2005. ISBN 81-8128-292-2.
3. Kim Topley, *J2ME – In a Nutshell,* O'Reilly publications, 2002. ISBN: 81-7366-343-2.
4. John W. Muchow, *Core J2ME Technology*, First Edition, Prentice Hall PTR. ISBN-10: 0130669113.

09CS212 OPERATING SYSTEM

Credits: 3: 0: 0

Course Objective:
To gain knowledge about the Operating Systems concepts such as process, main memory management, secondary memory management, CPU and disk scheduling etc.

UNIT I
Introduction - What Operating Systems Do - Computer System Organization Computer System Architecture - Operating System Structure - Operating System Operations - Process Management - Memory Management – Storage Management – Protection and Security – Distributed Systems – Special Purpose Systems - Computing Environments – 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
Process Concept – Process Scheduling – Operation on Processes – Interprocess Communication– Multithreaded Programming –Multithreading models – Thread Libraries - Threading Issues – Process Scheduling – Basic concepts – Scheduling Criteria – Scheduling Algorithms – Multiple Processor Scheduling – Thread Scheduling.

UNIT III
Synchronization – The Critical Section Problem – Peterson's Solution – Synchronization Hardware – Semaphores – Classic Problems of Synchronization – Monitors - Atomic Transactions – System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlock – Memory management Strategies – Swapping – Contiguous memory Allocation – Paging – Structure of the Page Table – Segmentation.

UNIT IV
Virtual Memory Management – Demand Paging – Copy-on-Write - Page Replacement – Allocation of Frames – Thrashing – Memory-mapped Files – Allocating Kernel Memory - Other Considerations – Storage Management - File Concepts – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection – Implementing File Systems -File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free Space Management – Efficiency and Performance – Recovery.

UNIT V
Secondary Storage Structure – Overview of Mass Storage Structure – Disk Structure – Disk Attachment - Disk Scheduling – Disk Management – Swap-Space Management – RAID Structure – Stable-Storage Implementation – Tertiary Storage Structure - I/O Systems – I/O Hardware – Application I/O interface – Kernel I/O Subsystem – Transforming I/O Requests to Hardware Operations .

Text Book:
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, *Operating System Principles*, Seventh Edition, John Wiley & Sons, 2006. ISBN: 9812-53-176-9.

Reference Books:
1. D. M. Dhamdhere, *Operating Systems*, Second Edition, Tata McGraw-Hill Education (India), 2006. ISBN: 0070611947.
2. Achyut S. Godbole *Operating Systems With Case Studies in Unix Netware Windows NT*, Tata McGraw-Hill, 2005. ISBN: 007059113X, 9780070591134.
3. Andrew S. Tanenbaum, *Modern Operating System*s, Third Edition, Prentice Hall, 2008. ISBN 0136006639, 9780136006633
4. Pramod Chandra P. Bhatt, *An Introduction to Operating Systems: Concepts and practice,* PHI Learning Pvt. Ltd., 2003. ISBN: 8120323068, 9788120323063.
5. Paul J. Deitel, David R. Choffnes, *Operating Systems*, Third Edition, Prentice Hall, 2003. ISBN: 0131828274, 9780131828278.
6. Colin Ritchie *Operating Systems Incorporating UNIX and Windows: Incorporating Unix and Windows*, Fourth Edition, Cengage Learning EMEA, 2003. ISBN: 0826464165, 9780826464163.

09CS213 INTELLIGENT SYSTEMS

Credits: 3: 0: 0

Course Objective:
1. To introduce the basic concepts of artificial intelligence.
2. To introduce new approaches to solve a wide variety of research-oriented problem.

Prerequisite: Basic concepts of computer science such as algorithms and data structure.

UNIT I
What is Artificial Intelligence? – Problems, Problem Spaces, and Search – Heuristic Search Techniques.

UNIT II
Knowledge Representation Issues – Using Predicate Logic.

UNIT III
Representing Knowledge Using Rules – Symbolic Reasoning under Uncertainty – Statistical Reasoning.

UNIT IV
Weak Slot-and–Filler Structures – Strong Slot-and-Filler Structures – Knowledge representation Summary – planning.

UNIT V

Learning : What is learning – Rote learning – Learning by taking advice – Learning in problem-solving – Learning from Examples: Induction – Explanation-based Learning – Discovery – Analogy – Formal learning theory – Neural net learning and genetic learning. Expert Systems.

Text Books:
1. 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

Reference Books:
1. Stuart Russell, Peter Norvig, *Artificial Intelligence a modern Approach*, Second Edition, Pearson Education, 2003. ISBN: 81-297-0041-7.
2. Nils J. Nilsson, *Artificial Intelligence: A New Synthesis*, Harcourt Asia PTE Ltd., 2000. ISBN: 981 4033 464.
3. Dan W. Patterson, *Introduction to Artificial Intelligence and Expert Systems*, Prentice-Hall India, 2001. ISBN: 81-203-0777-1.

09CS214 PRINCIPLES OF COMPILER DESIGN

Credits: 3: 0: 0

Course Objective:
1. To introduce the major concept areas of language translation and compiler design
2. To develop an awareness of the function and complexity of modern compilers.
3. To provide practical, hands on experience in compiler design.

UNIT I
Introduction to Compilers: Translators-Compilation and Interpretation – The phases of Compiler-Errors encountered in different phases-The grouping of phases – cousins of the compiler-Compiler construction tools – A simple one-pass compiler– Context Free Grammars-Derivation – Reduction and Ambiguity.

UNIT II
Lexical Analysis: Need and role of lexical analyzer – Lexical errors-Expressing tokens by Regular Expression – Converting regular expression to DFA – Minimization of DFA – Language for specifying lexical analyzers – LEX-Design of lexical analyzer for a sample language.

UNIT III
Syntax Analysis: Need and role of the parser – Context Free Grammars – Top Down parsing – General strategies – Recursive Descent Parser – Predictive Parser – LL(1) Parser – Shift Reduce Parser – LR Parser – LR (0) item – Construction of SLR Parsing table – Introduction to LALR Parser – Error handling and recovery in syntax analyzer – YACC – Design of a syntax analyzer for a sample language.

UNIT IV
Syntax Directed Translation and Type Checking: Definitions – Construction of syntax trees – Bottom-up evaluation of S-attributed and L-attributed definitions – Top down translation – Bottom up evaluation – Forms of intermediate code – Translation of Assignment, Boolean

Expression and Control statements – Backpatching type systems – Specification of a simple type checker – equivalence of type expressions – Type conversions.

UNIT V

Code Optimization and Code Generation: Principal sources of Optimization – DAG – Optimization of basic blocks – Global data flow analysis – Efficient data flow algorithms – Source language issues – Storage organization – Symbol tables – Dynamic storage allocation – Issues in design of a code generator – A simple code generator algorithm.

Text Books:
1. Alfred V Aho, Ravi Sethi and Jeffrey D Ullman, *Compilers – Principles, Techniques and Tools*, First Edition, Pearson Education, Nineteenth Indian Reprint, 2005. ISBN: 81-7808-046-X.

Reference Books:
1. Dick Grone, Henri E Bal, Ceriel J H Jacobs and Koen G Langendoen, *Modern Compiler Design*, John Wiley and Sons, USA, 2000. *ISBN*-10: 0-471-97697-0.
2. Allen I. Hollub, *Compiler Design in C*, PHI, 1990. ISBN: 978-0131550452.

09CS215 FUNDAMENTALS OF COMPUTER ALGORITHMS

Credits: 3: 0: 0

Course Objective:
1. To be Familiar with fundamental algorithms and algorithmic techniques.
2. To analyze the running time of a given algorithm.

UNIT 1
Introduction – Notion of Algorithm - Fundamentals of algorithmic problem solving –Important problem types – Fundamentals of the analysis of algorithm efficiency – analysis frame work – Asymptotic notations – Mathematical analysis for recursive and non-recursive algorithms.

UNIT II
Brute Force and Divide and Conquer Method: Selection Sort and Bubble Sort – Sequential Search and Brute – Force String Matching-Closest-Exhaustive Search – Merge sort – Quick sort – Binary search – Binary tree traversal.

UNIT III
Decrease-and-Conquer and Transform-And-Conquer Insertion Sort – Depth-First Search and Breadth – First Search – Topological Sorting – Decrease by a Constant Factor Algorithm – Variable Size – Decrease Algorithms – Presorting – Gaussian Elimination – Balanced Search Trees – Heaps and Heapsort.

UNIT IV

Dynamic Programming and Greedy Technique: Computing a binomial coefficient – Warshall's and Floyd' algorithm – Optimal binary search tree – Knapsack problem and Memory functions-Prim's Algorithm – Kruskal's Algorithm – Dijkstra's Algorithm – Huffman Algorithm

UNIT V

Backtracking and Branch and Bound: Backtracking – N-Queens problem – Hamiltonian circuit problem – Subset sum problem – Branch and bound – Assignment problem – Knapsack problem – Traveling salesman problem – P,NP and NP complete Problems – Approximation Algorithm for NP-hard Problems.

Text book:

1. Anany Levitin, *Introduction to the Design and Analysis of Algorithms*, Pearson Education 2005. ISBN: 81-7808-984-X.

Reference books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, *Introduction to Algorithms* Prentice Hall, 2001. **ISBN**: 10: 0262032937.
2. Sara Baase and Allen Van Gelder, *Computer Algorithms – Introduction to Design and Analysis*, Pearson Education, 2003. ISBN: 81-7808-171-7.
3. Horowitz Ellis, Sahni Sartaj, Rajasekaran Sanguthevar, *Fundamentals of Computer Algorithms,* 2008. ISBN: 8173716129.

09CS216 VISUAL PROGRAMMING

Credits: 3: 0: 0

Course Objective:

1. To introduce the concepts of visual programming.
2. To introduce GUI programming using Microsoft foundation classes.
3. To enable the students to develop programs and simple application using Visual C++.

UNIT I

Programming with Visual C++ 2008: The .NET Framework – The Common Language Runtime (CLR) – Writing C++ Applications – Learning Windows Programming - What Is the Integrated Development Environment? – Using the IDE. Windows Programming Concepts: Windows Programming Basics – The Structure of a Windows Program – Windows Program Organization – The Microsoft Foundation Classes – Using Windows Forms

UNIT II

Windows Programming with the Microsoft Foundation Classes: The Document/View Concept in MFC – Creating MFC Applications. Working with Menus and Toolbars: Communicating with Windows – Extending the Sketcher Program – Elements of a Menu – Adding Handlers for Menu Messages – Adding Toolbar Buttons – Menu and Toolbars in a C++/CLI Program. Drawing in a Window: Basics of Drawing in a Window – The Drawing Mechanism in Visual C++ – Drawing Graphics in Practice – Programming the Mouse – Exercising Sketcher – Drawing with the CLR.

UNIT III

Creating the Document and Improving the View: The MFC Collection Classes – Using the CList Template Class – Creating the Sketch Document – Improving the View – Deleting and Moving Shapes – Implementing a Context Menu – Dealing with Masked Elements – Extending CLRSketcher. Working with Dialogs and Controls: Understanding Dialogs – Understanding Controls – Creating a Dialog Resource – Programming for a Dialog – Supporting the Dialog Controls – Completing Dialog Operations – Using a Spin Button Control – Using the Scale Factor –Working with Status Bars – Using a List Box – Using an Edit Box Control – Dialogs and Controls in CLR Sketcher.

UNIT IV

Storing and Printing Documents: Understanding Serialization – Serializing a Document – Applying Serialization – Exercising Serialization – Moving Text – Printing a Document – Implementing Multipage Printing – Serialization and Printing in CLR Sketcher. Writing Your Own DLLs: Understanding DLLs – Deciding What to put in a DLL – Writing DLLs.

UNIT V

Connecting to Data Sources: Database Basics – A Little SQL – Database Support in MFC – Creating a Database Application – Sorting a Recordset – Using a Second Recordset Object – Viewing Customer Details. Updating Data Sources: Update Operations – A Simple Update Example – Managing the Update Process – Adding Rows to a Table.

Text Book:
1. Ivor Horton, *Beginning Visual C++ 2008*, Wiley Dreamtech India Pvt. 2008. ISBN:978-0-470-22590-5

Reference Books:
1. Steve Holzner, *Professional Visual C++ 6 Programming*, Wiley Dreamtech India Pvt. 1998
2. David J. Kruglinski, George Shepherd and Scot Wingo, *Programming Microsoft Visual C++*, Fifth Edition, Microsoft Press 1998.
3. Yashavant Kanetkar, *Visual C++ Programming*, BPB publications 1998.

09CS217 PROGRAMMING IN C LAB

Credit: 0: 0: 2

1. Write a Program to find the Palindrome.
2. Write a Program using switch statement with the multiple cases (Fibonacci Series, Factorial for the Given Number, Armstrong Number or Not, Prime or Not)
3. Sorting of Numbers Using Arrays
4. Printing 10 Numbers both in Ascending and Descending.
5. Pyramid
6. Customer Account Locator.
7. Counting Number of Characters, Number and Special Characters In Given String.
8. Student Record Using Structure.
9. Print Multiplication Table In Reverse Order Using For, While Do While.
10. Matrix Addition, Multiplication Using Functions.
11. Data Files

12. Data Files.

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS218 PROGRAMMING IN C++ LAB

Credit: 0: 0: 2

1. Student Record Using Structure.
2. Class Example
3. Constructor Example
4. Static, Const Examples
5. Function Overloading
6. Inheritance Example
7. Operator Overloading.
8. Multiple Inheritances.
9. 9.Pinters
10. Virtual Functions
11. File Pointers
12. Exceptions

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS219 UNIX AND LINUX LAB

Credit: 0: 0: 2

1. Study Experiment- UNIX basics
2. Basic Shell Programming (Fibonacci Series generation, Factorial of a given number, Checking for Armstrong number)
3. Designing a Arithmetic calculator
4. Generation of Multiplication table
5. Base Conversion (Decimal to Binary, Binary to Decimal)
6. Checking for a Palindrome of a number
7. Finding the information about the Login name and File name
8. Students Evaluation
9. Process Creation (Basics, Arithmetic operations on processes, Displaying process ID, Creation of grandchild processes)
10. System calls (Usage of link(), Usage of dup(), Renaming a file)
11. Inter Process Communication using Named Pipe
12. Inter Process Communication using Unnamed Pipe
13. Inter Process Communication using Shared Memory
14. Sockets

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS220 SYSTEM SOFTWARE AND COMPILER LAB

Credit: 0: 0: 2

1. Token Separation
2. Simulation of Macro-processor
3. Simulation of Assembler
4. Simulation of Loader
5. Symbol Table Generation
6. Token Separation using Lex Compiler
7. A lex program which replaces vowels in the input string to 'V'
8. A lex program to count the occurrence of 'aaa' in the input string
9. Intermediate Code Generation
10. Minimization of DFA
11. FIRST and FOLLOW of Predictive Parser
12. Conversion of Regular Expression to NFA

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS221 DATABASE SYSTEMS LAB

Credit: 0: 0: 2

1. Basic SQL Commands
2. Working With Single-Row Functions
3. Joins And Group Functions
4. Sub Queries
5. Advanced Sub Queries And Co-Related Sub Queries
6. Creation Of Views And Other Data Base Objects
7. Triggers
8. PL/SQL
9. Functions And Procedures
10. Exception Handling
11. JDBC-Online Quiz
12. JDBC –Online Shopping

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS222 JAVA PROGRAMMING LAB

Credit: 0: 0: 2

1. Basic Java Programs
2. Command Line Arguments
3. Arrays and Array of objects
4. Linked List Implementation using classes and objects
5. Inheritance
6. Package
7. Interface
8. Exception Handling
9. Synchronization with Multithreading
10. File management
11. Applets
12. Network programming
13. Event programming with AWT

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS223 PROGRAMMING IN J2EE LAB

Credit: 0: 0: 2

1. Java Database Connectivity
2. Website Designing
3. Online Quiz
4. Online Shopping
5. Chat Engine
6. Employee Payroll using Session Bean
7. File Transfer Protocol using RMI
8. Student Information System
9. Online Banking System
10. Online Ticket Reservation
11. Online Employment Office System
12. Online Library management System

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS224 C# AND . NET PROGRAMMING LAB

Credit: 0: 0: 2

1. Classes and Objects using out, ref and params
2. Student Information System using Properties
3. Banking Application using Inheritance
4. Library Management using Predefined Interfaces
5. Students Admission using User defined Interfaces

6. Solving Postfix Expressions using Stack
7. Solving Complex Numbers using Operator Overloading
8. Matrix Addition, Subtraction, Multiplication and Division using Delegates
9. User Subscription for News Events using Events
10. Calculator using Windows Application
11. Advanced Windows Controls

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS225 DATASTRUCTURES IN C++ LAB

Credit: 0: 0: 2

1. Structures and Pointers
2. Classes and Objects
3. Implementation of Singly Linked List
4. Array Implementation of Stack
5. Array Implementation of Queue
6. Implementation of Doubly Linked List
7. Conversion of Infix to Postfix Expression
8. Binary Tree Traversal
9. Implementation of Function Overloading
10. Implementation of Operator Overloading
11. Sorting
12. Implementation of Inheritance

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS226 VISUAL PROGRAMMING LAB

Credit: 0: 0: 2

1. Creating simple window application using MFC
2. Basics of Drawing in a Window
3. Programming the Mouse
4. Creating Menus
5. Dialog Based applications
6. Creating spin control / List box and other controls
7. Creating MDI applications
8. Creating DLLs and using them
9. Document view Architecture, Serialization
10. Data access through ODBC

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS227 PROGRAMMING IN J2ME LAB

Credit: 0: 0: 2

1. Realization of MIDlet Life-Cycle
2. User Verification
3. Tips Calculation
4. To send and receive SMS
5. Record Management
6. Personal and Official Organizer
7. Secure Message Transfer
8. Online Quiz
9. Ticket Reservation
10. Mobile Banking
11. Online Student Information System

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS301 THEORY OF COMPUTATION

Credits: 4: 0: 0

Course Objective:
1. To understand the logical and mathematical foundations of computer science.
2. To study abstract models of computation.

UNIT I
Introduction to the Theory of computation - Finite Automata: Deterministic Finite Accepters – Non-deterministic Finite Accepters – Equivalence of Deterministic and Non deterministic Finite Accepters – Reduction of the number of states in Finite Automata – Regular Languages and regular grammars: Regular Expressions – Connection between Regular expressions an regular languages – Regular Grammars.

UNIT II
Properties of Regular Languages – Context-free Languages: Context-free Grammars – Parsing and ambiguity – Parsing and Membership – Context-Free grammars – Programming – Simplification of Context Free Grammars: Methods for transforming grammars – Important Normal Forms – Membership algorithm for Context – free Grammars.

UNIT III
Pushdown Automata: Non deterministic Pushdown Automata – Pushdown Automata and context Free Languages – Deterministic Pushdown Automata – Deterministic Context Free Languages – Grammars for Deterministic Context free languages – Properties of Context Free Languages.

UNIT IV
Turing Machines: The Standard Turing machine. - Combining Turing machine for complicated task- Turing thesis - Other models of Turing machine.

UNIT V
A Hierarchy of Formal Languages and Automata – An Introduction to Computational Complexity: Efficiency of Computation – Turing Machines and Complexity – Language family and Complexity Class – the Complexity Classes P and NP.

Text Book:
1. Peter Linz, *An Introduction to Formal Languages and Automata*, Fourth Edition, Narosa Publishing House, 2009. ISBN: 978-81-7319-781-9.

Reference Books:
1. J. E. Hopcroft and J. D. Ullman, *Introduction to Automata Theory Languages and Computation*, Narosa Publishers, 2002. ISBN: 978-81-85015-96-5.
2. H. R. Lewis and C. H. Papadimitriou, *Elements of the Theory of Computation*, Second Edition, Pearson Education/PHI, 2003. ISBN: 81-7808-487-2.
3. Michael Sipser, *Introduction to the Theory of Computation*, Brooks/Cole Thomson Learning, 1997. ISBN: 981-240-226-8.

09CS302 SOFTWARE AGENTS

Credits: 4: 0: 0

Course Objective:
1. To introduce the concept of agents, multi-agent systems and the key issues surrounding the design of intelligent agents.
2. To design multi agent society and develop applications for agent technology.

UNIT I
Introduction - Intelligent Agents – Deductive Reasoning Agents – Agents as theorem provers – Agent Oriented Programming – Concurrent MetateM.

UNIT II
Practical Reasoning Agents – Reactive and Hybrid Agents – Brook's and Subsumption Architecture – Limitations of Reactive Agents – Hybrid agents – Multiagent Interactions – Making Group Decisions.

UNIT III
Forming Coalitions – Allocating Resources – Bargaining – Argumentation – Sharing Understanding.

UNIT IV
Communication Languages – Working Together – Cooperative Distributed Problem Solving - Task Sharing and Result Sharing -Coordination – Multiagent Planning and Synchronization – Applications.

UNIT V
 The JADE Platform – Programming with JADE – Basic Features.

Text Books:
1. Michael Wooldridge, *An Introduction to Multi Agent Systems,* Second Edition, John Wiley and Sons Ltd, 2009. ISBN: 978-0-470-51946-2.
2. Fabio Bellifemine, Giovanni Caire, Dominic Greenwood, *Developing Multiagent Systems with JADE*, John Wiley and Sons Ltd, 2007. ISBN: 978-0-470-05747-6.

Reference Books:
1. Gerhard Weiss, *Multiagent Systems – A Modern Approach to Distributed Artificial Intelligence*, Massachusetts Institute of Technology, 1999. ISBN: 0-262-73131-2.
2. Michael N. Huhns, Munindar P. Singh, *Readings in Agents*, Morgan Kaufmann Publishers, 1998. ISBN: 1-55860-495-2.

09CS303 SOFTWARE ARCHITECTURE

Credits: 4: 0: 0

Course Objective:
This course will expose the concepts, principles, and state-of- the-art methods in software architectures, including domain-specific software architectures (DSSA), architectural styles, architecture description languages (ADL), software connectors, dynamism in architectures, and architecture-based testing and analysis.

UNIT I
Introduction–What is software Architecture? –An Engineering Discipline for software –The Status of Software Architecture – Architectural Styles – Architectural styles-pipes and filters – Data Abstraction and object oriented organization – Event Based, Implicit Invocation– Layered Systems – Repositories – Interpreters-process control – Other Familiar Architectures – Heterogeneous Architectures.

UNIT II
Case Studies – Key word in context – Instrumentation software – Mobile Robotics – Cruise Control – Three vignettes in mixed Style

UNIT III
Shared Information Systems – Shared Information systems – Database Integration – Integration in software development environments – Integration in the design of buildings – Architectural structures for shared information systems – Architectural Design Guidance – Guidance for user interface architecture –The quantified design space.

UNIT IV
Formal Models And Specification – The value of Architectural formalism-Formalizing the architecture of a specific system – Formalizing an architectural style – formalizing an architectural design space – Toward a theory of software architecture – Linguistic Issues – Requirements for architecture description languages – First class connectors – Adding implicit invocation to traditional programming languages.

UNIT V

Tools for Architectural Design – UniCon: A   Universal   Connector Language – Exploiting style in architectural design environments – Beyond definition/use: Architectural Interconnection – Education Of Software Architects – Philosophy   and course overview – Course description – Assignments – Evaluation.

Text book:
1. Mary Shaw and David Garlan, *Software Architecture: Perspectives on an Emerging Discipline*, Prentice-Hall, 2005. ISBN: 82-203-1470-0.

Reference Books:
1. Len Bass, Paul Clements, and Rick Kazman, *Software Architecture in Practice*, Second Edition, Addison-Wesley, 2003. *ISBN*: 0321154959
2. Eric Braude, *Software Design: From Programming to Architecture*, Wiley, 2004. *ISBN*: 978-0-471-20459-6

09CS304 OBJECT ORIENTED SOFTWARE ENGINEERING

Credits: 4: 0: 0

Course Objective:
1. Gain Knowledge in both the principles of software engineering as well as the practices of various object-oriented tools, processes, and products.
2. Design and construction of modular, reusable, extensible and portable software using object-oriented programming languages.

Prerequisites:
1. Having knowledge about Software engineering.
2. Familiarity with a high-level programming language (Java, C++) and data structures.

UNIT I
Introduction to Software engineering: What is Software Engineering – Software Engineering Concepts – Software Engineering Development Activities – Managing Software Development-Case Study? **Modeling with UML:** Introduction – Overview of UML – Modeling Concepts – Deeper View into UML.

UNIT II
Project Organization and Communications: Introduction – An Overview of Projects – Project Organization Concepts – Project Communication Concepts – Organizational Activities**.** **Analysis**: Introduction – Overview of Analysis – Analysis Concepts – Analysis Activities – Managing Analysis-Case study.

UNIT III
System Design: Overview of System Design – System Design Concepts – System Design activities – Managing System Design-Case study. **Object Design:** Overview of Object design – Reuse Concepts – Reuse Activities – Managing Reuse- Case study.

UNIT IV

Mapping Models to Code: Overview of mapping – Mapping concepts – Mapping Activities – Mapping Implementation-Case study. **Configuration Management and Project Management:** Configuration Management Overview-Concepts-Activities and Managing Configuration Management – Overview of Project management – Project Management Concepts – Project Management Activities.

UNIT V
Software Life Cycle: Introduction – IEEE 1074 – Characterizing the Maturity to Software Life Cycle Models – Life cycle Models. **Methodologies:** Introduction – Project environment – Methodology Issues – A Spectrum of Methodologies-Case studies.

Text Book:
1. Bernd Bruegge and Allen Dutoit, *Object-Oriented Software Engineering: Practical software development using UML, Patterns and java*, Second Edition, Pearson Education, 2004. ISBN-10: 0130471100.

Reference Books:
1. Bernd Bruegge and Allen H. Dutoit, *Object-Oriented Software Engineering: Conquering Complex and Changing Systems*, Pearson Education, 2002. ISBN 0-13-489725-0.
2. George Wilkie, *Object-oriented Software Engineering: The Professional Developer's Guide,* Addison-Wesley, 1993. ISBN-10: 0201627671.
3. Timothy C. Lethbridge and Robert Laganiere, *Object-Oriented Software Engineering: Practical software development using UML and Java*, McGraw-Hill Higher Education, 2005. ISBN: 0077109082.

09CS305 REQUIREMENTS ENGINEERING
Credits: 4: 0: 0

Course Objective:
To learn details about
1. The Requirements Process i.e. identifying stakeholders and their needs, documenting and modeling the requirements process.
2. Management of requirements.
3. Improvement of requirements process, Risk Management.

UNIT I
Software Requirements: Introduction: The Essential Software Requirement: Software Requirements Defined – Requirements Development and Management – Characteristics of Excellent Requirements – Requirements from the Customer's Perspective: Who Is the Customer? – The Customer-Development Partnership – What About Sign-Off? – Good Practices for Requirements Engineering: Knowledge – Requirements Analysis –Requirements Specification – Requirements Validation – Requirements Management – Project Management – Getting Started with New Practices – A Requirements Development Process – The Requirements Analyst: The Requirements Analyst Role –The Making of an Analyst – Creating a Collaborative Environment.

UNIT II

Software Requirements Development- Capturing Requirements: Establishing the Product Vision and Project Scope**:** Defining the Vision Through Business Requirements – Vision and Scope Document – The Context Diagram-Keeping the Scope in Focus – Finding the Voice of the Customer: Sources of Requirements – User Classes- Finding User Representatives – The Product Champion – Who Makes the Decisions? – Understanding User Requirements: The Use-Case Approach – Event-Response Tables.

UNIT III
Software Requirements Development- Documenting and Modeling of Requirements: Documenting the Requirements: The Software Requirements Specification – A Software Requirements Specification Template – Guidelines for Writing Requirements – Sample Requirements, Before and After – The Data Dictionary – A Picture Is Worth 1024 Words: Modeling the Requirements – From Voice of the Customer to Analysis Models – Data Flow Diagram – Entity-Relationship Diagram – State-Transition Diagram – Dialog Map – Class Diagrams – Decision Tables and Decision Trees – A Final Reminder.

UNIT IV
Software Requirements Management: Requirements Management Principles and Practices: The Requirements Baseline – Requirements Management Procedures – Requirements Version Control- Requirement Attributes – Tracking Requirements Status – Measuring Requirements Management Effort – Change Happens: The Change-Control Process – The Change Control Board – Change-Control Tools – Measuring Change Activity – Links in the Requirements Chain: Tracing Requirements – Motivations for Tracing Requirements – The Requirements Traceability Matrix – Tools for Requirements Tracing – Requirements Traceability Procedure – Is Requirements Traceability Feasible? Is It Necessary?

UNIT V
Implementing Requirements Engineering: Improving Your Requirements Processes: How Requirements Relate to Other Project Processes – Requirements and Various Stakeholder Groups – Fundamentals of Software Process Improvement – The Process Improvement Cycle – Requirements Engineering Process Assets – Requirements Process Improvement Road Map – Software Requirements and Risk Management: Fundamentals of Software Risk Management – Requirements – Related Risks – Risk Management Is Your Friend.

Text Book:
1. Karl E. Wiegers, *Software Requirements*, WP Publishers and Distributors Private Limited, 2005. ISBN: 81-7853-071-6.

Reference Books:
1. Ralph R.Young, *Effective Requirements Practices*, Addison Wesley, 2001. ISBN: 0-201-70912-0.
2. Elizabeth Hull, Ken Jackson, Jeremy Dick, *Requirements Engineering*, Second Edition, Springer Publication, 2005. ISBN: 1852338792, 9781852338794.
3.

09CS306 SECURITY IN COMPUTING

Credits: 4: 0: 0

Course Objective:
To understand the security threats in computing and to learn necessary control measures.

Prerequisite: Basics of Database, Networks, Operating System and Programming.

UNIT I
Program Security: Secure Programs – Nonmalicious Program Errors – Viruses and Other Malicious Code – Targeted Malicious Code – Controls Against Program Threats.

UNIT II
Operating Systems Security: Protected Objects and Methods of Protection – Memory and Address Protection – Control of Access to General Objects – File Protection Mechanisms – User Authentication – Trusted System – Security Policies – Models of Security – Trusted Operating System Design.

UNIT III
Database Security: Introduction to Databases – Security Requirements – Reliability and Integrity – Sensitive Data – Inference – Multilevel Databases – Proposals for Multilevel Security.

UNIT IV
Security in Networks: Threats in Networks – Network Security Controls – Firewalls – Intrusion Detection Systems – Secure E-Mail –Mobile IP V6 security.

UNIT V
Administering Security: Security Planning – Risk Analysis – Organizational Security Policies – Physical Security – Case studies of Ethics.

Text Book:
1. Charles P. Pfleeger, Shari Lawrence Pfleeger, *Security in Computing,* Third Edition, Pearson Education, 2003. ISBN: 81-297-0042-5.

Reference Books:
1. Dieter Gollmann, *Computer Security*, Second edition, John Wiley and Sons, 2006. ISBN:81-265-0690-3.
2. William Stallings, *Cryptography and Network Security*, Second edition, Prentice Hall, 1999. ISBN: 81-7808-902-5.
3. Bruce schneier, *Applied Cryptography*, Second Edition, John Wiley and Sons, 2002. ISBN: 9971-51-348-X.
4. Paul Campbell, Ben Calvert, Steven Boswell, *Security + In Depth*, International Student Edition, and 2004. ISBN:981-254-246-9.

09CS307 REAL TIME SYSTEM SOFTWARE

Credits: 4: 0: 0

Course Objective:
1. To understand the main underlying theoretical and practical problems.
2. To validate formal specifications, in particular of real-time systems, with the aid of software tools for the verification and analysis.

UNIT I
The World of Real Time Systems – Software Architecture-Process and State Based Systems Model – Cyclic Executives.

UNIT II
Requirements and Design Specifications – Survey and Classifications of Notations – Data Flow Diagrams – Tabular Languages – State Machines – Systems of State Machines – Communicating Real Time State Machines – State chart.

UNIT III
Declarative Specifications – Regular Expressions and Extensions –Traditional Logics – Real-Time Logic – Deterministic Scheduling – Assumptions and Candidate Algorithms – Basic RM and EDF Results – Relaxing the Assumptions – Process Interactions.

UNIT IV
Execution Time Prediction – Measurement of Software by software – Program Analysis with Timing Schema – Prediction by optimization – System Interferences and architectural – Keeping Time on computers – Timer applications-properties of real and Ideal Clocks – Clock Servers – Clock synchronization.

UNIT V
Programming Languages – Real time Language features – Ada – Java and real time extensions – CSP and Occam – Estherel Concepts – Operating Systems Real time functions and services – OS architectures – Issues in Task Management – Interrupts and the OS.

Text Book:
1. Alan C. Shaw, *Real–Time Systems and Software*, Wiley, 2001. ISBN: 9814-12-657- 8.

Reference Book:
1. Jane W. S. Liu, *Real-Time Systems,* Pearson Education, 2000. ISBN: 81-7808-463-5.

09CS308 DIGITAL SPEECH AND IMAGE PROCESSING

Credits: 4: 0: 0

Course Objective:
1. To provide adequate Information on Speech Processing and Coding Techniques.
2. To provide an introduction to basic concepts and methodologies for Digital Image Processing.

UNIT I

Introduction: Coding Strategies and Standards – Speech Coding Techniques – Algorithm Objectives and Requirements – Standard – Standard Speech Coders – Sampling and Quantization – Sampling – Scalar Quantization – Vector Quantization – Speech Signal Analysis and Modeling.

UNIT II

Multimode Speech Coding: Design Challenges of a Hybrid Coder – Summary of Hybrid Coders – Synchronized Waveform Matched Phase Model – Hybrid Encoder – Speech Classification – Hybrid Decoder – Performance Evaluation – Acoustic Noise and Channel Error Performance – Speech Enhancement: Review of STSA based Speech Enhancement – Noise Adaptation – Echo Cancellation.

UNIT III

Introduction: Digital Image Processing – The Origins of Digital Image Processing – Examples of Fields that use Digital Image Processing – Fundamentals Steps in Digital Image Processing: Components of an Image Processing System – Digital Image Fundamental - Elements of Visual Perception – Light and Electromagnetic Spectrum – Image Sensing and Acquisition – Image Sampling and Quantization – Some basic Relationships between Pixels – Linear and Nonlinear Operations.

UNIT IV

Image Enhancement in the Spatial Domain: Histogram Processing – Smoothing Spatial Filters – Image Enhancement in the frequency Domain: Smoothing Frequency Domain Filters – Sharpening Frequency Domain Filters – Homomorphic Filtering.

UNIT V

Image Compression: Fundamentals – Image Compression Models – Error Free Compression – Lossy Compression – Image Segmentation: Detection of Discontinuities-Edge Linking and Boundary Detection – Thresholding - Region based Segmentation.

Text Books:
1. M. Kondoz, Digital Speech, Second Edition, Wiley Student Edition, 2005. ISBN 9812-53-172-6.
2. Rafael C. Gonzalez and Richard E. Woods, *Digital Image Processing*, Second Edition, Pearson Edition, 2002. ISBN 81-7758-168-6.

Reference Books:
1. Rabiner and Schaeffeer, *Digital Processing of Speech Signals*, Prentice Hall, 2005. ISBN: 81-297-0272-X.
2. Anil Jain K., *Fundamentals of Digital Image Processing*, Prentice Hall India, 2001. ISBN: 013-0307963.

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09CS309 MAINFRAME SYSTEMS

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Credits: 4: 0: 0

Course Objective:
To understand and learn
1. Mainframe hardware system.
2. Operating systems in mainframe.
3. Virtualization Concepts.
4. Networking in Mainframe.
5. Security in Mainframe systems.

Prerequisite: Computer Architecture – Operating System and Computer Networks or Data Communication.

UNIT I
Main Frame Basics: The New Mainframe – System management – Autonomic Computing.

UNIT II
Z/VM Basics: Introduction to Mainframe hardware systems – Introduction to virtualization and z/vm – History of z/vm – z/vm-Job roles and basic concepts.

UNIT III
NETWORKING: Introduction to Mainframe networking – Hardware connectivity – Sample configuration

UNIT IV
SECURITY: System z architecture & security – System z virtualization and its challenges – z/OS System integrity

UNIT V
SECURITY: z/OS System Authorization Facility & security managers – Security in z/OS UNIX

Text Books:
1. Lydia Parziale, Edi Lopes Alves, Eli M. Dow, Klaus Egeler, Jason J. Herne, Introduction to the New Mainframe: Z/VM Basics, IBM RedBooks, November 2007. ISBN: 0738488550.
2. Mike Ebbers, Christopher Hastings, Matt Nuttall, Micky Reichenberg, Introduction to the New Mainframe: Networking, IBM RedBooks, August 2006. ISBN: 0738494798.
3. Rica Weller, Ross Clements, Ken Dugdale, Per Fremstad, Introduction to the New Mainframe: Security, IBM RedBooks, March 2007. ISBN: 0738489656.
4. Mike Edders, Frank Byrne, Pilar Gonzalez, Rodney Martin, Introduction to New Mainframe: Large Scale Commercial Computing. ISBN: 0738495972.

09CS310 DATA WAREHOUSING AND MINING

Credits: 4: 0: 0

Course Objective:
1. To provide methods to create a Data Warehouse.

2. To provide an introduction to machine learning Algorithms.
3. To learn the implementation techniques of Data mining algorithms.

UNIT I
Introduction to Data mining and Warehousing: Data Mining: Motivation of Data mining – Data mining functionalities – Integration of a Data Mining System with a Database or Data Warehouse system. **Data Warehouse:** The Data Warehouse Environment.

UNIT II
Data Warehouse Design and its Technology: The Data Warehouse and Design – The Data Warehouse and Technology – The really Large Data Warehouse.

UNIT III
Data Mining Techniques: Mining Frequent patterns, Associations and Correlations: Basic Concepts and a road map – Efficient and scalable frequent Itemset Mining Methods – Mining various kinds of Association Rules – From Association Mining to correlation Analysis – Constraint-based Association Mining. Classification and Prediction: Classification – Classification by decision tree induction – Bayesian Classification – Rule Classification – Association Classification.

UNIT IV
Data Mining Techniques: Cluster Analysis: Types of Data in cluster Analysis – A categorization of major clustering methods – partitioning methods – Hierarchical Methods – Density based methods – Grid based methods – Model based clustering methods – Clustering high dimensional data – Constraint based clustering analysis – Outlier analysis.

UNIT V
Applications of Data Mining: Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web – Data Mining Applications.

Text Books:
1. Jiawei Han and Micheline Kamber, *Data Mining,* Second Edition, Elsevier, 2007. ISBN: 81-312-0535-5.
2. William H. Innon, *Building the Data Warehouse,* Fourth Edition, Wiley, 2008. ISBN: 81-265-0645-8.

Reference Books:
1. Claudia Imhoff, Nicholas Galemmo, Jonathan G. Geiger, *Mastering Warehousing Design-Relational and Dimensional Techniques,* Wiley, 2005. ISBN: 81-265-0365-3.
2. Ian H.Witten, Eibe Frank, *Data Mining Practical Machine Learning Tools and Techniques,* Second Edition, Elsevier, 2005. ISBN: 81-312-0050-7.
3. Jiawei Han, Micheline Kamber, *Data Mining Concepts and Techniques,* Chris Ullman, Morgan Kaufmann Publishers, 2001. ISBN: 81-8147-049-4.
4. George M. Marakas, *Modern Data Warehousing, Mining, and Visualization*, Prentice-Hall, 2003. ISBN: 10:0131014595.
5. Ralph Kimball, *The Data Warehouse Toolkit*, Wiley, 2002. ISBN: 0-476-20024-7.

09CS311 ADVANCED JAVA

Credits: 4: 0: 0

Course Objective:
1. To know the advanced concepts of Java.
2. Advanced Java course provides advanced skills for programming in Java language.
3. This course delves deeper into the concepts and capabilities of Java.

UNIT I
Introduction and the Presentation Tier: Understanding Java and the J2EE platform–
Reviewing XML Fundamentals – Introducing Application Servers – Understanding RMI –
Studying Servlet Programming – Going over JSP Basics – Using JSP Tag Extensions.

UNIT II
The Enterprise Information System Tier: Working with Java Mail – Understanding the JMS,
Introducing Java Transactions – Examining JNDI and Directory Services – Understanding Java
Authentication and Authorization Services – Exploring Java Cryptography Extensions.

UNIT III
The Service Tier and the Data Tier : Understanding EJB Architecture and Design – Explaining
Session beans and Business Logic – Working with Entity Beans – Using Message Driven Beans
– Reviewing Java Database Connectivity – Understanding the J2EE Connector Architecture –
Web Services – Introduction – SOAP – WSDL – UDDI – Understanding J2EE Web services.

UNIT IV
Patterns: Reviewing Presentation tier Patterns – Working with Service Tier Patterns – Using
Data Tier Patterns.

UNIT V
Advanced Topics: Exploring Frameworks and Application Architecture – Using ANT to Build
and Deploy Applications – Creating High Performance Java Applications.

Text Book:
1. James McGovern, Rahim Adatia, Yakov Fain, Jason Gordon, Ethan Henry, Walter Hurst,
   Ashish Jain, Mark Little, Vaidyanathan Nagarajan, Harshad Oak, Lee Anne Phillips, *J2EE
   1.4 Bible,* Wiley Publishing , 2004. ISBN: 978-0-7645-3966-4.

Reference Books:
1. Ed Roman, *Mastering Enterprise Java Beans and the Java 2 Platform*, Enterprise Edition,
   Wiley Computer Publishing, 1999. ISBN: 9971-51-341-2.
2. Harvey M. Deitel, Paul J. Deitel ,Sean E. Santry, *Advanced Java(TM) 2 Platform How to
   Program*, Prentice Hall, 2001. ISBN-10: 0130895601, ISBN-13: 9780130895608.
3. Jim Farley, William Crawford, Prakash Malani, John Norman, Justin Gehtland *Java
   Enterprise in a Nutshell*, O'Reilly, November 2005. ISBN 10: 0-596-10142-2, ISBN 13:
   9780596101428.

09CS312 EVOLUTIONARY COMPUTING

Credits: 4: 0: 0

Course Objective:
1. To provide basic knowledge about the class of evolutionary methods used in solving computer science problems.
2. To study genetic algorithms, evolutionary strategies, genetic programming, problem representations, genetic operations, theory of evolutionary algorithms.
3. To understand various approaches and applications of evolutionary computation to combinatorial optimization problems.

UNIT I
Introduction - What is an Evolutionary Algorithm? – What is an Evolutionary Algorithm? – Components of Evolutionary Algorithms – Example Applications – Working of an Evolutionary Algorithm – Evolutionary Computing and Global Optimization – Genetic Algorithms: Representation of Individuals – Mutation, Recombination – Population Models – Parent selection – Survivor Selection – Example Application: Solving a Job Shop Scheduling problem.

UNIT II
Evolution Strategies – Evolutionary Programming – Genetic Programming.

UNIT III
Learning Classifier Systems – Parameter Control in Evolutionary Algorithms – Multi-Modal Problems and Spatial Distribution.

UNIT IV
Hybridization with Other Techniques: Mimetic Algorithms – Theory – Constraint Handling.

UNIT V
Special Forms of Evolution – Working with Evolutionary Algorithms.

Text book:
1. E. Eiben and J. E. Smith, *Introduction to Evolutionary Computing*, Springer - Natural Computing Series, 2003. ISBN: 3-540-40184-9.

Reference Books:
1. Kenneth A. De Jong, *Evolutionary Computation: A Unified Approach*, MIT Press, 2006. ISBN-10:0-262-04194-4
2. William B. Langdon, Riccardo Poli, *Foundations of Genetic Programming*, Springer - Natural Computing Series, 2002. ISBN: 35-40-42451-2.
3. N. Nedjah, E. Alba, L. de. Macedo Mourelle, *Parallel Evolution Computation*, Springer Natural Computing Series, 2006. ISBN-10: 3-540-32837-8.
4. William M. Spears, *Evolutionary Algorithms: The Role of Mutation and Recombination*, Springer-Verlag, 2000. ISBN: 3540669507.
5. John R. Koza, *Genetic Programming: on the Programming of Computer by means of Natural Selection* ,Springer Natural Computing Series, 2000. ISBN: 0-262-11170-5.

09CS313 QUANTUM COMPUTING

Credits: 4: 0: 0

Course Objective:
To understand the quantum model of computation and how it relates to quantum mechanics.

UNIT I
Introduction to quantum computing – Qubits, Quantum Mechanics & Computer Perspectives – Quantum Gates.

UNIT II
Applications: Quantum Teleportation, Quantum Parallelism, Superdense Coding, Quantum Communication.
Introductory quantum algorithms: Probabilistic quantum algorithms-Phase kick-back, Deutsch algorithms, Deutsch algorithms-Jozsa algorithm - Simon's algorithm.

UNIT III
Algorithm with super polynomial speedup: Quantum phase estimation and the quantum Fourier – transform - Eigen value estimation-Finding orders-Finding discrete logarithms - Hidden subroots.

UNIT IV
Algorithm based on Amplitude Amplification: Grover's Quantum search algorithm - Amplitude amplification - Quantum amplitude estimation & Quantum Counting - Searching without knowing the success probability.

UNIT V
Quantum Error Correction: Classical error correction - The classical three bit code - Fault tolerance - Quantum error correction - Three and nine-Qubit Quantum codes - Fault tolerant Quantum computation.

Text Books:
1. Vishal Sahni, *Quantum Computing*, Tata McGraw-Hill, 2007. ISBN-13: 978-0-07-065700-7, ISBN-10: 0-07-065700-9.
2. Phillip Kaye, Raymond Laflamme, *An Introduction to Quantum Computing*, Oxford University Press, 2007. ISBN-10: 0-19-85700-07, ISBN-13: 978-0-19-857000-4.

Reference Books:
1. Michael A. Nielsen, Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 2000. ISBN-10: 0-52-16323-58, ISBN-13: 978-0-52-163235-5.
2. Willi-Hans Steeb, Yorick Hardy, *Problems and Solutions in Quantum Computing and Quantum Information*, World Scientific, 2006. ISBN-10: 9-81-25674-02, ISBN-13: 978-9-81-256740-6.

09CS314 SOFTWARE TESTING

Credits: 4: 0: 0

Course Objective:
1. To understand the basics of software testing and its strategies.
2. To learn about software quality evaluation policies and procedures.
3. To give adequate knowledge on various testing methodologies.

Prerequisite: Basics of Software Engineering.

UNIT 1
Introduction to testing as an Engineering activity – Testing Fundamentals – Defects, Hypotheses, and tests – Strategies and methods for test case design I.

UNIT II
Strategies and methods for test case design II – Levels of testing – Test goals, policies plans, and documentation.

UNIT III
The test organization – Controlling and monitoring the testing process – Reviews as a testing activity.

UNIT IV
A measurement program to support product and process quality – Evaluating software quality: A quantitative approach – Defect analysis and prevention.

UNIT V
The tester's workbench – Process control and optimization – The testing maturity model and test process assessment.

Text Book:
1. Ilene Burnstein, *Practical Software Testing*, Springer International, 2003. ISBN: 81-8128-089-X.

Reference Books:
1. William E. Perry, *Effective Methods for Software Testing*, Second Edition, John Wiley, 2000. ISBN: 0-471-35418-X.
2. Elfriede Dustin, *Effective Software Testing*, Pearson Education, 2003. ISBN: 81-297-0048-4.

09CS315 SOFTWARE METRICS AND QUALITY MANAGEMENT

Credits: 4: 0: 0

Course Objective:
1. To understand how to choose appropriate quality goals and to select, to plan, and to execute quality assurance activities throughout development and evolution to predictably meet quality and schedule goals.
2. To study the software quality engineering metrics and models.

Prerequisite: Basic knowledge of software engineering principles, methodologies, models and an overview of software quality.

UNIT I
Overview of software metrics: Software measurement – software metrics. **The basics of measurement :** Metrology – Property-oriented measurement – Meaningfulness in measurement – Measurement quality – Measurement process – Scale – Measurement validation – Object-oriented measurement – Subject-domain – oriented measurement – Software measure classification – Goal-based paradigms: Goal-Question-Metrics (GQM) and Goal-Question-Indicator-Metrics (GQIM) – Applications of GQM and GQIM -Case studies. **Empirical investigation :** Software engineering investigation – Investigation principles – Investigation techniques – Formal experiments: Planning – Formal experiments: Principles – Formal experiments: Types – Formal experiments: Selection – Guidelines for empirical research.

UNIT II
Measuring internal product attributes: size: Software size – Software Size: Length (code, specification, design) – Software Size: Reuse – Software Size: Functionality (function point, feature point, object point, use-case point) – Software Size: Complexity. **Measuring internal product attributes: structure:** Software structural measurement – Control-flow structure – Cyclomatic complexity – Data flow and data structure attributes – Architectural measurement. **Measuring cost and effort :** Software cost model – COCOMO and – COCOMO II – Constraint model – Software Lifecycle Management (SLIM) – Cost models: advantages and drawbacks.

UNIT III
Measuring external product attributes: quality : Software quality – Software quality models: Boehm's model, McCall's model, ISO 9126 model, etc. – Basic software quality metrics – Quality management models – Measuring customer satisfaction – Software Quality Assurance (SQA). **Measuring software reliability :** Reliability concepts and definitions -Software reliability models and metrics – Fundamentals of software reliability engineering (SRE) – Reliability management models. **Software test metrics:** Test concepts, definitions and techniques – Estimating number of test case – Allocating test times – Decisions based on testing – Test coverage measurement – Software testability measurement – Remaining defects measurement.

UNIT IV

The Elements of a Complete Software Quality System: The elements of a software quality system – Additional issues. **Standards:** Areas of standardization – Sources of standards – Selection of standards – Promulgation of standards – Nonstandard standards. **Reviews:** Types of reviews – Review subjects – Documentation reviews. **Testing:** Types of testing – Test planning and conduct. **Defect Analysis:** Analysis concepts – Locating data – Defect repair and closure – Selecting metrics – Collecting measurements – Quality tools**. Configuration Management:** CM components – Configuration identification – Configuration control – Configuration accounting. **Associated Quality Concerns:** Education – Vendor management – Maintenance.
UNIT V
Software Safety: Aspects of software safety – Safety issues -Safety requirements – Safety management. **Risk Management:** Types of risk – Risk management process. **Software Documentation:** Management documents – Development documents – Test documentation - User documentation – Training documentation – Documentation standards. **Quality System Implementation**: Planning the implementation – The quality charter – Changing the organizational culture – Organizational considerations – Development organization participation – Implementation strategies – SQS improvement.

Text Book:
1. John W. Horch, *Practical Guide to Software Quality Management*, Second Edition, Artech House Computer Library, 2003.
2. N.E. Fenton and S.L. Pfleeger, **Software Metrics: A Rigorous and Practical Approach**, Second Edition, PWS Publishing, 1998. ISBN 0-534-95425-1.

Reference Books:
1. Gerald M. Weinberg, *Quality Software Management: Anticipating Change*, Dorset House Publishing Company, May 1997.
2. Stephen H. Kan, *Metrics and Models in Software Quality Engineering*, Second Edition, Addison-Wesley Professional, 2002. ISBN: 0201729156.
3. John C. Munson, **Software Engineering Measurement**, Auerbach Publications, 2003. ISBN: 0849315034.
4. B A Kitchenham, **Software Metrics: Measurement for Software Process Improvement**, Blackwell Pub, 1996. ISBN: 1855548208.

09CS316 ADVANCED COMPUTER ARCHITECTURE

Credits: 4 : 0 : 0

Course Objective:
This course qualitatively and quantitatively examines computer design tradeoffs. The objective of this course is to learn the fundamental aspects of computer architecture design and analysis. The course focuses on processor design, pipelining, superscalar, out-of-order execution, caches (memory hierarchies), virtual memory, storage systems, and simulation techniques.

Prerequisite: Computer Architecture.

UNIT I

Fundamentals of Computer Design: Introduction – Measuring and Reporting performance – Quantitative Principles of computer design. Instruction set Principles and Examples: Introduction – Classifying Instruction set Architectures – Memory Addressing – Addressing Modes for signal processing – Type and size of operands – Operands for media and signal processing – operations in the instruction set – Instruction for control flow – Encoding an instruction set – the role of compiler.

UNIT II

Pipelining: Introduction – The Major Hurdle of pipelining – pipeline Hazards – Implementation – Extending the MIPS pipeline to handle multicycle operations – crosscutting issues.

UNIT III

Instruction – Level parallelism: concepts and challenges – overcoming data Hazards with Dynamic scheduling – Dynamic scheduling: Examples and the Algorithm – Reducing Branch costs with Dynamic Hardware Prediction – High Performance instruction delivery – Taking advantage of More ILP with Multiple Issue – Hardware – Based speculation – Studies of the Limitations of ILP – Limitations of ILP for Realizable processors – thread level parallelism – crosscutting issues.

UNIT IV

Exploiting Instruction – Level Parallelism with Software Approaches: Basic compiler Techniques for Exposing ILP - Static Branch Prediction – Static Multiple issue: The VLIW approach – advanced compiler support for Exposing and Exploiting ILP – Hardware support for Exposing more parallelism at compile Time – crosscutting issues: Hardware versus software speculation mechanisms.

UNIT V

Memory Hierarchy Design: Introduction – Review of the ABCs of the caches – Cache Performance – Reducing Cache Miss Penalty – Reducing Miss Rate – Reducing Cache Miss Penalty or Miss Rate via Parallelism – Reducing Hit Time – Main Memory and Organizations for Improving Performance – Memory Technology – Virtual Memory – Protection and Examples of Virtual Memory.

Text Book:
1. John L. Hennessy and David Patterson, *Computer Architecture, A Quantitative Approach*, Fourth Edition, Elsevier, 2006. ISBN-13**:** 9780123704900.

References:
1. Barry Wilkinson and Michael Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, 2nd Edition, Prentice Hall, 2005. ISBN 0-13-140563-2.
2. Ananth Grama, Anshul Gupta,George Karypis and Vipin Kumar, *Introduction to Parallel Computing*, Addison Wesley, January 2003. ISBN 0201648652.

09CS317 MODERN DIGITAL COMMUNICATION TECHNIQUES

Credit: 4: 0: 0

Course Objective:
1. To introduce the advanced concepts of digital communication.
2. To learn about communication channels and modulations techniques.

UNIT I
Coherent and Non-Coherent Communication: Coherent receivers – Optimum receivers in WGN – IQ modulation & demodulation – Noncoherent receivers in random phase channels; M-FSK receivers – Rayleigh and Rician channels – Partially coherent receives – DPSK,M-PSK,M-DPSK–BER Performance Analysis.

UNIT II
Bandlimited Channels and Digital Modulations: Eye pattern– demodulation in the presence of ISI and AWGN– Equalization techniques – IQ modulations, QPSK- QAM- QBOM- BER Performance Analysis – Continuous phase modulation– CPFM, CPFSK, MSK- OFDM.

UNIT III
Block Coded Digital Communication: Architecture and performance – Binary block codes-Orthogonal, Biorthogonal, Transorthogonal – Shannon's channel coding theorem–Channel capacity–Matched filter–Concepts of Spread spectrum communication – Coded BPSK and DPSK demodulators –Linear block codes-Hamming, Golay, Cyclic, BCH , Reed – Solomon codes.

UNIT IV
Convolutional Coded Digital Communication: Representation of codes using Polynomial-State diagram- Tree diagram- and Trellis diagram – Decoding techniques using Maximum likelihood – Viterbi algorithm – Sequential and Threshold methods – Error probability performance for BPSK and Viterbi algorithm–Turbo Coding.

UNIT V
Spread Spectrum Signals for Digital Communication: Model of spread Spectrum Digital Communication System – Direct Sequence Spread Spectrum Signals – Error rate performance of the coder – Generation of PN Sequences – Frequency-Hopped Spread Spectrum Signals – Performance of FH Spread Spectrum Signals in an AWGN Channel – Synchronization of Spread Spectrum Systems.

Text Book:
1. Marvin Kenneth Simon, Sami M. Hinedi, William C. Lindsey, *Digital Communication Techniques: Signal Design and Detection*, Prentice Hall India, New Delhi. 1995. ISBN: 81-203-1473-5.

Reference Books:
1. Simon Haykin, *Digital Communications*, John Wiley and sons, 1998.

2. Wayne Tomasi, *Advanced electronic communication systems*, Fourth Edition, Pearson Education Asia, 1998.
3. B.P.Lathi, *Modern Digital and Analog Communication Systems*, Third Edition, Oxford University press, 1998.
4. John G. Proakis, *Digital Communications*, Fourth Edition, McGraw-Hill, New York, 2003.

09CS318 ADVANCED DATABASE LAB

Credit: 0: 0: 2

1. Basic SQL Commands
2. Database Locks
3. Single-row and Multiple-row Functions
4. Sub queries & Advanced Sub queries
5. Views & Materialized Views
6. Procedures, Functions and Cursor Management
7. Tuning Queries and Performance Evaluation
8. Storage of large objects in Database
9. Simple application development using JDBC
10. Simple application development using ODBC

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS319 OPERATING SYSTEMS AND NETWORKING LAB

Credit: 0: 0: 2

1. TCP One & Two Way Communication
2. UDP One & Two Way Communication
3. File Transfer Protocol
4. Remote Method Invocation
5. Simple Http Server
6. Domain Name System
7. Rate & Deadline Monotonic Scheduling
8. Deadline Monotonic Scheduling
9. Earliest Deadline First Scheduling
10. Bankers Algorithm
11. Producer Consumer Problem
12. Dining Table Philosophy

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS320 SOFTWARE ENGINEERING LAB

Credit: 0: 0: 2

1. Study of Software Engineering Paradigms
2. Railway Reservation Using Waterfall Model
3. Telephone Directory Using Spiral Model
4. Employee Management Using Incremental Model
5. Inventory System Using Prototype Model
6. Use-case Diagram, Class Diagram, Sequence Diagram and Collaboration Diagram for ATM System
7. State Chart Diagram and Activity Diagram, Component Diagram, Deployment Diagram for ATM System
8. Forward Engineering And Reverse Engineering for ATM System
9. Draw all UML diagrams and design a Library Management System using forward and reverse engineering.
10. Setting Up the GUI Map for Software Testing
11. Recording & Synchronizing Tests
12. Checking Bitmaps for Software Testing

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS321 SOFTWARE TESTING LAB

Credit: 0: 0: 2

1. Setting Up The GUI Map
2. Recording Tests
3. Synchronizing Tests
4. Synchronizing Tests
5. Checking Bitmaps
6. Programming Tests With Tsl
7. Creating Data-Driven Tests
8. Reading Text
9. Creating Batch Tests
10. Maintaining Test Scripts

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS322 SYSTEM DEVELOPMENT LAB

Credit: 0: 0: 2

1. Railway Reservation Using Waterfall Model
2. ATM System Using Waterfall Model
3. Telephone Directory Using Spiral Model
4. Online Quiz Using Spiral Model
5. Student Automation Using Win-win Spiral Model
6. Library Management Using Win-win Spiral Model

7. Banking System Using Incremental Model
8. Employee Management Using Incremental Model
9. Dictionary Creation Using Prototype Model
10. Inventory System Using Prototype Model

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS323 OBJECT ORIENTED CASE TOOLS LAB

Credit: 0: 0: 2

1. Use-case Diagram and Class Diagram For ATM System
2. Sequence Diagram and Collaboration Diagram For ATM System
3. State Chart Diagram and Activity Diagram For ATM System
4. Component Diagram, Deployment Diagram, Forward Engineering And Reverse Engineering for ATM System
5. Use-case Diagram And Class Diagram For Library Management
6. Sequence Diagram And Collaboration Diagram For Library Management
7. State Chart Diagram And Activity Diagram For Library Management
8. Component Diagram, Deployment Diagram, Forward Engineering And Reverse Engineering For Library Management
9. Use-case Diagram And Class Diagram For Inventory System
10. Sequence Diagram And Collaboration Diagram For Inventory System
11. State Chart Diagram And Activity Diagram For Inventory System
12. Component Diagram, Deployment Diagram, Forward Engineering And Reverse Engineering For Inventory System

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

09CS324 WEB TECHNOLOGY LAB

Credit: 0: 0: 2

1. Designing a Website
2. Designing a Scientific Calculator Using VB-Script
3. Form Validation Using VB-Script
4. Online Cake Shopping Using ASP
5. Online Shopping Using Cookies
6. Working with SSI
7. Online Shopping Using Cookies
8. Online Railway Ticket Reservation Using Server Object
9. Working with Ado Object
10. Introduction to Macromedia Flash
11. Movie Creation Using Macromedia Flash
12. Designing a Greeting Card Using Photoshop

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

COMPUTER SCIENCE AND ENGINEERING

S.No.	Subject Code	Subject Name	Total Credits
1	10CS101	Programming in C	4:0:0
2	10CS201	C# and .NET Programming	3:0:0

10CS101 PROGRAMMING IN C

Credits: 4:0:0

Course Objectives:
- To provide students with a basic understanding of programming language design.
- To emphasize the conceptual design and implementation of programming languages.

UNIT I
Introductory Concepts **-** Introduction to Computers– What is a Computer – Block Diagram of Computer – Computer Characteristics – Hardware vs Software – How to Develop a Program – Modes of Operation – Types of Programming Languages – Introduction to C – Desirable Program Characteristics - Introduction to C Programming **-** The C Character Set – Writing First Program in C - Identifiers and Keywords – A More Useful C Program – Entering the Program into the Computer – Compiling and Executing the Program - Data Types – Constants – Variables and Arrays – Declarations – Expressions – Statements – Symbolic Constants- Operators and Expressions **-** Arithmetic Operators – Unary Operators – Relational and Logical Operators – Assignment Operators – The Conditional Operator – Library Functions.

UNIT II
Data Input and Output **–** Preliminaries - Single Character Input & Output – Entering Input Data – More About scanf Function - Writing Output Data – More About printf Function – The Gets and Puts Functions – Interactive Programming-Preparing and Running a Complete C Program **–** Planning a C Program- Writing a C Program – Error Diagnostics – Debugging Techniques-Control Statements – Preliminaries – Branching – Looping – More Looping – Still More Looping - Nested Control Structures – The switch, break, continue, comma statements – The Goto Statement.

UNIT III
Functions Defining a Function – Accessing a Function – Function Prototypes – Passing Arguments to a Function – Recursion- Program Structure - Storage Classes – Automatic Variables – External Variables – Static Variables – Multifile Programs – More About Library Functions Arrays: Defining an Array – Processing an Array – Passing Arrays to Functions – Multidimensional Arrays – Arrays and Strings.

UNIT IV
Pointers - Fundamentals – Pointer Declarations – Passing Pointers to Functions – Pointers and One-Dimensional Arrays – Dynamic Memory Allocation - Operations on Pointers – Pointers and Multidimensional Arrays – Arrays of Pointers – Passing Functions to other Functions- Structures & Unions - Defining a Structure – Processing a Structure – User-Defined Data Types – Structures and Pointers -Passing Structures to Functions – Self Referential Structures - Unions.

UNIT V

Data Files – Why Files - Opening and Closing a Data File – Reading and Writing a Data File – Processing a Data File – Unformatted Data Files – Concept of Binary Files-Low level Programming –Register variables-Bitwise operations-Bit fields- Additional Features of C – Enumerations – Command Line Parameters.

Text Book:
1. Byron S. Gottfried, *Programming with C*, Second Edition, Tata McGraw Hill, Indian Adapted Edition, 2006. ISBN: 0-07-059369-8.

Reference Books:
1. Yashvant Kanetkar, *Let us C,* Seventh edition, BPB publications, 2007. ISBN: 81-8333-163-7.
2. K.R.Venugopal, S.R.Prasad, *Mastering C*, Tata McGraw Hill, 2007. ISBN: 10:0-07-061667-1.
3. E. Balaguruswamy, *Computing fundamentals and C Programming*, Tata McGraw Hill, 2008. ISBN: 0-07-066909-0.

10CS201 C# AND .NET PROGRAMMING

Credits: 3:0:0

Course Objectives:
- To introduce core and advanced programming constructs in C# and .NET platform.
- To develop windows and web applications along with data access methods.

UNIT I

.NET Architecture: The Relationship of C# to .NET - The Common Language Runtime - A Closer Look at Intermediate Language – Assemblies - .NET Framework Classes – Namespaces - Creating .NET Applications Using C# - The Role of C# in the .NET Enterprise Architecture. C# Basics: First C# Program – Variables - Predefined Data Types - Flow Control, Enumerations – Arrays – Namespaces - The Main() Method - More on Compiling C# Files - Console I/O - The C# Preprocessor Directives - C# Programming Guidelines. Objects and Types: Classes and Structs - Class Members - Anonymous Types – Structs - Partial Classes - Static Classes - The Object Class - Extension Methods. Inheritance: Types of Inheritance - Implementation Inheritance – Modifiers – Interfaces. Arrays: Simple Arrays - Multidimensional Arrays - Jagged Arrays - Array Class - Array and Collection Interfaces – Enumerations.

UNIT II

Operators and Casts: Operators - Type Safety - Operator Overloading - User-Defined Casts. Delegates and Events: Delegates – Events. Strings and Regular Expressions: System.String - Regular Expressions. Collections: Collection Interfaces and Types – Lists - Queues – Stacks - Linked Lists - Sorted Lists – Dictionaries – HashSet - Bit Arrays – Performance.

UNIT III

Memory Management and Pointers: Memory Management under the Hood - Freeing Unmanaged Resources. Reflection: Custom Attributes – Reflection. Errors and Exceptions: Exception Classes - Catching Exceptions - User-Defined Exception Classes. Assemblies: What Are Assemblies? - Creating Assemblies. Threading and Synchronization: Overview - Asynchronous Delegates -The Thread Class – Synchronization.

UNIT IV

Data Access: ADO.NET Overview - Using Database Connections – Commands - Fast Data Access: The Data Reader - Managing Data and Relationships: The DataSet Class - XML Schemas: Generating Code with XSD – Working with ADO.NET. Windows Forms: Creating a Windows Form Application - Control Class - Standard Controls and Components – Forms. Data Binding: The DataGridView Control - DataGridView Class Hierarchy - Data Binding - Visual Studio .NET and Data Access.

UNIT V

ASP.NET Pages: ASP.NET Introduction - ASP.NET Web Forms - ADO.NET and Data Binding. ASP.NET Development: User and Custom Controls - Master Pages - Site Navigation – Security – Themes - Web Parts. ASP.NET AJAX: What Is Ajax - What Is ASP.NET AJAX - Using ASP.NET AJAX.

Text Book:
1. Christian Nagel, Bill Evjen, Jay Glynn, Morgan Skinner, Karli Watson, *Professional C# 2008,* Wiley Publishing, Inc., 2008. ISBN: 978-8-126-51627-8.

Reference Books:
1. Andrew Troelson, *Pro C# 2008 and the .NET 3.5 Platform,* Apress, Fourth Edition, 2007. ISBN: 978-81-8128-878-3.
2. Kogent Solutions, *C# 2008 Programming: Covers .net 3.5 Black Book,* Dreamtech Press, Platinum Edition, 2009. ISBN: 8177228323.

SCHOOL OF COMPUTER SCIENCE AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Subject Code	Subject Name	Total Credits
10CS301	Advanced Database Technologies	3:0:0
10CS302	Advanced Operating Systems	3:0:0
10CS303	Distributed Systems	4:0:0
10CS304	Real Time Systems	4:0:0
10CS305	Design and Analysis of Algorithms	4:0:0
10CS306	Cryptography and Network Security	4:0:0
10CS307	Database Security	4:0:0
10CS308	Web Security	4:0:0
10CS309	Information Security	4:0:0
10CS310	Information Security Audit and Assurance	4:0:0
10CS311	Computing Security Lab	0:0:2

10CS301 ADVANCED DATABASE TECHNOLOGIES

Credits: 3:0:0

Course Objectives:
- To provide extensive knowledge on Database Management Systems.
- To cover the advanced topics in database technologies.
- To provide an application-oriented and system-oriented approach towards database design.

Unit I

Overview of Query Evaluation: The System catalog- introduction to Operator Evaluation-Algorithms for Relational Operators-Introduction to Query Optimization-Alternative Plans: A motivating example- What a typical optimizer Does-Overview of Transaction Management: The ACID Properties-Transactions and Schedules-Concurrent Execution of Transaction-Lock-Based Concurrency Control-Performance of Locking-Transaction Support in SQL-Introduction to Crash Recovery.

Unit II

Concurrency Control: 2PL, Serializability and Recoverability-Introduction to Lock Management-Lock Conversion-Dealing with Deadlock-Specialized Locking Techniques-Concurrency Control without Locking. Crash Recovery: Introduction To ARIES –The Log: Other Recovery-Related Structures-The Write-ahead Log Protocol –Check Pointing-Recovering from a System Crash –Media Recovery.

Unit III

Physical Database Design and Tuning : Introduction to Physical Database Design – Guidelines for Index Selection-Clustering and Indexing –Tools to Assist Index Selection –Overview of Database Tuning –Choices in Tuning the Conceptual Schema-Choices in Tuning Queries and Views –Impact of Concurrency- Case Study: The Internet Shop. Security and Authorization: Introduction to Database Security-Access Control-Discretionary and Mandatory Access Control-Security for Internet Application – Additional Issues Related to Security.

Unit IV

Parallel and Distributed Databases: Architecture for Parallel Databases-Parallel Query Evaluation- Parallelizing Individual Operations-Parallel Query Optimization-Types of Distributed Databases –Distributed DBMS Architecture-Storing Data in Distributed DBMS- Distributed Catalog Management-Distributed Query Processing-Updating Distributed Data-Distributed Transaction-Distributed Concurrency Control-Distributed Recovery.

Unit V

Information retrieval and XML Data: Colliding Worlds: Databases, IR and XML – Introduction to Information retrieval –Indexing for Text Search-Web Search Engines-Managing Text in a DBMS-A Data Model for XML –X Queries: Querying XML Data – Efficient Evaluation of XML Queries. Spatial Data Management: Types of Spatial Data and Queries-Application involving Spatial Data-Introduction to Spatial Indexes-Indexing Based on Space Filling Curves-Grid files –R-Trees –Issues in High Dimensional Indexing.

Text Book:
1. Raghu Ramakrishnan & Johannes Gehrke, *Database Management Systems*, Third edition, Tata McGraw Hill, 2003. ISBN: 0-07-115110-9 (ISE).

Reference Books:
1. Elmasri & Navathae, *Fundamentals of Database Systems*, Third Edition, Pearson Education, 2004. ISBN: 81-297-0228-2.
2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, *Database System Concepts*, Fifth Edition, McGraw-Hill Publication, 2006. ISBN: 007-124476-X.
3. Thomas Connolly, Carolyn Begg, *Database Systems – A Practical Approach to Design, Implementation, and Management*, Third Edition, Pearson Education, 2002. ISBN: 81-7808-861-4.

10CS302 ADVANCED OPERATING SYSTEMS

Credits: 3:0:0

Course Objectives:
- To provide comprehensive and up-to-date coverage of the major developments in distributed Operating System, Multi-processor Operating System and Database Operating System
- To cover important theoretical foundations including Process Synchronization, Concurrency, Event ordering, Mutual Exclusion, Deadlock, Agreement Protocol, Security, Recovery and fault tolerance.

Unit I

Overview, Synchronization Mechanisms, Architectures of Distributed Systems, Theoretical Foundations. Distributed Mutual Exclusion: Preliminaries, A Simple solution to distributed mutual exclusion, Non-Token Based Algorithm, Lamport's Algorithm, Ricart Agrawala algorithm. Distributed Deadlock detection, Agreement Protocols: System Model, Classification of Agreement Problem, solution to byzantine agreement problem.

Unit II

Distributed File Systems, Distributed Shared memory, Distributed Scheduling.

Unit III
Failure Recovery and Fault Tolerance-Recovery, Fault Tolerance.

Unit IV
Protection and Security-Resource Security and protection: Introduction, Preliminaries, Access Matrix Model, Implementation of Access Matrix, safety in Access matrix model. Multiprocessor Operating systems-Multiprocessor System Architectures.

Unit V
Database Operating Systems-Introduction to Database Operating systems, Concurrency Control, Theoretical Aspects, Concurrency Control Algorithms.

Text Book:
1. Mukesh Singhal, Niranjan G.Shivaratri, *Advanced Concepts in Operating Systems: Distributed, Database, and Multiprocessor Operating Systems,* Tata McGraw-Hill, 2001. ISBN: 0-07-047268-8.

Reference Books:
1. Mary Gorman, Todd Stubbs, *Introduction to Operating Systems: Advanced Course*, Course Technology, 2001. ISBN: 0619059443.
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, *Operating System Principles,* John Wiley and Sons, Seventh Edition, 2006. ISBN: 9812-53-176-9.

10CS303 DISTRIBUTED SYSTEMS

Credits: 4:0:0

Course Objectives:
- To introduce the concepts of resource sharing, system modeling, inter-process communication and file systems in distributed systems.
- To inculcate the skill sets in name services and global states, distributed transaction and concurrency model, distributed shared memory and distributed multimedia system.

Unit I
Introduction to Distributed systems - Examples of distributed systems, resource sharing and the web, challenges – System model – introduction - architectural models - fundamental models - Introduction to inter-process communications – API for Internet protocol - external data representation and marshalling- client server communication - group communication – case study.

Unit II
Distributed objects and File system: Introduction - Communication between distributed objects - Remote procedure call - Events and notifications – case study – Operating system support – introduction – operating system layer – protection – process and threads – communication and invocation – architecture - Introduction to DFS - File service architecture - Sun network file system – Andrew file system – Enhancements and future developments.

Unit III
Name services and Global states: Introduction to Name Services- Name services and DNS - Directory services – case study – Introduction to peer-to-peer systems – Napster

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and its legacy – Peer-to-peer middleware – Routing overlays – case study - Introduction to time and global states - Clocks, Events and Process states - Synchronizing physical clocks - Logical time and logical clocks - Global states - Distributed debugging.

Unit IV

Distributed transaction and Concurrency control: Introduction to coordination and agreement - Distributed mutual exclusion – elections – multicast communication – consensus and related problems – Introduction to transaction and concurrency control - Transactions – Nested transaction – Locks - Optimistic concurrency control - Timestamp ordering - Comparison of methods for concurrency control - Introduction to distributed transactions - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery.

Unit V

Replication and Distributed multimedia system: Introduction to Replication - System model and group communications – Fault tolerant services – Highly available services – Transactions with replicated data - Distributed multimedia systems – characteristics of multimedia data – quality of service management – resource management – stream adaptation – case study - Distributed shared memory – design and implementation issues – sequential consistency and Ivy – release consistency and munin – other consistency models.

Text Book:
1. George Coulouris, Jean Dollimore, and Tim Kindberg, *Distributed Systems Concepts and Design,* Fourth edition, Addison-Wesley, 2005. ISBN: 0321263545.

Reference Books:
1. Andrew S. Tanenbaum and Maartenvan Steen, *Distributed Systems: Principles and Paradigms,* Second edition, Prentice Hall, 2006. ISBN: 0132392275.
2. William Buchanan, Distributed *Systems and Networks*, McGraw-Hill, 2001. ISBN: 0077095839.
3. Pradeep K. Sinha, *Distributed Operating Systems*: *Concepts and Design*, Wiley-IEEE Press, 1996. ISBN: 0780311191.

10CS304 REAL TIME SYSTEMS

Credits: 4:0:0

Course Objective:
- To study the fundamental concepts, the algorithms and protocols for scheduling and validating of real-time systems.
- To learn the design and evaluation issues in real-time systems.

Unit I

Introduction: A Car-Driver Example – Issues in Real-time Computing – Structure of a Real-Time System – Task Classes. Hard Versus Soft Real time Systems: Jobs and Processors – Real times, Deadlines and Timing constraints – Hard and Soft timing constraints – Hard Real time systems – Soft Real time systems – A Reference model of Real time systems: Processors and resources – Temporal parameters of Real time workload – Periodic task model – Precedence constraints and data dependency – Other

types of dependencies – Functional Parameters – Resource Parameters of Jobs and Parameters of resources – Scheduling hierarchy. Commonly used approaches to Real time scheduling: Clock driven approach – Weighted round robin approach – Priority Driven approach – Dynamic versus Static systems – Effective Release times and Deadlines – Optimality of EDF and LST – Challenges in validating timing constraints in Priority driven systems – Offline versus Online scheduling.

Unit II
Clock-driven scheduling: Notations and assumptions – Static Timer driven scheduler – General structure of Cyclic schedules – Cyclic executives – Improving average response time of Aperiodic jobs – Scheduling Sporadic jobs – Practical considerations – Algorithm for constructing Static schedules – Pros and Cons of Clock driven scheduling. Priority-driven scheduling of Periodic jobs: Static assumptions – Fixed priority versus Dynamic priority algorithms – Maximum schedulable utilization – Optimality of RM and DM algorithms - Practical factors.

Unit III
Scheduling aperiodic and Sporadic Jobs in Priority Driven Systems: Assumptions and Approaches – Deferrable servers – Sporadic servers – Constant Utilization, Total bandwidth and weighted fair – queuing servers – Slack stealing in Deadline-Driven Systems – Slack stealing in Fixed-Priority Systems.

Unit IV
Resources and Resource Access Control: Assumptions on resources and their usage – Effects of resource contention and resource access control – Non-preemptive Critical Sections – Basic Priority Inheritance Protocol – Basic Priority Ceiling Protocol - Stack Based Priority ceiling Protocol – Use of Priority Ceiling Protocol in Dynamic Priority System – Preemption Ceiling Protocol - Controlling access to multiple unit resources - Controlling concurrent accesses to data objects.

Unit V
Real-time Databases: Introduction – Basic Definitions – Real-time vs. General-purpose databases – Main memory databases – Transaction priorities – Transaction aborts – Concurrency control issues – Disk Scheduling algorithms – A two-phase approach to improve predictability – Maintaining serialization consistency – Databases for hard real-time systems. Fault-tolerant Techniques: Introduction – What causes failures – Fault types – Fault Detection – Fault and Error Containment – Redundancy – Data diversity – Reversal Checks – Malicious or Byzantine Failures – Integrated failure handling.

Text Books:
1. Jane W.S. Liu, *Real-Time Systems*, Pearson Education, 2000. ISBN: 81 - 7758 - 575 - 4.
2. C. M. Krishna, Kang G. Shin, *Real-Time Systems*, McGraw-Hill International Edition. ISBN: 0-07-114243-6.

Reference Book:
1. Phillip A. Laplante, *Real-Time Systems Design and Analysis,* Prentice Hall of India, Third Edition, 2004. ISBN 0-471-22855-9.

10CS305 DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 4:0:0

Course Objectives:
- To provide a rigorous introduction to advanced algorithms that implement strategies for solving more complicated problems including dynamic programming techniques, greedy algorithms, and amortized analysis.
- To develop classical graph and combinatorial algorithms for problems such as sorting, shortest paths and minimum spanning trees.
- To discuss engineering issues in algorithm design.

Unit I
Role of Algorithms in computing - Insertion sort - Analyzing algorithms - Designing algorithms - Growth of Functions - Recurrences - Probabilistic Analysis and Randomized Algorithms.

Unit II
Heapsort – Maintaining and building the heap - The heapsort algorithm-priority Queues - Quicksort – description – performance - randomized version – analysis - Sorting in Linear Time - Elementary Data Structures - Hash Tables - Binary Search Trees.

Unit III
Red-Black Trees – properties – rotations – insertions – deletions - Dynamic Programming - Greedy Algorithms - aggregate analysis - the accounting method - the potential method – Dynamic tables - B-Trees - basic operations – deletion.

Unit IV
Elementary Graph Algorithms – representations - BFS – DFS - Topological sort - Strongly connected components - Minimum Spanning Trees - Single-Source Shortest Paths - Shortest path and matrix multiplication - The Floyd Warshall algorithm - Johnson's algorithm for sparse graphs.

Unit V
Linear Programming - Standard and slack forms - Formulating problems as linear programs - The simplex algorithm – Duality - The initial basic feasible solution - Polynomials and the FFT -NP-completeness.

Text Book:
1. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Clifford Stein, *Introduction to Algorithms*, Second Edition, Prentice-Hall India, 2001. ISBN: 8120321413.

Reference Book:
1. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Clifford Stein, *Introduction to Algorithms*, Third Edition, Prentice-Hall India, 2009. ISBN-10: 0262033844, ISBN-13: 978-0262033848.
2. Michael T. Goodrich, Roberto Tamasia, *Algorithm Design*, First Edition, John Wiley & sons, 2001. ISBN: 0471383651.

10CS306 CRYPTOGRAPHY AND NETWORK SECURITY

Credits: 4:0:0

Course Objectives:
- To highlight on fundamental principles and practices of cryptography and network security.
- To understand the principles of cryptographic algorithms.
- To have a detailed knowledge about authentication, hash functions and application level security mechanisms.

Unit I
Security trends – OSI Security Architecture – Security Attacks – Security Services – Security mechanisms – A Model for Network Security – Symmetric Cipher Model – Substitution Techniques- Transposition Techniques - Block Cipher Principles – The Data Encryption Standard – The Strength of DES – Differential linear cryptanalysis Block cipher design principles – Evaluation criteria for AES - The AES Cipher.

Unit II
Multiple Encryption and Triple DES – Block Cipher Modes of Operation – Stream cipher and RC4 – Placement of Encryption function - Traffic confidentiality - Key Distribution- Principle of Public Key Cryptosystems – The RSA Algorithm – Key management - Diffie Hellman Key Exchange – Elliptic curve cryptography.

Unit III
Message Authentication and Hash functions: Authentication requirements-Authentication functions - Message Authentication codes - Hash functions - Security of hash functions and MAC's - Secure hash Algorithm – Whirlpool – HMAC – CMAC – Digital Signatures – Authentication protocols –Digital signature standard - Kerberos – X.509 Authentication Service – Public Key Infrastructure.

Unit IV
Pretty Good Privacy – S/MIME – IP Security Overview - IP Security Architecture – Authentication Header – Encapsulating Security Payload – Combining Security Associations, Key management.

Unit V
Web Security Considerations – Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction – Intruders – Intrusion Detection – Password Management – Viruses and related threads – Virus countermeasures – Distributed denial of services attack - Firewall Design principles – Trusted System – Common Criteria for Information Technology Security Evaluation.

Text Book:
1. William Stallings, *Cryptography and Network Security: Principles and Practices*, Fourth Edition. ISBN: 978-81-7758-774-6.

Reference Books:
1. Man Young Rhee, Internet Security, Wiley, 2003. ISBN: 0-470-85285-2.
2. Bruce Schneier, *Applied Cryptography: Protocols, Algorithms and Source code in C*, Second Edition, Pearson Education. ISBN: 9971-51-348-X.

10CS307 DATABASE SECURITY

Credits: 4:0:0

Course Objectives:
- To learn the security issues pertaining with database servers.
- To survey the security problems existing in popular database systems.

Unit I
Introduction: Need for Database Security, Oracle architecture, Attacking Oracle, Oracle: Moving Further into the Network, Securing Oracle.

Unit II
DB2: IBM DB2 Universal Database, DB2 Discovery, attack, Defense, Securing DB2. Informix: Information Architecture, Informix: Discovery, attack, defense, Securing Informix.

Unit III
Sybase ASE: Sybase Architecture, Sybase: Discovery, Attack, and Defense, Moving further into the network, Securing Sybase.

Unit IV
MySQL: MySQL Architecture, Discovery, attack and Defense, MySQL: Moving further into network, Securing MySQL.

Unit V
SQL Server: SQL server Architecture, Exploitation, Attack, Defense, Securing SQL Server.

Text Book:
1. David Litchfield, John Heasman, *Defending Database Servers-The Database Hacker's Handbook*, Wiley Dreamtech India (P) Ltd, 2005,ISBN: 81-265-0615-6.

Reference Books:
1. Ron Ben Natan, *Implementing Database Security and Auditing*, Elsevier, 2005. ISBN: 81-312-0134-1.
2. Ramez Elmasri, Navathe, "*Fundamentals of Database System*", Fifth Edition, 2007. ISBN: 0-321- 36957-2.

10CS308 WEB SECURITY

Credits: 4:0:0

Course Objectives:
- To create awareness of legal and ethical issues in securing web.
- To impart basic knowledge on security threats and prevention techniques at the user level, server level and transaction level on the web.

Unit I
Introduction to Web Security: The architecture of World Wide Web, Common threats on the Web, The Web Security Landscape-User Security, Web Server Security, Security of data transaction between user and the web server; Cryptography Basics, Cryptography and the Web.

Unit II

User Level Security: Privacy-protection Techniques, Privacy-protecting Technologies, Backups and Antitheft, Mobile Code I: Plugin's, ActiveX; Mobile Code II: Java, JavaScript, Flash and Shockwave; Digital Certificates- Digital Identification Techniques, Certification Authorities and Server Certificates, Client Side Digital Certificates, Code signing and Microsoft's Authenticode.

Unit III
Server Level Security: Physical security of servers, Host security for servers, securing web applications, Deploying SSL server certificates, Securing your Web Service, Controlling access to your web content, Secure CGI/API programming.

Unit IV
Transaction level security and security infrastructure: SSL/TLS protocol, Secure Authentication and Messaging, understanding public key infrastructure, Firewall solutions, Intrusion Detection System, Disaster Recovery & Backups.

Unit V
Commerce and Legal issues: Digital Payments, Blocking Software and Censorship Technologies, Legal issues: civil; Legal issues: Criminal, Intellectual Property and Actionable Content.

Text Book:
1. Simpson Garfinkel, Gene Spafford, *Web Security, Privacy and Commerce*, O'REILLY, Second Edition, 2002. ISBN: 978-0-596-00045-5.

Reference Books:
1. Shweta Bhasin, *Web Security Basics*, Premier Press, 2003. ISBN: 1-59200-006-1.
2. Simpson Garfinkel, Eugene H. Spafford, *Web Security and Commerce,* O'REILLY, First Edition. ISBN:1-56592-269-7.

10CS309 INFORMATION SECURITY

Credits: 4:0:0

Course Objective:
- To provide students with an exposure about Security System Development Life Cycle.

Unit I
Introduction to Information Security: Introduction – The History of Information Security – What is Security – What is Information Security – Critical Characteristics of Information – NSTISSC Security Model – Components of an Information System – Securing the Components – Balancing Security and Access – Top-Down Approach to Security Implementation – The Systems Development Life Cycle – The Security Systems Development Cycle. The Need for Security: Introduction – Business Needs First, Technology Needs Last – Threats – Attacks.

Unit II
 Legal, Ethical and Professional Issues in Information Security: Introduction – Law and Ethics in Information Security – Types of Law – Relevant U.S Laws – International Laws and Legal Bodies – Policy Versus Law – Ethical Concepts in Information Security – Codes of Ethics, Certifications and Professional Organizations – Organizational Liability

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and the Need for Counsel. Risk Management: Identifying and Assessing Risk: Introduction – Risk Management – Risk Identification – Risk Assessment – Documenting Results of Risk Assessment.

Unit III

Risk Management: Assessing and Controlling Risk: Introduction – Risk Control Strategies – Risk Mitigation Strategy Selection – Categories of Controls – Feasibility Studies – Risk Management Discussion Points – Documenting Results – Recommended Practices in Controlling Risk. Blueprint for Security: Introduction – Information Security Policy, Standards and Practices – Information Classification – Systems Design – Information Security Blueprints – ISO 17799/BS 7799 – NIST Security Models – VISA International Security Model – Hybrid Framework for a Blueprint of an Information Security System – Security Education, Training and Awareness Program – Design of Security Architecture.

Unit IV

Planning for Continuity: Introduction – Continuity Strategy – Business Impact Analysis – Incident Response Planning – Incident Reaction – Incident Recovery – Automated Response – Disaster Recovery Planning – Business Continuity Planning – Model for a Consolidated Contingency Plan – Law Enforcement Involvement. Security Technology: Introduction – Physical Design of the SecSDLC – Firewalls – Dial-up Protection – Intrusion Detection Systems – Scanning and Analysis Tools – Content Filters – Trap and Trace – Cryptography and Encryption-based solutions – Access Control Devices.

Unit V

Physical Security: Introduction – Access Controls – Fire Safety – Failure of Supporting Utilities and Structural Collapse – Interception of Data – Mobile and Portable Systems – Special Considerations for Physical Security Threats. Security and Personnel: Introduction – The Security Function Within an Organization's Structure – Staffing the Security Function – Credentials of Information Security Professionals – Employment Policies and Practices – Security Considerations for Nonemployees – Separation of Duties and Collusion – Privacy and the Security of Personnel Data.

Text Book:
1. Michael E. Whitman, Herbert J. Mattord, *Principles of Information Security*, Thompson Course Technology, 2003. ISBN: 981-243-862-9.

Reference Books:
1. Timothy P. Layton, *Information Security Design, Implementation, Measurement and Compliance,* Auerbach Publications, 2007. ISBN: 0-8493-7087-6.

10CS310 INFORMATION SECURITY AUDIT AND ASSURANCE

Credits: 4:0:0

Course Objective:
- To provide students the foundation for Information Technology Audit and Control.

Unit I

Information Technology Environment: Controls and Audit – Audit and Review: Its Role in Information Technology – The Audit Process in an Information Technology Environment.

Unit II
IT Strategy and Standards – Planning and Controlling – Project Management.

Unit III
Quality Management - Software Acquisition – Application Risk and Controls.

Unit IV
IT Operations Environments: Complexities and Control Issues – Operational Control Issues –Assessing Risk in IT Operations.

Unit V
The Legal Environment and its Impact on Information Technology: From IT Crime Law to IT Contract Law to Netlaw – Security and Privacy of Information Technology: From the Individual to the Extranet/Intranet/Internet – IT Auditing: Career Planning and Development, Evaluating Audit Quality and Best Practices.

Text Book:
1. Frederick Gallegos, Sandra Senft, Daniel P. Mason, Carol Gonzales*, Information Technology Control and Audit*, Auerbach Publications, Second Edition, 2004. ISBN: 0-8493-2032-1.

Reference Books:
1. Jagdish Pathak, *Information Technology Auditing: an Evolving Agenda,* Springer, 2005. ISBN: 3-540-22155-7.

10CS311 COMPUTING SECURITY LAB

Credits: 0:0:2

1. Implement RSA Algorithm
2. Implement DES Algorithm
3. Write a java program to implement digital signatures.
4. Write a program based on CAPTCHA to prevent DOS attacks.
5. Demonstrate buffer overflow problem and write a program to prevent it.
6. Write a program to prevent simple SQL injection attacks.
7. Write a java program to provide secure group communication.
8. Write a program to address data aggregation problem in databases.
9. Create a web application that provides secure access to database.
10. Demonstrate the use of trusted applets.

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

SCHOOL OF C.S.T.
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Subject Code	Subject Name	Credit
10CS401	Data Warehousing for Business Intelligence	3:1:0

10CS401 DATA WAREHOUSING FOR BUSINESS INTELLIGENCE

Credit 4:0:0

Course Objective:
1. To present leading Data Mining methods and their applications to real world.
2. Defines Business problems and helps to provide solution using business intelligence.

Unit – I
Knowledge discovery process – Data selection – cleaning – Enrichment – coding –Preliminary analysis of the data set using traditional query tools – Visualization techniques –OLAP tools – Decision trees – Neural networks – Genetic algorithms – KDD (Knowledge Discover in Databases) environment

Unit -II
Evolution of Decision Support Systems - The Data Warehouse Environment – The Data Warehouse and Design.

Unit- III
Granularity in the Data Warehouse - The Data Warehouse and Technology – The Distributed Data Warehouse.

Unit-IV
Introduction to Data Integration
Introduction to SSIS Architecture, Introduction to ETL using SSIS; Integration Services objects; Data flow components – Sources, Transformations and Destinations;Working with transformations, containers, tasks, precedence constraints and event handlers.

Unit-V
Introduction to Multi-Dimensional Data Modeling
Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling; Concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema; Introduction to business metrics and KPIs; Creating cubes using SSAS

Text Books
1. Pieter Adriaans, Dolf Zantinge, "data Mining", Addison Wesley, 1996 ISBN: 0-201-40380-3.
2. William H.Inmon, *"Building the data warehouse"*, Wiley Dreamtech (P) Ltd, Fourth Edition, 2005, ISBN:81-265-0645-8. (Chapters 1 – 6).

Reference Book:

1. Sam Anahory, Dennis Murray, *Data Warehousing in the Real World*, Pearson Education (P) Ltd., First Edition 1997, Fifteenth Indian Reprint 2005, ISBN: 81-7808-387-6.
2. Business Intelligence" by David Loshin
3. "Business Intelligence for the Enterprise" by Mike Biere
4. "Business Intelligence Roadmap" by Larissa Terpeluk Moss, Shaku Atre
5. "Successful Business Intelligence: Secrets to making Killer BI Applications" by Cindi Howson
6. "Delivering Business Intelligence with Microsoft SQL server 2008" by Brain, Larson
7. "Foundations of SQL Server 2005 Business Intelligence" by Lynn Langit
8. "Information Dashboard Design" by Stephen Few

SCHOOL OF COMPUTER SCIENCE AND TECHNOLOGY

ADDITIONAL SUBJECTS

S.No.	Subject Code	Subject Name	Credits
1.	11CS101	Programming in C	4:0:0
2.	11CS201	Programming in C Lab	0:0:2
3.	11CS202	Software Engineering	3:0:0
4.	11CS203	C# Programming	3:0:0
5.	11CS301	Communication and Switching Techniques	4:0:0
6.	11CS302	Data Warehouse	4:0:0
7.	11CS303	Mainframe Systems	4:0:0
8.	11CS304	Advanced Data Mining	4:0:0
9.	11CS305	Pervasive Computing	4:0:0
10.	11CS306	Digital Image Processing	4:0:0
11.	11CS307	Microwave Engineering	4:0:0
12.	11CS308	Optical Fiber Communication	4:0:0
13.	11CS309	Parallel Computing	4:0:0
14.	11CS310	Advanced Computer Architecture	4:0:0
15.	11CS311	ASP .NET	4:0:0
16.	11CS312	Internetworking Lab	0:0:2
17.	11CS313	Computer Communication Lab	0:0:2
18.	11CS314	Digital Signal Processing Lab	0:0:2

11CS101 PROGRAMMING IN C

Credits: 4: 0: 0

Objectives:
- 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

Unit I
What is C - Getting started with C-Data Types Revisited-C Instructions- use of Logical Operators-Conditional Operators, Bitwise Operators

Unit II
Control Instruction in C-The Decision Control Structure: if statement-if-else statement, nested if-else, forms of if-The Loop Control Structure: Loops-the while loop-the for loop-the do-while loop-the break statement-the continue statement-the Case Control Structure-Decisions using switch-the goto statement

Unit III
Storage classes in C-Functions: What is a Function-Passing values between functions-Scope Rule of Functions-Calling Convention-One Dicey Issue-Advanced Features of Functions: Function Declaration and Prototypes-Call by value and Call by Reference-Recursion-Adding Functions to the Library-An introduction to Pointers-Pointer notation-Function calls

Unit IV

Arrays: What are Arrays-More on Arrays-Pointers and Arrays-More than One-Dimension Puppetting on Strings: What are Strings--Pointers and Strings-Standard Library String Functions-Two Dimensional Array of Characters-Array of Pointers to Strings-Limitation of Array of Pointers to Strings

Unit V

Enumerated Data Type-Renaming Data Types with typedef-Type Casting - Input/Output in C: Types of I/O-Console I/O Functions-Disk I/O Functions-File Opening Modes-a File-Copy program-fclose()-args and argv-Formatted Disk I/O Functions-Text Mode versus Binary Mode-Record I/O in files Structures: Why use Structures-Array of Structures-Additional Features of Structures-Uses of Structures Unions-Union of Structures

Text Book:
1. Yashavant Kanetkar, Let Us C, Sixth revised edition,2005, Bpb Publications, New Delhi.

Reference Books:
1. Byron S. Gottfried, Programming with C, Second Edition, 1996 (Indian Adapted Edition 2006), Tata McGraw Hill, ISBN 0-07-059369-8.
2. Herbert Schildt, The Complete Reference C, Fourth Edition, 2007, McGraw-Hill Publications.

11CS201 PROGRAMMING IN C LAB

Credits: 0: 0: 2

The following are the threaded exercises that will be conducted through a case study.

1. Usage of input / output library functions
2. Usage of Operators
3. Usage of Branching Control Structures
4. Usage of Looping Control Structures
5. Usage of User Defined Functions
6. Pointers and Functions
7. Usage of One Dimensional Arrays
8. Usage of Two Dimensional Arrays
9. Arrays and Functions.
10. Array of Structures
11. Input & Output using Files
12. Files and Structures.

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

11CS202 SOFTWARE ENGINEERING

Credits: 3: 0: 0

Course Objective:
To learn
* Different life cycle models
* Requirement dictation process.
* Analysis modeling and specification.
* Architectural and detailed design methods.
* Implementation and testing strategies.
* Verification and validation techniques.
* Project planning and management.

Unit I

Introduction: A Generic View of Process – Process Models-Waterfall Model-Incremental Model-Evolutionary Model-Specialized Model-The Unified Process– Agile view of process– Software Project Estimation- Decomposition Techniques -Empirical Estimation models- Specialized Estimation Techniques – Project Scheduling- Risk management

Unit II

Requirement Analysis: System Engineering Hierarchy – System Modeling – Requirements Engineering: Tasks- Initiating The Requirements Engineering Process-Eliciting Requirements-Developing Use Cases- Building the Analysis Models -Negotiating Requirements-Validating Requirements-Data modeling concepts-Scenario based modeling-Flow Oriented Modeling

Unit III

Software Design : Design Concepts – Design Models – Pattern Based Software Design – Software Architecture-Data Design-Architectural Styles and Patterns- Architectural Design – Component – Designing Class Based And Conventional Components – Performing User Interface Design

Unit IV

Software Testing :Strategic approach to software testing-Strategic Issues-Test Strategies for Conventional and Object Oriented Software– Validation Testing – System Testing – Software Testing Fundamentals-– White Box – Basis Path-Control Structure- Black Box testing

Unit V

SCM And Quality Assurance :Software Configuration Management-SCM Process-Software Quality Concepts – Quality Assurance – Software Review– Formal Technical Reviews – Formal Approach To SQA – Reliability – ISO 9000 Quality Standards – SQA Plan

Text Book:
1. Roger Pressman.S., Software Engineering: A Practitioner's Approach, Sixth Edition, McGraw- Hill, 2005. ISBN: 007-124083-7.

Reference Books:
1. Sommerville, Software Engineering, Eighth Edition: Addison Wesley, 2007. ISBN: 032-131379-8.
2. Carl Dichter, Mark Pease, Software Engineering with Perl, Prentice Hall, 2007. ISBN: 013-016965-X.
3. James F Peters, Witold Pedryez, Software Engineering-An Engineering Approach, John Witold Pedrycz, 2004. ISBN: 997-1513099.
4. P. Fleeger, Software Engineering, Third Edition, Prentice Hall, 1999. ISBN: 013-146913-4.
5. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli, Fundamentals Of Software Engineering, Prentice Hall Of India 1991. ISBN: 013-820432-2.

11CS203 C# PROGRAMMING

Credits: 3: 0: 0

Course Objective
- To learn about the .Net platform and introduce the basic object oriented concepts
- To learn about delegates, events, assemblies and remoting
- To provide the knowledge necessary to develop windows and web applications

Unit I

Essential C#: Visual C#.net – data types – operators – statements. C# programming: loops – creating methods – exception handling – working with strings – working with regular expressions. C# object oriented programming: creating classes - creating objects – using access modifiers – creating fields, methods, properties, constructors – structs – static members – destructors – overloading

Unit II
Handling inheritance and delegates: working with inheritance – overriding virtual methods – abstract classes – polymorphism – boxing and unboxing – nested classes and interfaces – delegates - handling events with delegates. Collection and indexers: collections – arrays – array list – queues – stacks – hash tables.

Unit III
Windows applications: basic windows controls – advanced controls – multi window applications. Web applications: web applications – web programming skills – web server controls – advanced windows control.

Unit IV
ADO.NET and Databases: Connections – Data Adapters – Datasets – Data Application – Working with relational databases – Multiple tables in a single dataset – Data views – Data Binding – Complex Binding – Navigating through datasets using bound controls.

Unit V
Assemblies: Creating an assembly – multiple modules in an assembly – Creating Shared assembles- Security in c#. Multithreading & Remoting: multiple threads – sleeping, aborting, suspending, resuming and joining threads – Synchronizing threads – Remoting – SOAP for remoting

Text Book:
1. Steven Holzner, "Microsoft Visual C#.NET 2003", Pearson Education, First Indian reprint, 2004, ISBN: 81-297-0235-5.

Reference Book:
1. Andrew Troelson, "C# and the .Net Platform", Intertech Instructor Series, Second Edition, 2005. ISBN: 81-8128-062-8.

11CS301 COMMUNICATION AND SWITCHING TECHNIQUES

Credits: 4:0:0

Course Objective:
- To learn Switching, Signaling and traffic in the context of telecommunication network.
- To expose through the evolution of switching systems from manual and electromechanical systems to stored-program-controlled digital systems.

Unit I
Introduction: The development of telecommunications-Network structures-Network services-Regulation-Standards-The OSI reference model for open systems interconnection. Telecommunications Transmission: Power levels-Four wire circuits-Digital transmission-Frequency division multiplexing-Time division multiplexing-Transmission performance-Transmission systems

Unit II

Evolution of Switching systems: Message switching-Circuit switching-Manual systems-Functions of a switching system-The Strowger step by step system-Register translator senders-Distribution frames-Crossbar systems-A general trunking –Electronic switching-Reed electronic systems-Digital switching systems. Telecommunications traffic: The Unit of traffic-Congestion-Traffic measurement-A mathematical model-Lost call systems-Queuing systems-Simulation.

Unit III

Switching Networks: Single stage networks- Gradings- Link systems-Grades of service of link systems-Application of graph theory to link systems-Use of expansion-Call packing-Rearrangeable networks-Strict sense nonblocking networks-Sectionalized switching networks. Time division switching: Space and time switching-Time division switching networks-Grades of service of time division switching networks-Non blocking networks-Synchronization.

Unit IV

Control of switching systems: Call processing functions-common control-Reliability, availability and security-Stored program control. Signaling: Customer line signaling-Audio frequency junctions and trunk circuits- FDM carrier systems-PCM signaling-Inter register signaling-Common channel signaling principles-CCITT signaling system no. 6-CCITT signaling system no. 7-Digital customer line signaling.

Unit V

Packet switching: Statistical multiplexing-Local area and wide area networks-Large scale networks-Broadband networks. Networks: Analog networks-Integrated digital networks-Integrated services digital networks-Cellular radio networks-Intelligent networks-Private networks-Numbering-Charging-Routing-Network Management.

Text Book:
1. J.E.Flood, Telecommunications Switching, Traffic and Networks, Pearson Education, 1999, ISBN 978-317-0502-5.

Reference Books:
1. Thiagarajan Viswanathan, Telecommunication Switching Systems and Networks, Prentice Hall of India, 1992, ISBN 81-203-0713-5.
2. Robert G.Winch, Telecommunication Transmission System, Second Edition, Tata Mcgraw-hill Education Private Ltd,2004, ISBN-13:978-0070709706.
3. Wayne Tomasi, Advanced Electronics Communication System, Sixth edition, Prentice Hall of India, 2003. ISBN 013-0453501.

11CS302 DATA WAREHOUSE
Credits: 4:0:0

Course Objective:
- To understand different methods for handling unstructured data in a data warehouse.
- To learn the techniques to store the data across multiple storage media.
- To examine Relational and Multidimensional Models.
- To explore advanced topics, including data monitoring and testing.

Unit I

Evolution of Decision Support Systems - The Data Warehouse Environment – The Data Warehouse and Design.

Unit II
Granularity in the Data Warehouse - The Data Warehouse and Technology – The Distributed Data Warehouse.

Unit III
Executive Information Systems and The Data Warehouse – External Data and The Data Warehouse – Migration to the architectural Environment.

Unit IV
The Data Warehouse and the Web – Unstructured Data and The Data Warehouse – The Really Large Data Warehouse.

Unit V
The Relational and the Multidimensional Models as a Basis for Database and design – Advanced Topics in the Data Warehouse.

Text Book:
1. William H.Inmon, Building the Datawarehouse, Wiley Dreamtech (P) Ltd, Fourth Edition, Reprint 2010, ISBN:81-265-0645-8.

Reference Books:
1. Claudia Imhoff ,Nicholas Galenno, Jonathan G.Geiger, Mastering data warehouse design, Wiley Publishing, First Edition, 2003,ISBN:81-265-0365-3.
2. Paulraj Ponniah, Data Warehousing Fundamentals – A Comprehensive guide for IT Professionals, John Wiley & Sons, First Edition, 2003, ISBN: 981-2-53-012-6.

11CS303 MAINFRAME SYSTEMS

Credits: 4:0:0

Course Objective:
- To understand the basic concepts of the mainframe, including its use and architecture
- To understand the fundamentals of z/OS, a widely used mainframe operating system
- To understand the mainframe workloads and various security issues.

Unit I
Introduction to Mainframe hardware systems - Introduction to virtualization & z/vm – History of z/vm - z/vm basic concepts.

Unit II
System administration tasks - Performance - z/vm security

Unit III
Introduction to Mainframe networking - Hardware connectivity- Sample configuration

Unit IV
System z architecture & security - System z virtualization & its challenges - z/OS system integrity

Unit V
z/OS System Authorization Facility & security managers - Security in z/OS UNIX

Text Books:

1. Lydia Parziale,Edi Lopes Alves,Eli M. Dow, Klaus Egeler, Jason J. Herne, Introduction to the New Mainframe: Z/VM Basics, IBM RedBooks, November, 2007 .
2. Mike Ebbers, Christopher Hastings, Matt Nuttall, Micky Reichenberg, Introduction to the New Mainframe: Networking, IBM RedBooks, August 2006.
3. Rica Weller, Ross Clements,Ken Dugdale, Per Fremstad, Introduction to the New Mainframe: Security, IBM RedBooks, March 2007.

11CS304 ADVANCED DATA MINING

Credits: 4:0:0

Course Objective:
* To provide an in-depth knowledge of building data models, evaluating model's predictive quality and how to apply them in practice.
* To provide practical knowledge of how commercial systems work.

Unit I
Data mining and machine learning - Simple examples - Fielded applications - machine learning and statistics - Generalization as search - Data mining and ethics. Input: Concepts, instances, and attributes. Output: Knowledge representation.

Unit II
Algorithms: Inferring rudimentary rules - Statistical modeling - Divide-and-conquer – Covering algorithm - Mining association rules - Linear model - Instance-based learning - clustering.

Unit III
Credibility: Training and testing - predicting performance, - cross-validation - other estimates - comparing data mining methods - predicting probabilities - counting cost - evaluating numeric prediction - The minimum description length principle - Applying the MDL principle to clustering.

Unit IV
Implementations: Real machine learning schemes: Decision trees - Classification rules – Clustering - Bayesian networks. Extension and applications.

Unit V
The Weka Machine Learning Workbench: Introduction to Weka – The Explorer – The Knowledge Flow Interface

Text Book:
1. Ian H. Witten, Eibe Frank, Data Mining Practical Machine Learning Tools and Techniques, Elsevier, Second Edition, 2005, ISBN 81 – 312 – 0050 – 7.

Reference Books:
1. Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques, Chris Ullman, Morgan Kaufmann Publishers, 2001, ISBN 81 – 8147 – 049 – 4.
2. David Hand, Heikki Mannila and Padhraic Smyth, Principles of Data Mining, The MIT Press, 2001. ISBN-10: 026208290X

11CS305 PERVASIVE COMPUTING

Credits: 4:0:0

Course Objective:
* To gain an insight into future developments in the field of pervasive computing.
* To provide an in depth knowledge on pervasive computing and wireless networking.

- To describe the variety of pervasive services and applications.

Unit I
What Pervasive Computing is all About: Times are Changing-Decentralization continues- Applied Pervasive computing-Pervasive computing principles-Pervasive Information Technology. Devices: Information Access Devices-Handheld Computers-Sub-Notebooks- Phones. Smart Identification**:** Smart Cards-Smart Labels. Embedded Controls: Smart sensors and Actuators-Smart Appliances-Appliances and Home Networking-Automotive Computing.

Unit II
Entertainment Systems**:** Television Systems-Game Consoles. Operating Systems**:** Windows CE, -Palm OS-Symbian EPOC-Java Card-Windows for Smart Cards. Middleware Components: Programming Consumer Devices-Smart Card Programming-Messaging Components-Database Components.

Unit III
WAP**:** The WAP Architecture-Wireless Application Environment. Connectivity**:** Wireless Wide Area Networks-Short Range Wireless Communication-Home Networks. Service Discovery: Universal Plug and Play-Jini-Salutation.

Unit IV
Gateways: Connectivity Gateway-Wireless Gateway-Transcoding-Residential Gateway. Web Application Servers: Architecture and Components-WebSphere Application Server WebSphere Everyplace Suite-Oracle Portal-to-Go. Device Management**:** Tasks of Device Management Systems-Tivoli Device Support Infrastructure-User Profiles and Directory Services. Synchronization: What Synchronization is all About-The Challenge of Synchronizing Data-Industry Data Synchronization Standards-Today's Synchronization Solution.

Unit V
Portals and Access Services: Internet Portals-Wireless Portal-Broadcasting Portal. Home Services: The System View-Communication Services-Home Automation-Energy Services- Security Services-Remote Home Healthcare Services. Travel and Business Services: Travel Services-Business Services**.** Consumer Services: Interactive Advertisement-Loyalty-Shopping- Payment Services.

Text Book:
1. Uwe Hansmann, Lothar Merk, Martin S. Nicklous, Thomas Stober, Pervasive Computing Handbook, Springer, 2001, ISBN 3-540-6712.

Reference Book:
1. Asoke K Talukder, Roopa R Yavagal, Mobile computing: Technology, Applications and Service Creation, Tata McGraw-Hill Publishing Company Limited, 2005, ISBN 0 – 07 - 058807 – 4.

11CS306 DIGITAL IMAGE PROCESSING

Credits: 4:0:0

Course Objective:
- To address the basic theory and algorithms that are widely used in digital image processing
- To develop critical thinking about short-comings of the state-of-the-art in image processing
- To provide the learners a useful skill-base to carry out further study and work in the field

Unit I

Introduction-Examples of Fields that use Digital Image processing-Fundamental Steps in Digital Image Processing -Components of an Image Processing System – Image Sensing and acquisition-Image Sampling and Quantization-Basic Relationships between Pixels-Image Enhancement in the spatial domain.

Unit II

Image enhancement in the Frequency Domain: Introduction to the Fourier transform and Frequency Domain –Smoothing Frequency Domain Filters - Sharpening Frequency Domain Filters-Homomorphic filtering

Unit III

Introduction to Wavelets and Multi-resolution Processing – Image compression: Fundamentals - Image compression models-Error free compression-Lossy compression.

Unit IV

Image Segmentation: Detection of discontinuities-Edge Linking and Boundary Detection - Thresholding -Region-Based Segmentation -The Use of Motion in Segmentation

Unit V

Representation and Description: Representation - Boundary Descriptors - Regional Descriptors-Use of Principal Components for Description-relational Descriptors.

Text Book:
1. Rafael .C.Gonzalez and Richard.E.Woods, Digital Image Processing, Second Edition, Addison Wesley, 2002. ISBN 81-7758-168-6.

Reference Book:
1. William K.Pratt, Digital Image Processing, Third Edition, John Wiley, 2002. ISBN 9-814-12620-9.

11CS307 MICROWAVE ENGINEERING

Credits: 4:0:0

Course Objective:
- To learn about microwave and its characteristics
- To analyze microwave network theory and passive devices.
- To learn the applications of microwave.

Unit I

Introduction to Microwave-Basic Transmission Line theory: Transmission Line Equations-Characteristic and Input Impedances – Reflection and Transmission Coefficients – Standing Wave – Mismatch Losses in Transmission Lines - Smith Chart – High Frequency Lines; Propagation of Electromagnetic Waves: Wave Impedance and Propagation – Electromagnetic Wave - Equation, Energy and Power Flow – Poynting Theorem – Equivalent Circuit Parameters of Propagation Lines – Boundary Conditions – Polarization of Waves – Plane Waves in Unbounded medium – Lossy Dielectric – Lossless Dielectric – Good Conductor – Plane Waves at the Interface of two Media – Propagation of Microwaves in Ferrite – Faraday Rotation in Ferrites.

Unit II

Microwave Transmission Lines: Ideal Coaxial Line – Planar Transmission Lines – Wave Guides Types: Rectangular, Circular, Ridge, Surface – Power Handling Capability of Microwave

Transmission Lines; Impedance Transformations for Matching: General Condition- Narrow Band and Broad Band Matching – Tapered Transmission Lines.

Unit III
Microwave Network Theory and Passive Devices: Symmetrical Z and Y Matrices for Reciprocal Network – Scattering or S Matrix Representation of Multiport Network – Microwave Passive Devices

Unit IV
Microwave Resonators: Coaxial Resonators – Waveguide Cavity Resonators – Cavity Excitation and Tuning – Q-Factor of Microwave Cavities – Loaded and External Q – Coupled Cavities – Re-Entrant Cavity – Hole and Slot Cavity – Microstrip Resonators.

Unit V
Microwave Filter: Filter Parameters – Mismatch Effects – Microwave Realization of the Filter Elements – Filter Design – Microwave filters: Low-pass, High-pass, Band-pass and Band-stop filters; Applications of Microwaves: Microwave Radar Systems – Microwave Communication Systems – Industrial Application of Microwaves.

Text Book:
1. Annapurna Das and Sisir K Das, Microwave Engineering, Tata McGraw Hill Publishing Company Ltd, 2000, ISBN 0-07-463577-8.

Reference Books:
1. David M. Pozar, Microwave Engineering, Third Edition, John Wiley, 2005, ISBN 0-471-17096-8.
2. Robert E. Collin, Foundations for Microwave Engineering, Second Edition, McGraw Hill International Edition, 1992, ISBN 0-07-112569-8.

11CS308 OPTICAL FIBER COMMUNICATION
Credits: 4:0:0

Course Objective
- To understand how data is being carried out through light pulses in Optical Fiber cables
- To study the advantages of Optical Fiber Communication
- To understand the existing problems and future possibilities of Optical Fiber Communication

Unit I
Overview of Optical Fiber Communication: Basic Network Information Rates – The Evolution of Fiber Optic Systems – Elements of an Optical Fiber Transmission Link – Simulation and Modeling Tools. Optical Fibers: Structures, Wave guiding, and Fabrication: The Nature of Light – Basic Optical laws and definitions – Optical fiber modes and configurations –Mode theory for circular waveguides – single –mode fibers – Graded-Index fiber structure.

Unit II
Signal Degeneration in Optical Fibers- Attenuation – Signal distortion in optical waveguides – Pulse broadening in graded-index waveguides-Mode coupling. Optical Sources –Light – Emitting Diodes (LEDs)-Laser Diodes.

Unit III

Photodetectors: Physical principles of photodiodes-Photodetector Noise-Detector response time-Avalanche multiple noise. Optical Receiver Operation: Fundamental receiver operation – Digital receiver performance –Preamplifier Types – Analog receivers.

Unit IV

Digital Transmission Systems: Point-to-Point links – Line coding- Noise Effects on System Performance WDM Concepts and Components: Operational principles of WDM-Passive Components – Tunable sources – Tunable Filters.

Unit V

Optical Amplifiers: Basic Applications and Types of Optical Amplifiers – Semiconductor Optical Amplifiers – Erbium-Doped Fiber Amplifiers Optical Networks: Basic Networks – SONET/SDH-Broadcast-and-Select WDM Networks- Wavelength-Routed Networks-Optical CDMA.

Text Book:
1. G. Keiser, Optical Fiber Communications, 3rd Edition, McGraw Hill, 2000, ISBN 0-07-116468- 5.

Reference Book:
1. G.P. Agarwal, Fiber Optic Communication Systems, Second Edition, John Wiley & Sons, New York, 1997, ISBN: 0-471-21571-6.

11CS309 PARALLEL COMPUTING

Credits: 4:0:0

Course Objective:
- To provide a complete end-to-end source on almost every aspect of parallel computing.
- To explain both traditional computer science algorithms as well as scientific computing algorithms.
- To explain MPI, Pthreads and Open MP, the three most widely used standards for writing portable parallel programs.

Unit I

Introduction to Parallel Computing: Motivating Parallelism -Scope of Parallel Computing. Parallel Programming Platforms: Implicit Parallelism: Trends in Microprocessor Architectures - Limitations of Memory System Performance- Dichotomy of Parallel Computing Platforms - Physical Organization of Parallel Platforms -Communication Costs in Parallel Machines - Routing Mechanisms for Interconnection Networks.

Unit II

Principles of Parallel Algorithm Design - Preliminaries - Decomposition Techniques - Characteristics of Tasks and Interactions - Mapping Techniques for Load Balancing – Methods for Containing Interaction Overheads - Parallel Algorithm Models-Basic Communication Operations :One-to-All Broadcast and All-to-One Reduction -All-to-All Broadcast and Reduction - Linear Array and Ring- All-Reduce and Prefix-Sum Operations - Scatter and Gather- All-to-All Personalized Communication-Circular Shift - Improving the Speed of Some Communication Operations .

Unit III

Programming Using the Message-Passing: Principles of Message-Passing Programming – The Building Blocks: Send and Receive Operations - MPI: the Message Passing Interface - Topologies and Embedding - Overlapping Communication with Computation. Collective Communication and Computation Operations - Groups and Communicators.

Unit IV

Programming Shared Address Space: Thread Basics -Why Threads? The POSIX Thread API - Thread Basics: Creation and Termination - Synchronization Primitives in Pthreads – Controlling Thread and Synchronization Attributes - Thread Cancellation - Composite Synchronization Constructs - Tips for Designing Asynchronous Programs OpenMP: a Standard for Directive Based Parallel Programming.

Unit V

Sorting: Issues in Sorting on Parallel Computers - Sorting Networks - Bubble Sort and its Variants - Quicksort - Bucket and Sample Sort - Other Sorting Algorithms Graph Algorithms: Definitions and Representation - Minimum Spanning Tree: Prim's Algorithm - Single-Source Shortest Paths: Dijkstra's Algorithm – All-Pairs Shortest Paths- Transitive Closure- Connected Components - Algorithms for Sparse Graphs.

Text Book:
1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, Introduction to Parallel Computing, Second Edition, Pearson Education, 2004.ISBN 81-297-0407-2

Reference Books:
1. Michael J. Quinn, Parallel computing second edition: theory and practice,1994.ISBN:0-07-051294-9
2. Peter Arbenz**,** Wesley Petersen, W. P. Petersen, Introduction To Parallel Computing, 2004**.** ISBN: 0198515774

11CS310 ADVANCED COMPUTER ARCHITECTURE

Credits: 4:0:0

Course Objective:
- To have a detailed study on computer architecture concepts
- To study on different architectures and design principles
- To study on pipelining, parallel computer models and memory concepts

Unit I

Parallel Computer Models: Introduction, Flynn's classification, Parallel & Vector Computers system Attributes to performance, implicit & Explicit parallelism, shared, Memory Multiprocessors. Uniform and Non-uniform Memory Access and Cache only Memory Access Models, distributed Memory Multicomputers Multivector & SIMD Computers, PRAM and VLSI Models.

Unit II

Fundamentals of Computer Design: Introduction – Measuring and Reporting performance – Quantitative Principles of computer design. Instruction set Principles and Examples: Introduction– Classifying Instruction set Architectures – Memory Addressing – Addressing Modes for signal processing – Type and size of operands

Unit III

Pipelining: Introduction – The Major Hurdle of pipelining – pipeline Hazards – Implementation – Extending the MIPS pipeline to handle multicycle operations

Unit IV

Instruction – Level parallelism: concepts and challenges – overcoming data Hazards with Dynamic scheduling – Dynamic scheduling: Examples and the Algorithm – Reducing Branch costs with Dynamic Hardware Prediction – High Performance instruction delivery – Taking advantage of More ILP with Multiple Issue – Hardware – Based speculation – Studies of the Limitations of ILP – Limitations of ILP for Realizable processors – thread level parallelism

Unit V

Processors and Memory hierarchy: CISC & RISC Architectures, CISC Family, RISC scalar processors, Super Scalar Processors and their features. Very Long Instruction word Architecture vector & Symbolic processors, Memory Hierarchy.

Text Book:
1. John L. Hennessy and David Patterson, Computer Architecture, A Quantitative Approach, Fourth Edition, Elsevier, 2006. ISBN-13: 9780123704900.
2. Kai Hwang, Advanced Computer Architecture, Parallelism, Scalability, Programmability, McGraw-Hill, ISBN 0070316228.

Reference Books:
1. Barry Wilkinson and Michael Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, 2nd Edition, Prentice Hall, 2005. ISBN 0-13-140563-2.
2. K.IIWANG & E.A.BRIGGS, Computer Architecture and Parallel Processor, McGraw-Hill, New York, 1984.
3. H.S.STONE, High Performance Computer Architecture, Addison Wesley, Reading Mass, 1999.
4. W.STALLINGS, Computer Organization & Architecture, Second Edition, 1990.

11CS311 ASP .NET

Credits: 4:0:0

Course Objective:
- To gain experience about developing dynamic websites with ASP.NET in the .Net 3.5 platform.
- To help students to understand about State Management, Building Web forms, Master Pages, Themes, Website navigations, ADO.Net etc.

Unit I

Developing ASP.Net Applications – Visual Studio - Web Form Fundamentals-Web Controls.

Unit II

State Management - Error Handling, Logging, and Tracing: Deploying ASP.Net Applications: ASP.Net Applications and the Web Server.

Unit III

Building Better Web Forms – Validation - Rich Controls - User Controls and Styles – Themes – Master Pages

Unit IV

Website Navigation - Website Security – Security Fundamentals – Membership - Profiles

Unit V

Working With Data - Data Binding - The Data Controls.

Text Book:
1. Matthew MacDonald, Beginning ASP.NET 3.5 in C# 2008. Apress, Berkeley, CA, USA, Second Edition. ISBN: 978-81-8128-902-5

Reference Books:
1. William Sanders, William B. Sanders, ASP.Net 3.5: A Beginner's Guide, McGraw-Hill Professional, 2008, Second Edition, ISBN : 978-00-7159-194-2.
2. Imar Spaanjaars, Beginning ASP.Net 3.5 In C# And VB, Wiley-India, 2009, ISBN: 978-81-2651-624-7.
3. Bill Evjen, Scott Hanselman, Devin Rader, Professional ASP.Net 3.5: In C# and VB, John Wiley & Sons, 2008, ISBN : 978-04-7018-757-9.

11CS312 INTERNETWORKING LAB

Credits: 0:0:2

1. Study of IP Addressing and Subnetting
2. Simulation of ICMP Messages
3. TCP/IP Chatting
4. Simulation of Static Routing
5. OSPF Based Dynamic Routing
6. RIP V2 based Dynamic Routing
7. FTP for File Uploading and Downloading
8. SMTP Mailing System
9. Calculation of Throughput in a LAN
10. Calculation of Packet Delay Ratio in a LAN
11. Simulation of Wireless Adhoc Network
12. Simulation of Wired-cum Wireless Network

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

11CS313 COMPUTER COMMUNICATION LAB

Credits: 0:0:2

1. Study of Magic Tee
2. Study of Directional Coupler
3. Microwave Antenna System Measurement
4. DC Characteristics of Pin PD
5. DC Characteristics of APD
6. DC Characteristics of Laser
7. PI Characteristics of LED and Laser
8. TDM through fiber optic link
9. Levinson Durbin Recursion
10. Study of principles of OTDR operation and optical fiber events

11. Impedance Measurement using Smith Chart
12. Power Spectrum Estimation

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

11CS314 DIGITAL SIGNAL PROCESSING LAB

Credits: 0:0:2

1. Digital Modulation for ASK and FSK using MatLab
2. Digital Modulation for PSK and QPSK using MatLab
3. Digital Modulation for FSK using Simulink
4. Spread Spectrum of a CDMA system
5. Orthogonal Property of a CDMA system
6. Interpolation and Decimation of a signal
7. Measurement of Statistical Parameters of a signal
8. Least Mean Square Algorithm
9. Levinson Durbin Recursion
10. FSK Modulation in AWGN Channel
11. Quadrature Mirror filter
12. Linear and Cyclic codes using Simulink

12 Experiments will be notified by the HOD from time to time. A tentative list is mentioned above.

COMPUTER SCIENCE AND ENGINEERING

LIST OF SUBJECTS

Sub. Code	Name of the Subject	Credits
12CS101	Programming in C	4:0:0
12CS201	Database Systems	3:0:0
12CS202	Object Oriented Analysis and Design	3:0:0
12CS203	Object Oriented Programming in C++	3:0:0
12CS204	Programming in Java	3:1:0
12CS205	Unix Architecture	3:0:0
12CS206	Analysis of Algorithms	3:0:0
12CS207	Data Structures	3:0:0
12CS208	System Software	3:0:0
12CS209	Programming in J2EE	3:0:0
12CS210	Programming in J2ME	3:0:0
12CS211	Operating System	3:0:0
12CS212	Intelligent Systems	3:0:0
12CS213	Principles of Compiler Design	3:1:0
12CS214	Fundamentals of Computer Algorithms	3:0:0
12CS215	Visual Programming	3:0:0
12CS216	Object Oriented Programming in C++ Lab	0:0:2
12CS217	Programming in C Lab	0:0:2
12CS218	System Software and Compiler Lab	0:0:2
12CS219	Database Systems Lab	0:0:2
12CS220	Java Programming Lab	0:0:2
12CS221	Programming in J2EE Lab	0:0:2
12CS222	C# and .NET Programming lab	0:0:2
12CS223	Data structures in C++ Lab	0:0:2
12CS224	Visual Programming Lab	0:0:2
12CS225	Programming in J2ME Lab	0:0:2
12CS226	C# and .NET Programming	3:0:0
12CS227	Unix And Linux Lab	0:0:2
12CS228	Software Engineering	3:0:0
12CS229	C# Programming	3:0:0
12CS230	Theory of Computation	3:1:0
12CS231	Business Intelligence	4:0:0
12CS301	Theory of Computation	4:0:0
12CS302	Software Agents	4:0:0
12CS303	Software Architecture	4:0:0
12CS304	Object Oriented Software Engineering	4:0:0
12CS305	Requirements Engineering	4:0:0
12CS306	Security in Computing	4:0:0
12CS307	Real Time System Software	4:0:0
12CS308	Digital Speech and Image Processing	4:0:0
12CS309	Data Warehousing And Mining	4:0:0
12CS310	Advanced Java	4:0:0
12CS311	Evolutionary Computing	4:0:0
12CS312	Quantum Computing	4:0:0

12CS313	Software Testing	4:0:0
12CS314	Software Metrics and Quality Management	4:0:0
12CS315	Modern Digital Communication Techniques	4:0:0
12CS316	Advanced Database Lab	0:0:2
12CS317	Operating Systems and Networking Lab	0:0:2
12CS318	Software Engineering Lab	0:0:2
12CS319	Software Testing Lab	0:0:2
12CS320	System Development Lab	0:0:2
12CS321	Object Oriented Case Tools Lab	0:0:2
12CS322	Web Technology Lab	0:0:2
12CS323	Advanced Database Technologies	3:0:0
12CS324	Advanced Operating Systems	3:0:0
12CS325	Distributed Systems	4:0:0
12CS326	Real Time Systems	4:0:0
12CS327	Design and Analysis of Algorithms	4:0:0
12CS328	Cryptography and Network Security	4:0:0
12CS329	Database Security	4:0:0
12CS330	Web Security	4:0:0
12CS331	Information Security	4:0:0
12CS332	Information Security Audit and Assurance	4:0:0
12CS333	Computing Security Lab	0:0:2
12CS334	Communication and Switching Techniques	4:0:0
12CS335	Data Warehouse	4:0:0
12CS336	Mainframe Systems	4:0:0
12CS337	Advanced Data Mining	4:0:0
12CS338	Pervasive Computing	4:0:0
12CS339	Digital Image Processing	4:0:0
12CS340	Microwave Engineering	4:0:0
12CS341	Optical Fiber Communication	4:0:0
12CS342	Parallel Computing	4:0:0
12CS343	Advanced Computer Architecture	4:0:0
12CS344	ASP .NET	4:0:0
12CS345	Internetworking Lab	0:0:2
12CS346	Computer Communication Lab	0:0:2
12CS347	Digital Signal Processing Lab	0:0:2
12CS348	Advanced Operating Systems Lab	0:0:2
12CS349	Networking and Security Lab	0:0:2
12CS350	Mainframe Systems Lab	0:0:2

12CS101 PROGRAMMING IN C

Credits: 4:0:0

Course Objectives:
- 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:
Students will be able to

- understand the basics of C programming language.
- understand the emphasis of conceptual design and implementation of programming languages.

Unit I
INTRODUCTION TO C: What is C - Getting started with C-Data Types Revisited-C Instructions- use of Logical Operators- Conditional Operators, Bitwise Operators

Unit II
LOOPS: Control Instruction in C-The Decision Control Structure: if statement-if-else statement, nested ifelse, forms of if-The Loop Control Structure: Loops-the while loop-the for loop-the do-while loopthe break statement-the continue statement-the Case Control Structure-Decisions using switch-the goto statement

Unit III
FUNCTIONS AND POINTERS: Storage classes in C-Functions: What is a Function-Passing values between functions-Scope Rule of Functions-Calling Convention-One Dicey Issue-Advanced Features of Functions: Function Declaration and Prototypes-Call by value and Call by Reference-Recursion-Adding Functions to the Library-An introduction to Pointers-Pointer notation-Function calls

Unit IV
ARRAYS AND STRINGS: Arrays: What are Arrays-More on Arrays-Pointers and Arrays-More than One-Dimension Puppetting on Strings: What are Strings--Pointers and Strings-Standard Library String Functions-Two Dimensional Array of Characters-Array of Pointers to Strings-Limitation of Array of Pointersto Strings

Unit V
ENUMERATIONS, I/O FUNCTIONS, STRUCTURES AND UNIONS: Enumerated Data Type-Renaming Data Types with typedef-Type Casting - Input/Output in C: Types of I/O-Console I/O Functions-Disk I/O Functions-File Opening Modes-a File-Copy program-fclose()-args and argv-Formatted Disk I/O Functions-Text Mode versus Binary Mode- Record I/O in files Structures: Why use Structures-Array of Structures-Additional Features of Structures-Uses of Structures Unions-Union of Structures

Text Book:
1. Yashavant Kanetkar, Let Us C, Sixth revised edition,2005, Bpb Publications, New Delhi.

Reference Books:
1. Byron S. Gottfried, Programming with C, Second Edition, 1996 (Indian Adapted Edition (2006), Tata McGraw Hill, ISBN 0-07-059369-8.
2. Herbert Schildt, The Complete Reference C, Fourth Edition, 2007, McGraw-Hill Publications.

12CS201 DATABASE SYSTEMS

Credits: 3:0:0

Course Objective:
- To provide an introduction to the management of database systems.
- To emphasize the fundamentals of relational systems including data models, database architectures, and database manipulations.
- 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

- evaluate the normality of a logical data model, and correct any anomalies.
- retrieve data using SQL.
- understand database performance issues.
- understand the basics of data management and administration.
- understand the basics of data warehousing.
- work as a valuable member of a database design and implementation team.

Unit I

INTRODUCTION: Database-System Application – Purpose of Database System – View of Data, Database Language – Relational Database – Database Design – Object-Based and Semistructured Databases – Data Storage and Querying – Transaction Management – Data mining and Analysis – 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

SQL: 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. Application Design and Development: Triggers – Authorization in 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. Database-System Architecture: Centralized and Client-Server Architecture – Server System Architecture.

Unit IV

RELATIONAL DATABASE DESIGN: Features of good Relational Design – Atomic Domains and First Normal Form – Decomposition Using Functional dependencies – Functional Dependency Theory – Decomposition Using Functional Dependencies – Multivalued Dependencies – More Normal form – Database-Design Process – Modeling Temporal data.

Unit V

STORAGE AND FILE STRUCTURE: File organization – Organization of records in files – Data Dictionary Storage. Indexing and Hashing: Basic Concept – Ordered Indices – B+ Tree Index Files – B-Tree-Index Files – Multiple-Key Access – Static Hashing – Dynamic Hashing – Comparison of Ordered Indexing and Hashing. Transaction: Transaction concepts – Transaction State – Implementation of atomicity and durability – Concurrent executions – Serialization.

Text Book:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, Database System Concepts, Fifth Edition, Mc Graw-Hill International, 2006. ISBN 007-124476-X.

Reference Book:

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.

12CS202 OBJECT ORIENTED ANALYSIS AND DESIGN

Credits: 3:0:0

Course Objective:

- To Design an Application Using Object Management groups UML for Modeling, Describing, Analyzing and Designing an application
- To develop a proven successful system by applying the best practices and works done by Booch, Rumbaugh, and Jacobson.

Course Outcome:
Students will be able to
- familiarize with standard UML notation.
- model the requirements with use cases.
- describe the dynamic behaviour and structure of the design.

Unit I
OBJECT BASICS : Object oriented philosophy – objects, classes, and attributes – object behavior and methods – encapsulation and information hiding – class hierarchy – polymorphism – object relationships and associations – aggregations and object containment – case study – object identity – persistence. Object oriented systems development life cycle: Software development process – building high quality software – use- case driven approach – reusability.

UNIT II
OBJECT MODELING Rumbaugh et al.'s object modeling technique – Booch methodology – Jacobson et al. methodologies, patterns, frameworks, the unified approach – Unified modeling language: Static and dynamic models – UML diagrams – UML class diagrams – use-case diagrams – UML dynamic modeling, packages– UML extensibility and UML metamodel.

Unit III
BUSINESS OBJECT ANALYSIS – use-case driven object oriented analysis – business process modeling – use-case model – developing effective documentation - case study. Classification: Classification theory – noun phrase approach – common class patterns approach – use-case driven approach, classes, responsibilities, and collaborators– naming classes.

Unit IV
ASSOCIATION – super-subclass relationships – a-part of relationships - case study, class responsibility – defining attributes for vianet bank objects – object responsibility – defining methods for vianet bank objects –Design process and design axioms: Corollaries, design patterns.

Unit V
UML OBJECT CONSTRAINT LANGUAGES – designing classes – class visibility – refining attributes for the vianet bank objects – designing methods and protocols – designing methods for the vianet bank objects – packages and managing classes – Designing Access Layer Classes – Case Study: Designing – The Access Layer for the vianet Bank ATM – Designing View Layer Classes – Macro Level Process – Micro Level Process.

Text Book:
1. Ali Bahrami, Object Oriented Systems Development using the Unified Modeling Language, McGraw Hill, 1999 Second Reprint 2008 ISBN:978-0-07-026512-7

Reference Books:
1. Simon Benett, Object Oriented Analysis and Design Using UML, Second Edition, McGraw- Hill, 2002. ISBN: 0-07-709864-1.

2. Atul Kahate, Object Oriented Analysis And Design, First Edition, McGraw-Hill, 2004. ISBN:0070583765
3. Joseph Schmuller, UML, Third Edition, Pearson Education, 2004. ISBN: 81-297-0609-1.

12CS203 OBJECT ORIENTED PROGRAMMING IN C++

Credits: 3:0:0

Course Objective:
- This course teaches the student how to write high quality, internally documented, well-structured C++.
- Students will learn how C++ supports Object Oriented principles such as abstraction, information hiding, localization and modularity, and how to apply these principles in software development.

Course Outcome:
The student will be able to
- Identify the major elements in an object-oriented programming language.
- Implement operator overloading and use inheritance in C++.
- Select the proper class protection mechanism.
- Demonstrate the use of virtual functions to implement polymorphism.
- Understand the advanced features of C++ including templates, exceptions, and multiple inheritances.

Unit I
INTRODUCTION: Why do we need object oriented programming- Characteristics of Object Oriented Languages. C++ programming bascics: Basic program construction – data types: signed and unsigned, Input &output statements: cin – cout – directives- comments – manipulators-escape sequence –type conversion – arithmetic, relational and logic operators – and library function.

Unit II
LOOPS, DECISIONS & FUNCTIONS: loop –Decisions & other control statements, Structures: Structures– Enumeration. Functions: Simple functions -passing arguments to functions – returning values from functions –reference arguments – overloaded functions – inline functions – default arguments – variables and storage class and returning by reference-const function arguments.

Unit III
OBJECT, CLASSES, ARRAY AND STRINGS:A simple class – c++ objects as physical objects – C++ objects and data types – object as function argument – constructors – object as function argument – overloaded constructors – copy constructors – returning objects from functions – structures and classes – static class data – const and classes – Arrays and Strings: Array fundamentals-function declaring with array arguments-array as class member data-array objects-C strings-standard C++ string class.

Unit IV
OPERATOR OVERLOADING, INHERITANCE & POINTERS: Overloading unary and binary operators – data conversion – and pitfalls. Inheritance: derived class and base class – derived class constructors – overloading member functions – class hierarchies – public and private inheritance – level of inheritance – multiple inheritances. Pointers: address and pointers – pointers and arrays – pointer and c-type strings – new and delete operator – pointers to pointer.

Unit V
VIRTUAL FUNCTIONS, STREAMS and FILES, TEMPLATES &EXCEPTIONS: Virtual functions – friend functions – static functions – this pointer. Streams and files: stream classes –

stream errors – disk file I/O with streams – file pointers – error handling in file I/O. Templates and exception: function templates – class templates – exceptions.

Text Book:
1. Robert Lafore, Object Oriented Programming in C++, Fourth Edition, Tech Media, 2002. ISBN 0-672-32308-7.

Reference Book:
1. Herbert Schildt, *C++:* The Complete Reference, Fourth Edition, Tata McGraw-Hill, 2003. ISBN 0-07-053246-X.

<p style="text-align:center">**12CS204 PROGRAMMING IN JAVA**</p>

Credits: 3:1:0

Course Objective:
- To learn the Java programming language fundamentals: its syntax, idioms, patterns, and styles.
- To learn object oriented programming concepts.
- To learn the essentials of the Java class library.

Course Outcome:
The Student will be able to
- Understand the format and use of objects.
- Understand basic input/output methods and their use.
- Understand object inheritance and its use.
- Understand development of JAVA applets vs. JAVA applications.
- Understand the use of various system libraries.

Unit I
INTRODUCTION TO JAVA AND CONTROL STATEMENTS: The History and evolution of Java – An Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements.

Unit II
CLASS, INHERITANCE, PACKAGE, INTERFACE AND EXCEPTION HANDLING:
Introducing Classes – A Closer look at Methods and Classes – Inheritance – Packages and Interfaces – Exceptions Handling.

Unit III
MULTITHREADING, ENUMERATION, AUTOBOXING, ANNOTATION AND GENERICS: Multithreaded Programming – Enumerations – Autoboxing and Metadata – Generics.

Unit IV
STRING HANDLING, INPUT/OUTPUT, NETWORKING AND APPLET: String Handling – Input/Output: Exploring java.io – Networking – The Applet Class.

Unit V
EVENT HANDLING AND AWT: Event Handling-Introducing the AWT: Working with Windows – Graphics and Text – Using AWT Controls – Layout Managers – Menus.

Text Book:

1. Herbert Schildt, Java - The Complete Reference, Tata McGraw- Hill, Seventh Edition, 2008. ISBN 13: 978-0-07-063677-4

Reference Books:
1. Kathy Sierra, Bert Bates, Head First Java, Second Edition, O'Reilly Media, 2005. ISBN:10-0596004656, ISBN-13:9780596004651.
2. Harvey M. Dietel, Java How to Program, Seventh Edition, Prentice Hall, 2007. ISBN:10-0132222205, ISBN:13-978-0132222204
3. Bruce Eckel, Thinking in Java, Fourth Edition, Prentice Hall, 2006. ISBN: 978-0131872486.
4. Ivor Horton, Beginning Java 2 JDK, Fifth Edition, Wiley, 2004. ISBN: 978-0-7645-6874-9.
5. Ken Arnold, James Gosling, David Holmes, The Java Programming Language, Fourth Edition, Prentice Hall Professional Technical Reference. ISBN-13:9780321349804
6. E. Balagurusamy, Programming with Java: A primer, Third Edition, Tata McGraw-Hill, 2007.

12CS205 UNIX ARCHITECTURE

Credits: 3:0:0

Course Objective:
- To learn the internal working of Unix Kernel, its Data Structures and System calls.
- This course describes the algorithms, memory architecture, process management, system calls, interrupts and exceptions, and system start-up.

Course Outcome:
The Student will be able to
- customize the internal algorithms of kernel
- restructure the start-up process of Operating System
- add any new features into the existing operating system

Unit I
UNIX OPERATING SYSTEM – History – Commands – essential Unix commands – vi editor – shell programming – The First Step – Taking Decisions – The Loop Control structure. Introduction to Kernel: Architecture of the UNIX operating system – introduction to system concepts. The buffer cache – Buffer headers – structure of the buffer pool – scenarios for retrieval of a buffer – Reading and writing disk blocks – advantages and disadvantages of the buffer cache.

Unit II
THE INTERNAL REPRESENTATION OF FILES – INODE - structure of a regular file – directories – conversion of a path name to an INODE – Super block – INODE assignment to a new file. System calls for the file system: Open – read – write – file - record locking – Adjusting the position of the file I/O-lseek - close – File creation – creation of special files – change directory change root – Change owner and change mode Stat and fstat – pipes – DUP file Systems – link and unlink

Unit III
THE STRUCTURE OF PROCESSES: process states and transitions – Layout of system memory – The context of a process – saving the context of a process – Manipulation of the process address pace - sleep – Process Control: Process Creation - signals – Process termination – Awaiting process termination – invoking other programs – the user ID of a process – Changing the size of a process – Process Scheduling and time: process scheduling – System calls for time- clock.

Unit IV

MEMORY MANAGEMENT POLICIES: Swapping – Demand Paging – The I/O subsystem: driver interfaces – Disk drivers. Terminal driver's stream.

Unit V
INTER PROCESS COMMUNICATION: Process Tracing – System V IPC – Network Communications – Sockets.

Text Book:
1. Maruice J. Bach, The design of the UNIX operating system, Prentice Hall of India, 1990. Sixth Impression 2008 ISBN 81-203-0516-7.

Reference Books:
1. Kay A. Robbins, Steve Robbins, UNIX Systems Programming, Pearson Education, 2004. ISBN: 0-13-042411-0
2. Kenneth Rosen, Douglas Host, James Farber, Richard Rosinki, UNIX-The Complete Reference, McGraw- Hill, 1999. ISBN: 007211892X, 9780072118926.
3. Prabhat K. Andleigh, UNIX System Architecture, Prentice Hall, 1990. ISBN: 0139498435, 9780139498435.
4. Ed Dunphy, The UNIX Industry: Evolution, Concepts, Architecture, Applications and Standards, QED Technical Pub, 2007. ISBN: 089435390X, 9780894353901.
5. Andleigh, UNIX System Architecture, Prentice Hall, 1991. ISBN: 0139233016, 9780139233012.

12CS206 ANALYSIS OF ALGORITHMS

Credits: 3:0:0

Course Objective:
- To provide an introduction to asymptotic algorithm analysis.
- To develop algorithms for sorting, searching, insertion and matching.
- To introduce the concept of computational intractability and NP completeness.

Course Outcome:
The Student will be able to
- design algorithms for new problems.
- choose the best algorithm to solve the problem.
- calculate the efficiency of different algorithms for the same problem.

Unit I
FUNDAMENTALS OF ALGORITHMIC PROBLEM SOLVING AND ALGORITHM EFFIENCY: Introduction – Notion of algorithm – Fundamentals of algorithmic problem solving – important problem types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis framework – Asymptotic notations and basic efficiency classes – Mathematical analysis of non-recursive algorithms – Mathematical analysis of recursive algorithms.

Unit II
BRUTE FORCE AND DIVIDE-AND-CONQUER: Brute Force – Selection sort and bubble sort – Sequential search and brute –force string matching. Divide-and-Conquer– Merge sort – Quick sort – Binary search – Binary tree traversals and related properties.

Unit III
DECREASE-AND-CONQUER AND TRANSFORM-AND-CONQUER: Decrease-and-Conquer – Insertion sort, Depth-first search and breadth-first search –Topological sorting. Transform-and-Conquer – Presorting, Balanced search trees – Heaps and heap sort.

Unit IV
SPACE AND TIME TRADEOFFS AND DYNAMIC PROGRAMMING: Space and Time Tradeoffs – Sorting by counting – Input enhancement in string matching, Hashing – B-trees. Dynamic Programming – Computing a binomial coefficient – Warshall's and Floyd's algorithms.

Unit V
GREEDY TECHNIQUE, ITERATIVE IMPROVEMENT AND LIMITATIONS OF ALGORITHM POWER: Greedy Technique – Prim's algorithm – Kruskal's algorithm – Dijkstra's algorithm – Huffman trees – Iterative Improvement – The simplex method – The maximum matching in Bipartite Graph – Limitations of Algorithm Power – P, NP and NP-complete problems.

Text Book
1. Anany Levitin, "Introduction to the Design & Analysis of Algorithms", Pearson Education, 2007. ISBN-10: 0321358287.

Reference Books
1. S. K. Basu, "Design Methods and Analysis of Algorithms, Prentice-Hall India", 2005. ISBN: 81-203-2637-7.
2. Jeffrey Mcconnell, "Analysis of Algorithm", Jones and Battlet, 2008. ISBN-10: 0-7637-0782-1.
3. Jon Bentley, "Programming Pearls", Second Edition, Pearson Education, 2000.
4. Cormen, Leiserson, Rivest, Stein, "Introduction to Algorithms", Second Edition, Prentice Hall, 2001.
5. A.V. Aho, J. E. Hopcroft and J. D. Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education Asia, 2003.
6. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", Pearson Education Asia, 2003.

12CS207 DATA STRUCTURES

Credits: 3:0:0

Course Objective:
- To understand the concept of various Data Structures.
- To know about different applications of Data Structures.
- Enable to implement applications on Data Structures using C++ programming language.

Course Outcome:
The Student will be able to
- find and understand the Data Structures used in different applications
- design and implement various hybrid Data Structures suitable for different applications

Unit I
INTRODUCTION TO DATA STRUCTURES – STACK: definition and examples – specification and implementation, Polish notation – Idea, Infix to Postfix conversion – Postfix expression evaluation – Recursion – Divide and Conquer – Towers of Hanoi problem.

Unit II
QUEUES: definition, implementation – circular queue – priority queue – simulation **Lists:** contiguous implementation – singly linked lists – doubly linked lists – circular lists – linked stacks – linked queues.

Unit III

TABLES AND INFORMATION RETRIEVAL: Rectangular arrays – Tables of various shapes – **Searching:** – Linear and Binary search methods – **Sorting:** Bubble sort – Selection sort – Shell sort – Insertion sort – Quick sort – Heap sort – Merge sort – Radix sort – Hashing.

Unit IV
TREES: Binary trees - definition, traversals, linked implementation – Binary Search Trees– Height Balanced Trees – Comparison trees – Multiway Trees – External searching – B-trees.

Unit V
GRAPHS: mathematical background, representation – Graph traversals (DFS & BFS) – Shortest path algorithm – Minimum spanning trees.

Text book:
1. R. Kruse, C. L. Tondo, B. P. Leung, Data Structures and Program Design, Third Edition, Pearson Education, 1999. ISBN 81-203-0884-0.

Reference books:
1. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, Data Structures Using C & C++, Second Edition, PHI/Pearson Education, 1996. ISBN 978-81-203-1177-0.
2. Mark Allen Wiss, Data Structures and Algorithm Analysis in C++, Third Edition, Addison Wesley, 2006. ISBN: 032144146X.

12CS208 SYSTEM SOFTWARE

Credits: 3:0:0

Course Objective:
- To view some of the major tasks of the system software of a computer system.
- To understand internal working of the hardware and software interface of a typical system.
- To learn about the working of loader, macroprocessor and assembler.

Course Outcome:
The Student will be able to
- understand the various system software concepts.
- learn the Internal working and memory allocation, execution of the code is understood by the students.
- understand the internal working of assemblers.

Unit I
BACKGROUND: Introduction – System Software and Machine Architecture – The Simplified Instructional Computer (SIC) – Traditional (CISC) Machines – RISC Machines.

Unit II
ASSEMBLERS: Basic assembler functions: A simple SIC assembler – Assembler algorithms and data structures – Machine dependent assembler features: Instruction formats and addressing modes – Program relocation – Machine independent assembler features: Literals – Symbol defining statements – Expressions – Program Blocks – Control Sections and Program Linking –One Pass Assembler and Multi pass Assemblers – Implementation examples: 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 examples: 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 Processor Design Options – Recursive Macro Expansion – Algorithm – General Purpose Macro Processors – Macro Processing within Language Translators – Implementation examples: MASM Macro Processor – ANSI C Macro language.

Unit V

OTHER SYSTEM SOFTWARE: Database Management System: Basic concepts of a DBMS Level – Levels of a data description – Use of a DBMS. Text editors: Overview of Editing Process – User Interface – Editor Structure. Interactive Debugging systems: Debugging functions and capabilities – Relationships with Other parts of the system – User Interface Criteria.

Text Book:
1. L. Beck, System Software, An Introduction to System Programming, Addison Wesley, 1999 Third Edition 19th Indian Reprint 2005 ISBN: 81-7808-036-2.

Reference Books:
1. D. M. Dhamdhere, Systems Programming and Operating Systems, Tata McGraw-Hill Company, 1999. ISBN: 0-07-463579-4.
2. John J. Donovan, Systems Programming, Tata McGraw Hill-Edition, 1972.
3. D. M. Dhamdhere, Operating Systems: A Concept-based Approach, Second Edition, Tata McGraw-Hill, 2006. ISBN 0070611947.

12CS209 PROGRAMMING IN J2EE

Credits: 3:0:0

Course Objective:
- To develop the enterprise applications with cross platform capabilities.
- To explore the basic concepts of multi-tier distributed applications.
- To understand the working principles of real time enterprise applications.
- To know about various components of J2EE to develop enterprise applications.

Course Outcome:
The Student will be able to
- get a practical exposure to real time web based projects.
- make innovative ideas to develop enterprise applications.

Unit I
J2EE AND J2SE - The Birth of J2EE - Databases - The Maturing of Java - Java Beans and Java Message Service - Why J2EE? J2EE Multi-Tier Architecture - J2EE Best Practices - J2EE Design Patterns and Frameworks.

Unit II
JDBC Objects - Java servlets - Java Server Pages.

Unit III

ENTERPRISE JAVABEANS: The New Enterprise JavaBean – Introduction to Session Beans – Java

PERSISTENCE: Entity Beans – Introduction to Message-Driven Beans.

Unit IV
JAVA REMOTE METHOD INVOCATION – Java Mail API - Java Interface Definition Language and CORBA - Java Message Service – Security - Java Naming and Directory Interface API.

Unit V
WEB SERVICES : SOAP - Universal Description, Discovery, and Integration (UDDI)-Electronic Business XML - The Java API for XML Registries (JAXR) - Web Services Description Language (WSDL).

Text Books
1. James Keogh, J2EE - The Complete Reference, McGraw-Hill, 2002. ISBN-10: 007222472X ISBN-13: 978-0072224726
2. Rima Patel, Gerald Brose, Micah Silverman, Mastering Enterprise JavaBeans *3.0,* Wiley-India Edition, 2008. ISBN-10: 0471785415, ISBN-13: 978-0471785415.

Reference Books
1. Bryan Basham, Kathy Sierra, Bert Bates, Head First Servlets and JSP*,* O'Reilly Media, 2008. ISBN: 0596516681, ISBN-13: 9780596516680.
2. Esmond Pitt, Kathleen McNiff, *java.*rmi: The Remote Method Invocation Guide, Addison-Wesley Professional, 2001. ISBN-10: 0201700433, ISBN-13: 978-0201700435.
3. Kathy Sierra, Bert Bates, Head First EJB*,* O'Reilly Media, 2005. ISBN-10: 0596005717, ISBN-13: 978-0596005719.

12CS210 PROGRAMMING IN J2ME

Credits: 3:0:0

Course Objective:
- To know the basic concepts of small computing devices.
- To explore the concepts of developing java applications for small computing devices
- To understand the various components of J2ME platform.
- To know about the architecture of J2ME.

Course Outcome:
The Student will be able to
- understand the working principles of application in small computing devices.
- develop applications for small computing devices like PDA and Mobiles.
- come up with innovative ideas for developing mobile applications.

Unit I
J2ME BASICS: J2ME Overview – Small Computing Technology – J2ME Architecture and Development Environment.

Unit II
J2ME USER INTERFACE: Command, Items and Event Processing – High Level Display: Screens –Low Level Display: Canvas.

Unit III

J2ME DATA MANAGEMENT: Record Management System – J2ME Database Concepts-J2ME Personal Information Manger Profile.

Unit IV
J2ME JDBC CONCEPTS: JDBC Objects – JDBC and Embedded SQL.

Unit V
J2ME NETWORKING AND WEB SERVICES: Generic Connection Framework – Web Services.

Text Book
1. James Koegh, J2ME – The Complete Reference, Tata McGraw-Hill, 2003. ISBN: 0-07-053415-2.

Reference Books
1. Vartan Piroumian, Wireless J2ME Platform Programming, The Sun Microsystems Press, JAVA SERIES. ISBN-10: 0130449148.
2. Sing Li, Jonathan Knudsen, Beginning J2ME from Novice to Professional, Third Edition Springer (India) Private Limited publications, 2005. ISBN 81-8128-292-2.
3. Kim Topley, *J2ME* – In a Nutshell, O'Reilly publications, 2002. ISBN: 81-7366-343-2.
4. John W. Muchow, Core J2ME Technology, First Edition, Prentice Hall PTR. ISBN-10: 0130669113.

12CS211 OPERATING SYSTEM

Credits: 3:0:0

Course Objective:
To gain knowledge about the Operating Systems concepts such as process, main memory management, secondary memory management, CPU and disk scheduling etc.

Course Outcome:
The Student will be able to
- understand the architecture of operating system including kernel
- understand the issues in designing an operating system

Unit I
OPERATING SYSTEM INTRODUCTION : What Operating Systems Do - Computer System Organization Computer System Architecture - Operating System Structure - Operating System Operations - Process Management - Memory Management – Storage Management – Protection and Security – Distributed Systems – Special Purpose Systems - Computing Environments – 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
PROCESS MANAGEMENT: Process Concept - Process Scheduling – Operation on Processes – Interprocess Communication– Multithreaded Programming –Multithreading models – Thread Libraries - Threading Issues – Process Scheduling – Basic concepts – Scheduling Criteria – Scheduling Algorithms – Multiple Processor Scheduling – Thread Scheduling.

Unit III
SYNCHRONIZATION & MEMORY MANAGEMENT : The Critical Section Problem – Peterson's Solution – Synchronization Hardware – Semaphores – Classic Problems of

Synchronization – Monitors – Atomic Transactions – System Model – Deadlock Characterization – Methods for Handling Deadlocks –Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlock –Memory management Strategies – Swapping – Contiguous memory Allocation – Paging – Structure of the Page Table – Segmentation.

Unit IV
VIRTUAL MEMORY MANAGEMENT & FILE MANAGEMENT: Demand Paging – Copy-on-Write - Page Replacement – Allocation of Frames – Thrashing – Memory-mapped Files – Allocating Kernel Memory – Other Considerations – Storage Management - File Concepts – Access Methods – Directory Structure –File System Mounting – File Sharing – Protection – Implementing File Systems -File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free Space Management – Efficiency and Performance – Recovery.

UnitV
SECONDARY STORAGE MANAGEMENT & I/O SYSTEMS: Structure – Overview of Mass Storage Structure – Disk Structure – Disk Attachment - Disk Scheduling – Disk Management – Swap-Space Management – RAID Structure – Stable-Storage Implementation – Tertiary Storage Structure - I/O Systems – I/O Hardware – Application I/O interface – Kernel I/O Subsystem – Transforming I/O Requests to Hardware Operations .

Text Book:
1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles,Seventh Edition, John Wiley & Sons, 2006. ISBN: 9812-53-176-9.

Reference Books:
1. D. M. Dhamdhere, Operating Systems, Second Edition, Tata McGraw-Hill Education (India), 2006. ISBN: 0070611947.
2. Achyut S. Godbole Operating Systems With Case Studies in Unix Netware Windows NT, Tata McGraw-Hill, 2005. ISBN: 007059113X, 9780070591134.
3. Andrew S. Tanenbaum, Modern Operating Systems, Third Edition, Prentice Hall, 2008.ISBN 0136006639, 9780136006633
4. Pramod Chandra P. Bhatt, An Introduction to Operating Systems: Concepts and practice,PHI Learning Pvt. Ltd., 2003. ISBN: 8120323068, 9788120323063.
5. Paul J. Deitel, David R. Choffnes, Operating Systems, Third Edition, Prentice Hall, 2003.ISBN: 0131828274, 9780131828278.
6. Colin Ritchie Operating Systems Incorporating UNIX and Windows: Incorporating Unix and Windows, Fourth Edition, Cengage Learning EMEA, 2003. ISBN: 0826464165, 9780826464163.

12CS212 INTELLIGENT SYSTEMS

Credits: 3:0:0

Course Objective:
- To introduce the basic concepts of artificial intelligence.
- To introduce new approaches to solve a wide variety of research-oriented problem.

Course outcome:
The Student will be able to
- Understand the problem spaces and search techniques
- Form rules and reasoning

Prerequisite: Basic concepts of computer science such as algorithms and data structure.

Unit I
AI INTRODUCTION: What is Artificial Intelligence? – Problems, Problem Spaces, and Search – Heuristic Search Techniques.

Unit II
KNOWLEDGE AND LOGICS: Knowledge Representation Issues – Using Predicate Logic.

Unit III
KNOWLEDGE RULES: Representing Knowledge Using Rules – Symbolic Reasoning under Uncertainty – Statistical Reasoning.

Unit IV
KNOWLEDGE REPRESENTATION: Weak Slot-and–Filler Structures – Strong Slot-and-Filler Structures – Knowledge representation Summary – planning.

Unit V
LEARNING : What is learning – Rote learning – Learning by taking advice – Learning in problemsolving– Learning from Examples: Induction – Explanation-based Learning – Discovery – Analogy – Formal learning theory – Neural net learning and genetic learning. Expert Systems.

Text Book:
1. 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

Reference Books:
1. Stuart Russell, Peter Norvig, Artificial Intelligence a modern Approach, Second Edition, Pearson Education, 2003. ISBN: 81-297-0041-7.
2. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Harcourt Asia PTE Ltd., 2000. ISBN: 981 4033 464.
3. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice-Hall India, 2001. ISBN: 81-203-0777-1.

12CS213 PRINCIPLES OF COMPILER DESIGN

Credits: 3:1:0

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 provide practical, hands on experience in compiler design.

Course Outcome:
The Student will be able to
- develop a fundamental understanding of various stages of compiling.
- develop a firm and enlightened grasp of concepts learned earlier in their study like higher level programming, assemblers, automata theory and formal languages, data structures, algorithms and operating systems.
- design a compiler for a concise programming language.

Unit I
INTRODUCTION TO COMPILERS: Translators-Compilation and Interpretation – The phases of Compiler-Errors encountered in different phases-The grouping of phases – cousins of the

compiler-Compiler construction tools – A simple one-pass compiler– Context Free Grammars-Derivation – Reduction and Ambiguity.

Unit II
LEXICAL ANALYSIS: Need and role of lexical analyzer – Lexical errors-Expressing tokens by Regular Expression – Converting regular expression to DFA – Minimization of DFA – Language for specifying lexical analyzers – LEX-Design of lexical analyzer for a sample language.

Unit III
SYNTAX ANALYSIS: Need and role of the parser – Context Free Grammars – Top Down parsing – General strategies – Recursive Descent Parser – Predictive Parser – LL(1) Parser – Shift Reduce Parser – LR Parser – LR (0) item – Construction of SLR Parsing table –Introduction to LALR Parser – Error handling and recovery in syntax analyzer – YACC – Design of a syntax analyzer for a sample language.

Unit IV
SYNTAX DIRECTED TRANSLATION AND TYPE CHECKING: Definitions –Construction of syntax trees – Bottom-up evaluation of S-attributed and L-attributed definitions – Top down translation – Bottom up evaluation – Forms of intermediate code – Translation of Assignment, Boolean Expression and Control statements – Backpatching type systems – Specification of a simple type checker – equivalence of type expressions – Type conversions.

Unit V
CODE OPTIMIZATION AND CODE GENERATION: Principal sources of Optimization – DAG – Optimization of basic blocks – Global data flow analysis – Efficient data flow algorithms – Source language issues – Storage organization – Symbol tables – Dynamic storage allocation – Issues in design of a code generator – A simple code generator algorithm.

Text Book:
1. Alfred V Aho, Ravi Sethi and Jeffrey D Ullman, Compilers – Principles, Techniques and Tools, First Edition, Pearson Education, Nineteenth Indian Reprint, 2005. ISBN: 81-7808-046-X.

Reference Books:
1. Dick Grone, Henri E Bal, Ceriel J H Jacobs and Koen G Langendoen, Modern Compiler Design, John Wiley and Sons, USA, 2000. ISBN-10: 0-471-97697-0.
2. Allen I. Hollub, Compiler Design in *C*, PHI, 1990. ISBN: 978-0131550452.

12CS214 FUNDAMENTALS OF COMPUTER ALGORITHMS

Credits: 3:0:0

Course Objective:
- To be Familiar with fundamental algorithms and algorithmic techniques.
- To analyze the running time of a given algorithm

Course Outcome:
The Student will be able to
- Calculate the efficiency of any algorithm.
- Choose the best algorithm to solve a particular problem.
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Unit I

INTRODUCTION, FUNDAMENTALS OF ALGORITHM EFFICIENCY– Notion of Algorithm - Fundamentals of algorithmic problem solving –Important problem types – Fundamentals of the analysis of algorithm efficiency – analysis frame work –Asymptotic notations – Mathematical analysis for recursive and non-recursive algorithms.

Unit II
BRUTE FORCE AND DIVIDE AND CONQUER METHOD: Selection Sort and Bubble Sort – Sequential Search and Brute – Force String Matching-Closest-Exhaustive Search – Merge sort – Quick sort– Binary search – Binary tree traversal.

Unit III
DECREASE-AND-CONQUER AND TRANSFORM-AND-CONQUER: Insertion Sort – Depth-First Search and Breadth – First Search – Topological Sorting – Decrease by a Constant Factor Algorithm –Variable Size – Decrease Algorithms – Presorting – Gaussian Elimination – Balanced Search Trees – Heaps and Heapsort.

Unit IV
DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE: Computing a binomial coefficient – Warshall's and Floyd' algorithm – Optimal binary search tree – Knapsack problem and Memory functions-Prim's Algorithm – Kruskal's Algorithm – Dijkstra's Algorithm – Huffman Algorithm

Unit V
BACKTRACKING AND BRANCH AND BOUND: Backtracking – N-Queens problem – Hamiltonian circuit problem – Subset sum problem – Branch and bound – Assignment problem – Knapsack problem– Traveling salesman problem – P,NP and NP complete Problems – Approximation Algorithm for NP-hard Problems.

Text book:
1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Pearson Education 2005. ISBN: 81-7808-984-X.

Reference books:
1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Introduction to Algorithms Prentice Hall, 2001. ISBN: 10: 0262032937.
2. Sara Baase and Allen Van Gelder, Computer Algorithms – Introduction to Design and Analysis, Pearson Education, 2003. ISBN: 81-7808-171-7.
3. Horowitz Ellis, Sahni Sartaj, Rajasekaran Sanguthevar, Fundamentals of Computer Algorithms, 2008. ISBN: 8173716129.

12CS215 VISUAL PROGRAMMING

Credits: 3:0:0

Course Objective:
- To introduce the concepts of visual programming.
- To introduce GUI programming using Microsoft foundation classes.

Course Outcome:
The Students will be able to
- develop Windows application using the Microsoft Foundation Classes (MFC)
- develop C++/CLI Windows applications using Windows Forms.

Unit I

PROGRAMMING WITH VISUAL C++ 2008 AND WINDOWS PROGRAMMING CONCEPTS: The .NET Framework – The Common Language Runtime (CLR) – Writing C++ Applications – Learning Windows Programming - What Is the Integrated Development Environment? – Using the IDE - Windows Programming Basics – The Structure of a Windows Program – Windows Program Organization – The Microsoft Foundation Classes – Using Windows Forms

Unit II

WINDOWS PROGRAMMING WITH MFC, MENUS, TOOLBARS AND DRAWING IN A WINDOW: The Document/View Concept in MFC – Creating MFC Applications - Communicating with Windows – Extending the Sketcher Program – Elements of a Menu – Adding Handlers for Menu Messages – Adding Toolbar Buttons – Menu and Toolbars in a C++/CLI Program - Basics of Drawing in a Window – The Drawing Mechanism in Visual C++ – Drawing Graphics in Practice – Programming the Mouse – Exercising Sketcher – Drawing with the CLR.

Unit III

CREATING THE DOCUMENT, IMPROVING THE VIEW AND WORKING WITH DIALOGS AND CONTROLS: The MFC Collection Classes – Using the Clist Template Class – Creating the Sketch Document – Improving the View – Deleting and Moving Shapes – Implementing a Context Menu – Dealing with Masked Elements – Extending CLRSketcher. Understanding Dialogs – Understanding Controls – Creating a Dialog Resource – Programming for a Dialog – Supporting the Dialog Controls – Completing Dialog Operations – Using a Spin Button Control – Using the Scale Factor –Working with Status Bars – Using a List Box – Using an Edit Box Control – Dialogs and Controls in CLR Sketcher.

Unit IV

STORING, PRINTING DOCUMENTS AND WRITING DLLS: Understanding Serialization – Serializing a Document – Applying Serialization – Exercising Serialization – Moving Text – Printing a Document – Implementing Multipage Printing – Serialization and Printing in CLR Sketcher - Understanding DLLs – Deciding What to put in a DLL – Writing DLLs.

Unit V

CONNECTING TO DATA SOURCES AND UPDATING DATA SOURCES : Database Basics – A Little SQL – Database Support in MFC –Creating a Database Application – Sorting a Recordset – Using a Second Recordset Object – Viewing Customer Details - Update Operations – A Simple Update Example – Managing the Update Process – Adding Rows to a Table.

Text Book:
1. Ivor Horton, Beginning Visual *C++ 2008*, Wiley Dreamtech India Pvt. 2008. ISBN:978-0-470-22590-5

Reference Books:
1. Steve Holzner, Professional Visual C++ 6 Programming, Wiley Dreamtech India Pvt. 1998
2. David J. Kruglinski, George Shepherd and Scot Wingo, Programming Microsoft VisualC++, Fifth Edition, Microsoft Press 1998.Yashavant Kanetkar, Visual C++ Programming, BPB publications 1998.

12CS216 OBJECT ORIENTED PROGRAMMING IN C++ LAB

Credit: 0:0:2

List of Experiments

1. Student Record Using Structure.
2. Class Example
3. Constructor Example
4. Static, Const Examples
5. Function Overloading
6. Inheritance Example
7. Operator Overloading.
8. Multiple Inheritances.
9. Pointers
10. Virtual Functions
11. File Pointers
12. Exceptions

12CS217 PROGRAMMING IN C LAB

Credits: 0:0:2

The following are the threaded exercises that will be conducted through a case study.

1. Usage of input / output library functions
2. Usage of Operators
3. Usage of Branching Control Structures
4. Usage of Looping Control Structures
5. Usage of User Defined Functions
6. Pointers and Functions
7. Usage of One Dimensional Arrays
8. Usage of Two Dimensional Arrays
9. Arrays and Functions.
10. Array of Structures
11. Input & Output using Files
12. Files and Structures.

12CS218 SYSTEM SOFTWARE AND COMPILER LAB

Credit: 0:0:2

List of Experiments
1. Token Separation
2. Simulation of Macro-processor
3. Simulation of Assembler
4. Simulation of Loader
5. Symbol Table Generation
6. Token Separation using Lex Compiler
7. A lex program which replaces vowels in the input string to 'V'
8. A lex program to count the occurrence of 'aaa' in the input string
9. Intermediate Code Generation
10. Minimization of DFA
11. FIRST and FOLLOW of Predictive Parser
12. Conversion of Regular Expression to NFA

.

12CS219 DATABASE SYSTEMS LAB

Credit: 0:0:2

List of Experiments
1. Basic SQL Commands
2. Working with Single-Row Functions
3. Joins and Group Functions
4. Sub Queries
5. Advanced Sub Queries and Co-Related Sub Queries
6. Creation of Views and Other Data Base Objects
7. Triggers
8. PL/SQL
9. Functions and Procedures
10. Exception Handling
11. JDBC-Online Quiz
12. JDBC –Online Shopping

12CS220 JAVA PROGRAMMING LAB

Credit: 0:0:2

List of Experiments
1. Basic Java Programs
2. Command Line Arguments
3. Arrays and Array of objects
4. Linked List Implementation using classes and objects
5. Inheritance
6. Package
7. Interface
8. Exception Handling
9. Synchronization with Multithreading
10. File management
11. Applets
12. Network programming
13. Event programming with AWT

12CS221 PROGRAMMING IN J2EE LAB

Credits: 0:0:2

List of Experiments
1. Java Database Connectivity
2. Website Designing
3. Online Quiz
4. Online Shopping
5. Chat Engine
6. Employee Payroll using Session Bean
7. File Transfer Protocol using RMI
8. Student Information System
9. Online Banking System
10. Online Ticket Reservation
11. Online Employment Office System
12. Online Library management System

12CS222 C# AND. NET PROGRAMMING LAB

Credit: 0:0:2

List of Experiments
1. Classes and Objects using out, ref and params
2. Student Information System using Properties
3. Banking Application using Inheritance
4. Library Management using Predefined Interfaces
5. Students Admission using User defined Interfaces
6. Solving Postfix Expressions using Stack
7. Solving Complex Numbers using Operator Overloading
8. Matrix Addition, Subtraction, Multiplication and Division using Delegates
9. User Subscription for News Events using Events
10. Calculator using Windows Application
11. Advanced Windows Controls

12CS223 DATA STRUCTURES IN C++ LAB

Credits: 0:0:2

List of Experiments
1. Structures and Pointers
2. Classes and Objects
3. Implementation of Singly Linked List
4. Array Implementation of Stack
5. Array Implementation of Queue
6. Implementation of Doubly Linked List
7. Conversion of Infix to Postfix Expression
8. Binary Tree Traversal
9. Implementation of Function Overloading
10. Implementation of Operator Overloading
11. Sorting
12. Implementation of Inheritance

12CS224 VISUAL PROGRAMMING LAB

Credit: 0:0:2

List of Experiments
1. Creating simple window application using MFC
2. Basics of Drawing in a Window
3. Programming the Mouse
4. Creating Menus
5. Dialog Based applications
6. Creating spin control / List box and other controls
7. Creating MDI applications
8. Creating DLLs and using them
9. Document view Architecture, Serialization
10. Data access through ODBC

12CS225 PROGRAMMING IN J2ME LAB

Credits: 0:0:2
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List of Experiments
1. Realization of MIDlet Life-Cycle
2. User Verification
3. Tips Calculation
4. To send and receive SMS
5. Record Management
6. Personal and Official Organizer
7. Secure Message Transfer
8. Online Quiz
9. Ticket Reservation
10. Mobile Banking
11. Online Student Information System

12CS226 C# AND .NET PROGRAMMING

Credits: 3:0:0

Course Objectives:
- To introduce core and advanced programming constructs in C# and .NET platform.
- To develop windows and web applications along with data access methods.

Course Outcome
The Student will be able to
- work in various areas in .NET and to understand the concepts in C#
- grow in web development applications using ASP.NET Web Forms and ADO.NET

Unit I
C# BASICS: The Relationship of C# to .NET - The Common Language Runtime - A Closer Look at Intermediate Language – Assemblies - .NET Framework Classes – Namespaces - Creating .NET Applications Using C# - The Role of C# in the .NET Enterprise Architecture. C# Basics: First C# Program – Variables - Predefined Data Types - Flow Control, Enumerations – Arrays – Namespaces - The Main() Method - More on Compiling C# Files - Console I/O - The C# Preprocessor Directives - C# Programming Guidelines. Objects and Types: Classes and Structs - Class Members - Anonymous Types – Structs - Partial Classes - Static Classes - The Object Class - Extension Methods. Inheritance: Types of Inheritance - Implementation Inheritance – Modifiers – Interfaces. Arrays: Simple Arrays - Multidimensional Arrays - Jagged Arrays - Array Class – Array and Collection Interfaces – Enumerations.

Unit II
DELEGATES AND COLLECTION: Operators and Casts: Operators - Type Safety - Operator Overloading - User-Defined Casts. Delegates and Events: Delegates – Events. Strings and Regular Expressions: System.String - Regular Expressions. Collections: Collection Interfaces and Types – Lists - Queues – Stacks - Linked Lists - Sorted Lists – Dictionaries – HashSet - Bit Arrays – Performance.

UNIT III
REFLECTIONS AND THREADS: Memory Management and Pointers: Memory Management under the Hood - Freeing Unmanaged Resources. Reflection: Custom Attributes – Reflection. Errors and Exceptions: Exception Classes - Catching Exceptions - User-Defined Exception

Classes. Assemblies: What Are Assemblies? - Creating Assemblies. Threading and Synchronization: Overview - Asynchronous Delegates –The Thread Class – Synchronization.

Unit IV

DATA ACCESS: ADO.NET Overview - Using Database Connections – Commands - Fast Data Access: The Data Reader - Managing Data and Relationships: The DataSet Class - XML Schemas: Generating Code with XSD – Working with ADO.NET. Windows Forms: Creating a Windows Form Application - Control Class - Standard Controls and Components – Forms. Data Binding: The DataGridView Control - DataGridView Class Hierarchy - Data Binding - Visual Studio .NET and Data Access.

Unit V

ASP.NET AND AJAX: ASP.NET Pages: ASP.NET Introduction - ASP.NET Web Forms - ADO.NET and Data Binding. ASP.NET Development: User and Custom Controls - Master Pages - Site Navigation – Security – Themes - Web Parts. ASP.NET AJAX: What Is Ajax - What Is ASP.NET AJAX – Using ASP.NET AJAX.

Text Book:
1. Christian Nagel, Bill Evjen, Jay Glynn, Morgan Skinner, Karli Watson, Professional C# 2008, Wiley Publishing, Inc., 2008. ISBN: 978-8-126-51627-8.

Reference Books:
1. Andrew Troelson, Pro C# 2008 and the .NET 3.5 Platform*,* Apress, Fourth Edition, 2007.ISBN: 978-81-8128-878-3.
2. Kogent Solutions, C# 2008 Programming: Covers .net 3.5 Black Book, Dreamtech Press,Platinum Edition, 2009. ISBN: 8177228323.

12CS227 UNIX AND LINUX LAB

Credit: 0:0:2

List of experiments
1. Study Experiment- UNIX basics
2. Basic Shell Programming (Fibonacci Series generation, Factorial of a given number,
3. Checking for Armstrong number)
4. Designing a Arithmetic calculator
5. Generation of Multiplication table
6. Base Conversion (Decimal to Binary, Binary to Decimal)
7. Checking for a Palindrome of a number
8. Finding the information about the Login name and File name
9. Students Evaluation
10. Process Creation (Basics, Arithmetic operations on processes, Displaying process ID, Creation of grandchild processes)
11. System calls (Usage of link(), Usage of dup(), Renaming a file)
12. Inter Process Communication using Named Pipe
13. Inter Process Communication using Unnamed Pipe
14. Inter Process Communication using Shared Memory
15. Sockets
    .

12CS228 SOFTWARE ENGINEERING

Credits: 3:0:0

Course Objective:
To learn
- Different life cycle models
- Requirement dictation process
- Analysis modeling and specification
- Architectural and detailed design methods
- Implementation and testing strategies
- Verification and validation techniques
- Project planning and management.

Course Outcome:
The Student will be able to
- understand all the software lifecycle models
- identify the various requirements in a system and to validate them
- understand the various architectural design methods
- implement various testing strategies in a system
- understand various quality measurements for a software system

Unit I
INTRODUCTION: A Generic View of Process – Process Models-Waterfall Model-Incremental Model-Evolutionary Model-Specialized Model-The Unified Process– Agile view of process– Software Project Estimation- Decomposition Techniques -Empirical Estimation models-Specialized Estimation Techniques – Project Scheduling- Risk management

Unit II
REQUIREMENT ANALYSIS: System Engineering Hierarchy – System Modeling – Requirements Engineering: Tasks- Initiating The Requirements Engineering Process-Eliciting Requirements-Developing Use Cases- Building the Analysis Models -Negotiating Requirements-Validating Requirements-Data modeling concepts-Scenario based modeling-Flow Oriented Modeling

Unit III
SOFTWARE DESIGN: Design Concepts – Design Models – Pattern Based Software Design – Software Architecture-Data Design-Architectural Styles and Patterns- Architectural Design – Component – Designing Class Based And Conventional Components – Performing User Interface Design

Unit IV
SOFTWARE TESTING: Strategic approach to software testing-Strategic Issues-Test Strategies for Conventional and Object Oriented Software– Validation Testing – System Testing – Software Testing Fundamentals-– White Box – Basis Path-Control Structure- Black Box testing

Unit V
SCM AND QUALITY ASSURANCE: Software Configuration Management-SCM Process-Software Quality Concepts – Quality Assurance – Software Review– Formal Technical Reviews – Formal Approach To SQA – Reliability – ISO 9000 Quality Standards – SQA Plan

Text Book
1. Roger Pressman.S., Software Engineering: A Practitioner's Approach, Sixth Edition, McGraw- Hill, 2005. ISBN: 007-124083-7.

Reference Books

1. Sommerville, Software Engineering, Eighth Edition: Addison Wesley, 2007. ISBN: 032-131379-8.
2. Carl Dichter, Mark Pease, Software Engineering with Perl, Prentice Hall, 2007. ISBN:013-016965-X.
3. James F Peters, Witold Pedryez, Software Engineering-An Engineering Approach, John Witold Pedrycz, 2004. ISBN: 997-1513099.
4. P. Fleeger, Software Engineering, Third Edition, Prentice Hall, 1999. ISBN: 013-146913-4.
5. Carlo Ghezzi, Mehdi Jazayari, Dino Mandrioli, Fundamentals of Software Engineering, Prentice Hall of India 1991. ISBN: 013-820432-2.

12CS229 C# PROGRAMMING

Credits: 3:0:0

Course Objective:
- To learn about the .Net platform and introduce the basic object oriented concepts
- To learn about delegates, events, assemblies and remoting
- To provide the knowledge necessary to develop windows and web applications

Course Outcome:
The Student will be able to
- work in various areas in C# and to understand the concepts in C#.
- grow in web development applications using ASP.NET Web Forms

Unit I
ESSENTIAL C#: Visual C#.net – data types – operators – statements. C# programming: loops – creating methods – exception handling – working with strings – working with regular expressions. C# object oriented programming: creating classes - creating objects – using access modifiers – creating fields, methods, properties, constructors – structs – static members – destructors – overloading

Unit II
HANDLING INHERITANCE AND DELEGATES: working with inheritance – overriding virtual methods –abstract classes – polymorphism – boxing and unboxing – nested classes and interfaces – delegates- handling events with delegates. Collection and indexers: collections – arrays – array list – queues– stacks – hash tables.

Unit III
WINDOWS APPLICATIONS: basic windows controls – advanced controls – multi window applications. Web applications: web applications – web programming skills – web server controls – advanced windows control.

Unit IV
ADO.NET AND DATABASES: Connections – Data Adapters – Datasets – Data Application – Working with relational databases – Multiple tables in a single dataset – Data views – Data Binding – Complex Binding – Navigating through datasets using bound controls.

Unit V
ASSEMBLIES: Creating an assembly – multiple modules in an assembly – Creating Shared assembles- Security in c#. Multithreading & Remoting: multiple threads – sleeping, aborting,

suspending, resuming and joining threads – Synchronizing threads – Remoting – SOAP for remoting

Text Book:
1. Steven Holzner, "Microsoft Visual C#.NET 2003", Pearson Education, First Indian reprint, 2004, ISBN: 81-297-0235-5.

Reference Book:
1. Andrew Troelson, "C# and the .Net Platform", Intertech Instructor Series, Second Edition, 2005. ISBN: 81-8128-062-8.

12CS230 THEORY OF COMPUTATION

Credits: 3:1:0

Course Objective:
- To understand the logical and mathematical foundations of computer science.
- To study abstract models of computation.

Course Outcome:
The Student will be able to
- define and use abstract models of computation such as finite and push-down automata, and analyze their relative expressive power.
- define, use, and convert between abstract machine models and formal languages.
- Obtain the knowledge of the power and inherent limitations of algorithmic computation.

Unit I
FINITE AUTOMATA: Introduction to the Theory of computation - Finite Automata: Deterministic Finite Accepters –Non-deterministic Finite Accepters – Equivalence of Deterministic and Non deterministic Finite Accepters – Reduction of the number of states in Finite Automata – Regular Languages and regular grammars: Regular Expressions – Connection between Regular expressions an regular languages – Regular Grammars.

Unit II
CONTEXT FREE GRAMMAR: Properties of Regular Languages – Context-free Languages: Context-free Grammars – Parsing and ambiguity – Parsing and Membership – Context-Free grammars – Programming Simplification of Context Free Grammars: Methods for transforming grammars – Important Normal Forms – Membership algorithm for Context – free Grammars.

Unit III
PUSH DOWN AUTOMATA: Pushdown Automata: Non deterministic Pushdown Automata – Pushdown Automata and context Free Languages – Deterministic Pushdown Automata – Deterministic Context Free Languages – Grammars for Deterministic Context free languages – Properties of Context Free Languages.

Unit IV
TURING MACHINES: Turing Machines: The Standard Turing machine. - Combining Turing machine for complicated task- Turing thesis - Other models of Turing machine.

Unit V

COMPLEXITY: A Hierarchy of Formal Languages and Automata – An Introduction to Computational Complexity: Efficiency of Computation – Turing Machines and Complexity – Language family and Complexity Class – the Complexity Classes P and NP.

Text Book:
1. Peter Linz, An Introduction to Formal Languages and Automata, Fourth Edition, Narosa Publishing House, 2009. ISBN: 978-81-7319-781-9.

Reference Books:
1. J. E. Hopcroft and J. D. Ullman, Introduction to Automata Theory Languages and Computation, Narosa Publishers, 2002. ISBN: 978-81-85015-96-5.
2. H. R. Lewis and C. H. Papadimitriou, Elements of the Theory of Computation, Second Edition, Pearson Education/PHI, 2003. ISBN: 81-7808-487-2.
3. Michael Sipser, Introduction to the Theory of Computation, Brooks/Cole Thomson Learning, 1997. ISBN: 981-240-226-8.

12CS231 BUSINESS INTELLIGENCE

Credits: 4:0:0

Course Objective:
1. To provide enhanced knowledge on business Intelligence and the techniques for gathering, storing, analyzing, and Reporting.
2. To impart Knowledge about decision support system, online analytical processing (OLAP), statistical analysis, forecasting, and data mining.

Course Outcome:
The Course enables the students to
1. Apply the BI process across the organization
2. Make predictive analytics work for your bottom line
3. Blend BI process into daily management activities

Unit I
Introduction to Business Intelligence: Effective decision making-Keys to Effective Decision making Business Intelligence and Microsoft SQL Server 2008-What Business Intelligence can do for you-Business Intelligence at many levels-Maximum Miniatures-Building the foundation-Transactional data-The Data Mart-Snowflakes, Stars and Analysis Services-The Business Intelligence Development studio-T he SQL Server Management Studio.

Unit II
Defining Business Intelligence Structures: Data Mart - Designing a Data Mart-Table Compression-The Benefits of Integration-Integration services-Package items

Unit III
Analyzing Cube Content : Building in Analysis Services-Measures-Dimensions-MDX Scripting-MDX Queries-The Basic MDX Select Statement-Additional tools for Querying-Additional Dimensions-Operators-Functions.

Unit IV
Mining: What is Data Mining?-Data Mining Algorithms-Data Mining Structure- Mining Model Viewer-Mining Accuracy Chart-Mining Model Prediction-Data mining Extensions-Special Delivery.

Unit V

Delivering: Reporting Services-Report Service Architecture-Creating Reports using the Tablix Data Region-Report Manager-Managing Reports on the Report Server-Adhoc reporting

Text Book
1. Brain Larson, Delivering Business Intelligence with Microsoft SQL server *2008*, McGraw Hill,2008, ISBN: 978-0071549448

Reference Book
1. Lynn Langit, Foundations of SQL Server 2005 Business Intelligence , Apress 2007 , ISBN 978-1590598344

12CS301 THEORY OF COMPUTATION

Credits: 4:0:0

Course Objective:
- To understand the logical and mathematical foundations of computer science.
- To study abstract models of computation.

Course Outcome:
Student will be able to
- Define and use abstract models of computation such as finite and push-down automata, and analyze their relative expressive power.
- Define, use, and convert between abstract machine models and formal languages.
- Gain Knowledge of the power and inherent limitations of algorithmic computation.

Unit I
FINITE AUTOMATA: Introduction to the Theory of computation - Finite Automata: Deterministic Finite Accepters –Non-deterministic Finite Accepters – Equivalence of Deterministic and Non deterministic Finite Accepters – Reduction of the number of states in Finite Automata – Regular Languages and regular grammars: Regular Expressions – Connection between Regular expressions an regular languages – Regular Grammars.

Unit II
CONTEXT FREE GRAMMAR: Properties of Regular Languages – Context-free Languages: Context-free Grammars – Parsing and ambiguity – Parsing and Membership – Context-Free grammars – Programming Simplification of Context Free Grammars: Methods for transforming grammars – Important Normal Forms – Membership algorithm for Context – free Grammars.

Unit III
PUSH DOWN AUTOMATA: Pushdown Automata: Non deterministic Pushdown Automata – Pushdown Automata and context Free Languages – Deterministic Pushdown Automata – Deterministic Context Free Languages – Grammars for Deterministic Context free languages – Properties of Context Free Languages.

Unit IV
TURING MACHINES: Turing Machines: The Standard Turing machine. - Combining Turing machine for complicated task- Turing thesis - Other models of Turing machine.

Unit V
COMPLEXITY: A Hierarchy of Formal Languages and Automata – An Introduction to Computational Complexity: Efficiency of Computation – Turing Machines and Complexity – Language family and Complexity Class – the Complexity Classes P and NP.

Text Book:

1. Peter Linz, An Introduction to Formal Languages and Automata, Fourth Edition, Narosa Publishing House, 2009. ISBN: 978-81-7319-781-9.

Reference Books:
1. J. E. Hopcroft and J. D. Ullman, Introduction to Automata Theory Languages and Computation, Narosa Publishers, 2002. ISBN: 978-81-85015-96-5.
2. H. R. Lewis and C. H. Papadimitriou, Elements of the Theory of Computation, Second Edition, Pearson Education/PHI, 2003. ISBN: 81-7808-487-2.
3. Michael Sipser, Introduction to the Theory of Computation, Brooks/Cole Thomson Learning,1997. ISBN: 981-240-226-8.

12CS302 SOFTWARE AGENTS

Credits: 4:0:0

Course Objective:
- To introduce the concept of agents, multi-agent systems and the key issues surrounding the design of intelligent agents.
- To design multi agent society and develop applications for agent technology.

Course Outcome:
- The students will have the knowledge about agents and multi-agents
- The students will have the ability to develop complex applications using multi-agents

Unit I
INTELLIGENT AUTONOMOUS AGENTS: Introduction - Intelligent Agents – Deductive Reasoning Agents – Agents as theorem provers – Agent Oriented Programming – Concurrent MetateM.

Unit II
REASONING AGENTS: Practical Reasoning Agents – Reactive and Hybrid Agents – Brook's and Subsumption Architecture – Limitations of Reactive Agents – Hybrid agents – Multiagent Interactions – Making Group Decisions.

Unit III
MULTI-AGENT DECISION MAKING: Forming Coalitions – Allocating Resources – Bargaining – Argumentation – Sharing Understanding.

Unit IV
COMMUNICATION AND COOPERATION: Communication Languages – Working Together – Cooperative Distributed Problem Solving - Task Sharing and Result Sharing -Coordination – Multi-agent Planning and Synchronization – Applications.

Unit V
PROGRAMMING WITH JADE: The JADE Platform – Programming with JADE – Basic Features.

Text Books:
1. Michael Wooldridge, An Introduction to Multi Agent Systems, Second Edition, John Wiley and Sons Ltd, 2009. ISBN: 978-0-470-51946-2.
2. Fabio Bellifemine, Giovanni Caire, Dominic Greenwood, Developing Multiagent Systems with JADE, John Wiley and Sons Ltd, 2007. ISBN: 978-0-470-05747-6.

Reference Books:
1. Gerhard Weiss, Multiagent Systems – A Modern Approach to Distributed Artificial Intelligence, Massachusetts Institute of Technology, 1999. ISBN: 0-262-73131-2.
2. Michael N. Huhns, Munindar P. Singh, Readings in Agents, Morgan Kaufmann Publishers,1998. ISBN: 1-55860-495-2.

12CS303 SOFTWARE ARCHITECTURE

Credits: 4:0:0

Course Objective:
- This course will expose the concepts, principles, and state-of- the-art methods in software architectures, including domain-specific software architectures (DSSA), architectural styles, architecture description languages (ADL), software connectors, dynamism in architectures, and architecture-based testing and analysis.

Course Outcome:
Students will learn about
- description languages (ADL),
- Various software Architecture
- software connectors
- architecture-based testing and analysis

Unit I
INTRODUCTION: What is software Architecture? –An Engineering Discipline for software – The Status of Software Architecture – Architectural Styles – Architectural styles-pipes and filters – Data Abstraction and object oriented organization – Event Based, Implicit Invocation– Layered Systems – Repositories – Interpreters-process control – Other Familiar Architectures – Heterogeneous Architectures.

Unit II
CASE STUDIES : Key word in context – Instrumentation software – Mobile Robotics – Cruise Control – Three vignettes in mixed Style

Unit III
SHARED INFORMATION SYSTEMS: Shared Information systems – Database Integration – Integration in software development environments – Integration in the design of buildings – Architectural structures for shared information systems – Architectural Design Guidance – Guidance for user interface architecture –The quantified design space.

Unit IV
FORMAL MODELS AND SPECIFICATION: The value of Architectural formalism-Formalizing the architecture of a specific system – Formalizing an architectural style – formalizing an architectural design space – Toward a theory of software architecture – Linguistic Issues – Requirements for architecture description languages – First class connectors – Adding implicit invocation to traditional programming languages.

Unit V
TOOLS FOR ARCHITECTURAL DESIGN: UniCon: A Universal Connector Language – Exploiting style in architectural design environments – Beyond definition/use: Architectural Interconnection – Education Of Software Architects – Philosophy and course overview – Course description –Assignments – Evaluation.

Text Book:
1. Mary Shaw and David Garlan, Software Architecture: Perspectives on an Emerging Discipline, Prentice-Hall, 2005. ISBN: 82-203-1470-0.

Reference Books:
1. Len Bass, Paul Clements, and Rick Kazman, Software Architecture in Practice, Second Edition, Addison-Wesley, 2003. ISBN: 0321154959
2. Eric Braude, Software Design: From Programming to Architecture, Wiley, 2004. ISBN:978-0-471-20459-6

12CS304 OBJECT ORIENTED SOFTWARE ENGINEERING
Credits: 4:0:0

Course Objective:
- Gain Knowledge in both the principles of software engineering as well as the practices of various object-oriented tools, processes, and products.
- Design and construction of modular, reusable, extensible and portable software using objectoriented programming languages.

Course Outcome:
Students will be able to
- Understand basics of the software engineering (SE) process life cycle.
- Understand what the object-oriented (OO) approach to software development is, through OO principles and design patterns.
- Understand **UML** (Unified Modeling Language) that is part of most **CASE** (Computer Aided Software Engineering) tools and the benefits of visual modelling / diagramming.
- Practice the application of principles of object-oriented software development through the course group project.
- Develop teamwork and communication skills through the course group project.

Prerequisites:
- Having knowledge about Software engineering.
- Familiarity with a high-level programming language (Java, C++) and data structures.

Unit I
INTRODUCTION TO SOFTWARE ENGINEERING: What is Software Engineering – Software Engineering Concepts – Software Engineering Development Activities – Managing Software Development-Case Study? Modeling with UML: Introduction – Overview of UML – Modeling Concepts –Deeper View into UML.

Unit II
PROJECT ORGANIZATION AND COMMUNICATIONS: Introduction – An Overview of Projects – Project Organization Concepts – Project Communication Concepts – Organizational Activities. Analysis: Introduction – Overview of Analysis – Analysis Concepts – Analysis Activities –Managing Analysis-Case study.

Unit III
SYSTEM DESIGN AND OBJECT DESIGN: Overview of System Design – System Design Concepts – System Design activities – Managing System Design-Case study. Object Design: Overview of Object design –Reuse Concepts – Reuse Activities – Managing Reuse- Case study.

Unit IV

MAPPING MODELS TO CODE: Overview of mapping – Mapping concepts – Mapping Activities –Mapping Implementation-Case study. Configuration Management and Project Management: Configuration Management Overview-Concepts-Activities and Managing Configuration Management – Overview of Project management – Project Management Concepts – Project Management Activities.

Unit V
SOFTWARE LIFE CYCLE: Introduction – IEEE 1074 – Characterizing the Maturity to Software Life Cycle Models – Life cycle Models. Methodologies: Introduction – Project environment –Methodology Issues – A Spectrum of Methodologies-Case studies.

Text Book:
1. Bernd Bruegge and Allen Dutoit, Object-Oriented Software Engineering: Practical software development using UML, Patterns and java, Second Edition, Pearson Education, 2004.ISBN-10: 0130471100.

Reference Books:
1. Bernd Bruegge and Allen H. Dutoit, Object-Oriented Software Engineering: Conquering Complex and Changing Systems**,** Pearson Education, 2002. ISBN 0-13-489725-0.
2. George Wilkie, Object-oriented Software Engineering: The Professional Developer's Guide,Addison-Wesley, 1993. ISBN-10: 0201627671.
3. Timothy C. Lethbridge and Robert Laganiere, Object-Oriented Software Engineering: Practical software development using UML and Java, McGraw-Hill Higher Education, 2005.ISBN: 0077109082.

12CS305 REQUIREMENTS ENGINEERING
Credits: 4:0:0

Course Objective:
- To give a general introduction to the requirement engineering process.
- To know different approaches to model requirement engineering process.
- To understand the importance of human, social and organization factors influence those processes.

Course Outcome:
Students will be able to
- Improves the capability of gathering requirement for projects.
- Identifying factors involved for requirement engineering.
- classify the types of requirements needed for project.
- Understand how Requirement engineering leads towards a good design.

Unit I
SOFTWARE REQUIREMENTS: INTRODUCTION: The Essential Software Requirement: Software Requirements Defined – Requirements Development and Management – Characteristics of Excellent Requirements – Requirements from the Customer's Perspective: Who Is the Customer? – The Customer-Development Partnership – What about Sign-Off? – Good Practices for Requirements Engineering: Knowledge – Requirements Analysis –Requirements Specification – Requirements Validation – Requirements Management – Project Management – Getting Started with New Practices – A Requirements Development Process – The Requirements Analyst: The Requirements Analyst Role –The Making of an Analyst – Creating a Collaborative Environment.

Unit II

SOFTWARE REQUIREMENTS DEVELOPMENT- CAPTURING REQUIREMENTS: Establishing the Product Vision and Project Scope**:** Defining the Vision Through Business Requirements – Vision and Scope Document – The Context Diagram-Keeping the Scope in Focus – Finding the Voice of the Customer: Sources of Requirements – User Classes- Finding User Representatives – The Product Champion – Who Makes the Decisions? – Understanding User Requirements: The Use-Case Approach – Event-Response Tables.

Unit III
SOFTWARE REQUIREMENTS DEVELOPMENT- DOCUMENTING AND MODELING OF REQUIREMENTS: Documenting the Requirements: The Software Requirements Specification – A Software Requirements Specification Template – Guidelines for Writing Requirements – Sample Requirements, Before and After – The Data Dictionary – A Picture Is Worth 1024 Words: Modeling the Requirements – From Voice of the Customer to Analysis Models – Data Flow Diagram – Entity-Relationship Diagram – State-Transition Diagram – Dialog Map – Class Diagrams – Decision Tables and Decision Trees – A Final Reminder.

Unit IV
SOFTWARE REQUIREMENTS MANAGEMENT: Requirements Management Principles and Practices: The Requirements Baseline – Requirements Management Procedures – Requirements Version Control- Requirement Attributes – Tracking Requirements Status – Measuring Requirements Management Effort – Change Happens: The Change-Control Process – The Change Control Board – Change-Control Tools – Measuring Change Activity – Links in the Requirements Chain: Tracing Requirements – Motivations for Tracing Requirements – The Requirements Traceability Matrix – Tools for Requirements Tracing – Requirements Traceability Procedure – Is Requirements Traceability Feasible? Is It Necessary?

Unit V
IMPLEMENTING REQUIREMENTS ENGINEERING: Improving Your Requirements Processes: How Requirements Relate to Other Project Processes – Requirements and Various Stakeholder Groups – Fundamentals of Software Process Improvement – The Process Improvement Cycle – Requirements Engineering Process Assets – Requirements Process Improvement Road Map – Software Requirements and Risk Management: Fundamentals of Software Risk Management – Requirements – Related Risks – Risk Management Is Your Friend.

Text Book:
1. Karl E. Wiegers, Software Requirements, WP Publishers and Distributors Private Limited,2005. ISBN: 81-7853-071-6.

Reference Books:
1. Ralph R.Young, Effective Requirements Practices, Addison Wesley, 2001. ISBN: 0-201-70912-0.
2. Elizabeth Hull, Ken Jackson, Jeremy Dick, Requirements Engineering, Second Edition,Springer Publication, 2005. ISBN: 1852338792, 9781852338794.

12CS306 SECURITY IN COMPUTING
Credits: 4:0:0

Course Objective:
* To understand the security threats in computing and to learn necessary control measures.

Course Outcome:
* The students will be able to design trusted operating systems.

- Will be able to obtain the knowledge on multilevel database and security.
- Will learn the possibilities in securing the network.

Unit I
PROGRAM SECURITY: Secure Programs – Nonmalicious Program Errors – Viruses and Other Malicious Code – Targeted Malicious Code – Controls Against Program Threats.

Unit II
OPERATING SYSTEMS SECURITY: Protected Objects and Methods of Protection – Memory and Address Protection – Control of Access to General Objects – File Protection Mechanisms – User Authentication – Trusted System – Security Policies – Models of Security – Trusted Operating System Design.

Unit III
DATABASE SECURITY: Introduction to Databases – Security Requirements – Reliability and Integrity – Sensitive Data – Inference – Multilevel Databases – Proposals for Multilevel Security.

Unit IV
SECURITY IN NETWORKS: Threats in Networks – Network Security Controls – Firewalls – Intrusion Detection Systems – Secure E-Mail –Mobile IP V6 security.

Unit V
ADMINISTERING SECURITY: Security Planning – Risk Analysis – Organizational Security Policies – Physical Security – Case studies of Ethics.

Text Book:
1. Charles P. Pfleeger, Shari Lawrence Pfleeger, *Security in Computing,* Third Edition, Pearson Education, 2003. ISBN: 81-297-0042-5.

Reference Books:
1. Dieter Gollmann, Computer Security, Second edition, John Wiley and Sons, 2006. ISBN:81- 265-0690-3.
2. William Stallings, Cryptography and Network Security, Second edition, Prentice Hall, 1999. ISBN: 81-7808-902-5.
3. Bruce schneier, Applied Cryptography, Second Edition, John Wiley and Sons, 2002. ISBN: 9971-51-348-X.
4. Paul Campbell, Ben Calvert, Steven Boswell, Security + In Depth, International Student Edition, and 2004. ISBN:981-254-246-9.

12CS307 REAL TIME SYSTEM SOFTWARE
Credits: 4:0:0

Course Objective:
- To understand the main underlying theoretical and practical problems.
- To validate formal specifications, in particular of real-time systems, with the aid of software tools for the verification and analysis.

Course Outcome:

Students will be able to
- identify the Real Time Systems and Process and State Based Systems Model.
- classify the types of Data Flow Diagrams and Tabular Languages
- forecast the behavior Execution Time Prediction and Measurement of Software by software

Unit I
THE WORLD OF REAL TIME SYSTEMS : Software Architecture-Process and State Based Systems Model – Cyclic Executives.

Unit II
REQUIREMENTS AND DESIGN SPECIFICATIONS: Survey and Classifications of Notations – Data Flow Diagrams – Tabular Languages – State Machines – Systems of State Machines – Communicating Real Time State Machines – State chart.

Unit III
DECLARATIVE SPECIFICATIONS : Regular Expressions and Extensions –Traditional Logics – Real-Time Logic – Deterministic Scheduling – Assumptions and Candidate Algorithms – Basic RM and EDF Results – Relaxing the Assumptions – Process Interactions.

Unit IV
EXECUTION TIME PREDICTION: Measurement of Software by software – Program Analysis with Timing Schema – Prediction by optimization – System Interferences and architectural – Keeping Time on computers – Timer applications-properties of real and Ideal Clocks – Clock Servers –Clock synchronization.

Unit V
PROGRAMMING LANGUAGES: –Real time Language features – Ada – Java and real time extensions –CSP and Occam – Estherel Concepts – Operating Systems Real time functions and services – OS architectures – Issues in Task Management – Interrupts and the OS.

Text Book:
1. Alan C. Shaw, Real–Time Systems and Software, Wiley, 2001. ISBN: 9814-12-657- 8.
Reference Book:
1. Jane W. S. Liu, Real-Time Systems, Pearson Education, 2000. ISBN: 81-7808-463-5.

12CS308 DIGITAL SPEECH AND IMAGE PROCESSING

Credits: 4:0:0

Course Objective:
*   To provide adequate information on Speech Processing and Coding Techniques.
*   To provide an introduction to basic concepts and methodologies for Digital Image Processing.

Course Outcome:
Students will be able to
*   get an essential guidance on coding strategies and standards.
*   identify the wide range of speech coding techniques and its performance evaluation.
*   understand the fundamentals and work with the contemporary applications of digital imaging processing

Unit I
SPEECH ANALYSIS: Introduction: Coding Strategies and Standards – Speech Coding Techniques – Algorithm Objectives and Requirements – Standard – Standard Speech Coders – Sampling and Quantization – Sampling – Scalar Quantization – Vector Quantization – Speech Signal Analysis and Modeling.

Unit II

SPEECH CODERS AND ENHANCEMENT: Multimode Speech Coding: Design Challenges of a Hybrid Coder – Summary of Hybrid Coders – Synchronized Waveform Matched Phase Model – Hybrid Encoder – Speech Classification –Hybrid Decoder – Performance Evaluation – Acoustic Noise and Channel Error Performance – Speech Enhancement: Review of STSA based Speech Enhancement – Noise Adaptation – Echo Cancellation.

Unit III

FUNDAMENTALS OF DIGITAL IMAGE PROCESSING: Introduction: Digital Image Processing – The Origins of Digital Image Processing – Examples of Fields that use Digital Image Processing – Fundamentals Steps in Digital Image Processing: Components of an Image Processing System – Digital Image Fundamental - Elements of Visual Perception – Light and Electromagnetic Spectrum – Image Sensing and Acquisition – Image Sampling and Quantization – Some basic Relationships between Pixels – Linear and Nonlinear Operations.

Unit IV

IMAGE ENHANCEMENT: Image Enhancement in the Spatial Domain: Histogram Processing – Smoothing Spatial Filters – Image Enhancement in the frequency Domain: Smoothing Frequency Domain Filters – Sharpening Frequency Domain Filters – Homomorphic Filtering.

Unit V

IMAGE COMPRESSION AND SEGMENTATION: Image Compression: Fundamentals – Image Compression Models – Error Free Compression – Lossy Compression – Image Segmentation: Detection of Discontinuities-Edge Linking and Boundary Detection – Thresholding - Region based Segmentation.

Text Books:
1. M. Kondoz, Digital Speech, Second Edition, Wiley Student Edition, 2005. ISBN 9812-53-172-6.
2. Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, Second Edition, Pearson Edition, 2002. ISBN 81-7758-168-6.

Reference Books:
1. Rabiner and Schaeffeer, Digital Processing of Speech Signals, Prentice Hall, 2005. ISBN: 81-297-0272-X.
2. Anil Jain K., Fundamentals of Digital Image Processing, Prentice Hall India, 2001. ISBN:013-0307963.

12CS309 DATA WAREHOUSING AND MINING

Credits: 4:0:0

Course Objective:
- To learn the basics of Data mining algorithms.
- To learn the technical characteristics of a data warehouse.
- To understand the benefits of a data warehouse.

Course Outcome:
Students will be able to
- implement data mining algorithms.
- provide methods to create a Data Warehouse.
- develop new clustering methods

Unit I

INTRODUCTION TO DATA MINING AND WAREHOUSING: DATA MINING: Motivation of Data mining –Data mining functionalities – Integration of a Data Mining System with a Database or Data Warehouse system. Data Warehouse**:** The Data Warehouse Environment.

Unit II

DATA WAREHOUSE DESIGN AND ITS TECHNOLOGY: The Data Warehouse and Design – The Data Warehouse and Technology – The really Large Data Warehouse.

Unit III

CLASSIFICATION OF DATA MINING: Mining Frequent patterns, Associations and Correlations: Basic Concepts and a road map – Efficient and scalable frequent Itemset Mining Methods – Mining various kinds of Association Rules – From Association Mining to correlation Analysis –Constraint-based Association Mining. Classification and Prediction: Classification– Classification by decision tree induction – Bayesian Classification – Rule Classification – Association Classification.

Unit IV

DATA MINING TECHNIQUES: Cluster Analysis: Types of Data in cluster Analysis – A Categorization of major clustering methods – partitioning methods – Hierarchical Methods – Density based methods – Grid based methods – Model based clustering methods – Clusteringhigh dimensional data – Constraint based clustering analysis – Outlier analysis.

Unit V

APPLICATIONS OF DATA MINING: Spatial Data Mining – Multimedia Data Mining – Text Mining –Mining the World Wide Web – Data Mining Applications.

Text Books:
1. Jiawei Han and Micheline Kamber, Data Mining, Second Edition, Elsevier, ISBN: 81-312-0535-5, 2007.
2. William H. Innon, Building the Data Warehouse, Fourth Edition, Wiley, ISBN: 81-265-0645-8, 2008.

Reference Books:
1. Claudia Imhoff, Nicholas Galemmo, Jonathan G. Geiger, Mastering Warehousing Design Relational and Dimensional Techniques, Wiley, ISBN: 81-265-0365-3, 2005.
2. Ian H.Witten, Eibe Frank, Data Mining Practical Machine Learning Tools and Techniques, Second Edition, Elsevier, ISBN: 81-312-0050-7, 2005.
3. Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques, Chris Ullman, Morgan Kaufmann Publishers, ISBN: 81-8147-049-4, 2001.
4. George M. Marakas, Modern Data Warehousing, Mining, and Visualization, Prentice-Hall, ISBN: 10:0131014595, 2003..
5. Ralph Kimball, The Data Warehouse Toolkit, Wiley, 2002. ISBN: 0-476-20024-7.

12CS310 ADVANCED JAVA

Credits: 4:0:0

Course Objective:
- To know the advanced concepts of Java.
- Advanced Java course provides advanced skills for programming in Java language.
- This course delves deeper into the concepts and capabilities of Java.

Course Objective:

Students will be able to
- Understand the advanced programming skills in java
- Understand the various advanced concepts and capabilities in Java

Unit I
INTRODUCTION AND THE PRESENTATION TIER: Understanding Java and the J2EE platform–Reviewing XML Fundamentals – Introducing Application Servers – Understanding RMI –Studying Servlet Programming – Going over JSP Basics – Using JSP Tag Extensions.

Unit II
THE ENTERPRISE INFORMATION SYSTEM TIER: Working with Java Mail – Understanding the JMS,Introducing Java Transactions – Examining JNDI and Directory Services – Understanding Java Authentication and Authorization Services – Exploring Java Cryptography Extensions.

Unit III
THE SERVICE TIER AND THE DATA TIER : Understanding EJB Architecture and Design – Explaining Session beans and Business Logic – Working with Entity Beans – Using Message Driven Beans– Reviewing Java Database Connectivity – Understanding the J2EE Connector Architecture –Web Services – Introduction – SOAP – WSDL – UDDI – Understanding J2EE Web services.

Unit IV
PATTERNS: Reviewing Presentation tier Patterns – Working with Service Tier Patterns – Using Data Tier Patterns.

Unit V
ADVANCED TOPICS: Exploring Frameworks and Application Architecture – Using ANT to Build and Deploy Applications – Creating High Performance Java Applications.

Text Book:
1. James McGovern, Rahim Adatia, Yakov Fain, Jason Gordon, Ethan Henry, Walter Hurst, Ashish Jain, Mark Little, Vaidyanathan Nagarajan, Harshad Oak, Lee Anne Phillips, J2EE1.4 Bible, Wiley Publishing , 2004. ISBN: 978-0-7645-3966-4.

Reference Books:
1. Ed Roman, Mastering Enterprise Java Beans and the Java 2 Platform, Enterprise Edition, Wiley Computer Publishing, 1999. ISBN: 9971-51-341-2.
2. Harvey M. Deitel, Paul J. Deitel ,Sean E. Santry, Advanced Java(TM) 2 Platform How to Program, Prentice Hall, 2001. ISBN-10: 0130895601, ISBN-13: 9780130895608.
3. Jim Farley, William Crawford, Prakash Malani, John Norman, Justin Gehtland Java Enterprise in a Nutshell, O'Reilly, November 2005. ISBN 10: 0-596-10142-2, ISBN 13: 9780596101428.

12CS311 EVOLUTIONARY COMPUTING
Credits: 4:0:0

Course Objective:
- To provide basic knowledge about the class of evolutionary methods used in solving computer science problems.
- To study genetic algorithms, evolutionary strategies, genetic programming, problem representations, genetic operations, theory of evolutionary algorithms.
- To understand various approaches and applications of evolutionary computation to combinatorial optimization problems.

Course Outcome:

Students will be able to

- learn to apply evolutionary computation to combinatorial optimization problems.
- Obtain sound knowledge in genetic programming.

Unit I

INTRODUCTION: What is an Evolutionary Algorithm? – What is an Evolutionary Algorithm? – Components of Evolutionary Algorithms – Example Applications – Working of an Evolutionary Algorithm – Evolutionary Computing and Global Optimization – Genetic Algorithms: Representation of Individuals – Mutation, Recombination – Population Models – Parent election – Survivor Selection – Example Application: Solving a Job Shop Scheduling problem.

Unit II

EVOLUTION STRATEGIES: –Evolutionary Programming – Genetic Programming.

Unit III

LEARNING CLASSIFIER SYSTEMS: Parameter Control in Evolutionary Algorithms – Multi-Modal Problems and Spatial Distribution.

Unit IV

HYBRIDIZATION WITH OTHER TECHNIQUES: Mimetic Algorithms – Theory – Constraint Handling.

Unit V

SPECIAL FORMS OF EVOLUTION: Working with Evolutionary Algorithms.

Text Book:

1. E. Eiben and J. E. Smith, "Introduction to Evolutionary Computing", Springer – Natural Computing Series, 2003. ISBN: 3-540-40184-9.

Reference Books:

1. Kenneth A. De Jong, "Evolutionary Computation: A Unified Approach", MIT Press, 2006. ISBN-10:0-262-04194-4
2. William B. Langdon, Riccardo Poli, "Foundations of Genetic Programming", Springer - Natural Computing Series, 2002. ISBN: 35-40-42451-2.
3. N. Nedjah, E. Alba, L. de. Macedo Mourelle, "Parallel Evolution Computation", Springer Natural Computing Series, 2006. ISBN-10: 3-540-32837-8.
4. William M. Spears, "Evolutionary Algorithms: The Role of Mutation and Recombination", Springer-Verlag, 2000. ISBN: 3540669507.
5. John R. Koza, "Genetic Programming: on the Programming of Computer by means of Natural Selection", Springer Natural Computing Series, 2000. ISBN: 0-262-11170-5.

12CS312 QUANTUM COMPUTING

Credits: 4:0:0

Course Objective:

- To understand the quantum model of computation and how it relates to quantum mechanics.

Course Outcome:

Students will be able to
- to apply quantum models in computing

Unit I
INTRODUCTION : Qubits, Quantum Mechanics & Computer Perspectives – Quantum Gates.

Unit II
APPLICATIONS: Quantum Teleportation, Quantum Parallelism, Superdense Coding, Quantum Communication.Introductory quantum algorithms: Probabilistic quantum algorithms-Phase kick-back, Deutsch algorithms, Deutsch algorithms-Jozsa algorithm - Simon's algorithm.

Unit III
ALGORITHM WITH SUPER POLYNOMIAL SPEEDUP: Quantum phase estimation and the quantum Fourier –transform - Eigen value estimation-Finding orders-Finding discrete logarithms – Hidden subroots.

Unit IV
ALGORITHM BASED ON AMPLITUDE AMPLIFICATION: Grover's Quantum search algorithm – Amplitude amplification - Quantum amplitude estimation & Quantum Counting - Searching without knowing the success probability.

Unit V
QUANTUM ERROR CORRECTION: Classical error correction - The classical three bit code – Fault tolerance - Quantum error correction - Three and nine-Qubit Quantum codes - Fault tolerant Quantum computation.

Text Books:
1. Vishal Sahni, Quantum Computing, Tata McGraw-Hill, 2007. ISBN-13: 978-0-07-065700-7,ISBN-10: 0-07-065700-9.
2. Phillip Kaye, Raymond Laflamme, An Introduction to Quantum Computin*g*, Oxford University Press, 2007. ISBN-10: 0-19-85700-07, ISBN-13: 978-0-19-857000-4.

Reference Books:
1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information , Cambridge University Press, 2000. ISBN-10: 0-52-16323-58, ISBN-13: 978-0-52-163235-5.
2. Willi-Hans Steeb, Yorick Hardy*i* World Scientific, 2006. ISBN-10: 9-81-25674-02, ISBN-13: 978-9-81-256740-6.

12CS313 SOFTWARE TESTING
Credits: 4:0:0

Course Objective:
- To understand the basics of software testing and its strategies.
- To learn about software quality evaluation policies and procedures
- To give adequate knowledge on various testing methodologies.

Course Outcome:
Students will be able to
- predict the behavior of Defects, Hypotheses and Tests.
- identify the types of Test goals, policies plans, and documentation.

Unit I

INTRODUCTION TO TESTING AS AN ENGINEERING ACTIVITY: Testing Fundamentals – Defects, Hypotheses, and tests – Strategies and methods for test case design I.

Unit II
STRATEGIES AND METHODS FOR TEST CASE DESIGN II : Levels of testing – Test goals, policies plans, and documentation.

Unit III
THE TEST ORGANIZATION : Controlling and monitoring the testing process – Reviews as a testing activity.

Unit IV
A MEASUREMENT PROGRAM TO SUPPORT PRODUCT AND PROCESS QUALITY : Evaluating software quality: A quantitative approach – Defect analysis and prevention.

Unit V
THE TESTER'S WORKBENCH : Process control and optimization – The testing maturity model and test process assessment.

Text Book:
1. Ilene Burnstein, Practical Software Testing, Springer International, 2003. ISBN: 81-8128-089-X.

Reference Books:
1. William E. Perry, Effective Methods for Software Testing, Second Edition, John Wiley, 2000.ISBN: 0-471-35418-X.
2. Elfriede Dustin, Effective Software Testing, Pearson Education, 2003. ISBN: 81-297-0048-4.

12CS314 SOFTWARE METRICS AND QUALITY MANAGEMENT

Credits: 4:0:0

Course Objective:
- To understand how to choose appropriate quality goals and to select, to plan, and to execute quality assurance activities throughout development and evolution to predictably meet quality and schedule goals.
- To study the software quality engineering metrics and models

Course Outcome :
Students will be able to
- employ software metrics and models in software development
- select the best quality assurance plan during development

Unit I
OVERVIEW OF SOFTWARE METRICS: Software measurement – software metrics. **The basics of measurement :** Metrology – Property-oriented measurement – Meaningfulness in measurement – Measurement quality – Measurement process – Scale – Measurement validation – Objectoriented measurement – Subject-domain – oriented measurement – Software measure classification – Goal-based paradigms: Goal-Question-Metrics (GQM) and Goal-Question-Indicator-Metrics (GQIM) – Applications of GQM and GQIM -Case studies. **Empirical investigation :** Software engineering investigation – Investigation principles – Investigation

techniques – Formal experiments: Planning – Formal experiments: Principles – Formal experiments: Types – Formal experiments: Selection – Guidelines for empirical research.

Unit II
MEASURING INTERNAL PRODUCT ATTRIBUTES: size: Software size – Software Size: Length (code,specification, design) – Software Size: Reuse – Software Size: Functionality (function point,feature point, object point, use-case point) – Software Size: Complexity. **Measuring internalproduct attributes: structure:** Software structural measurement – Control-flow structure –Cyclomatic complexity – Data flow and data structure attributes – Architectural measurement.**Measuring cost and effort :** Software cost model – COCOMO and – COCOMO II – Constraintmodel – Software Lifecycle Management (SLIM) – Cost models: advantages and drawbacks.

Unit III
MEASURING EXTERNAL PRODUCT ATTRIBUTES: Quality : Software quality – Software quality models:Boehm's model, McCall's model, ISO 9126 model, etc. – Basic software quality metrics –Quality management models – Measuring customer satisfaction – Software Quality Assurance(SQA). **Measuring software reliability :** Reliability concepts and definitions – Software reliability models and metrics – Fundamentals of software reliability engineering (SRE) –Reliability management models. **Software test metrics:** Test concepts, definitions and techniques – Estimating number of test case – Allocating test times – Decisions based on testing– Test coverage measurement – Software testability measurement – Remaining defects measurement.

Unit IV
THE ELEMENTS OF A COMPLETE SOFTWARE QUALITY SYSTEM: The elements of a software quality system – Additional issues. **Standards:** Areas of standardization – Sources of standards –Selection of standards – Promulgation of standards – Nonstandard standards. **Reviews:** Types of reviews – Review subjects – Documentation reviews. **Testing:** Types of testing – Test planning and conduct. **Defect Analysis:** Analysis concepts – Locating data – Defect repair and closure –Selecting metrics – Collecting measurements – Quality tools**. Configuration Management:** CM components – Configuration identification – Configuration control – Configuration accounting.**Associated Quality Concerns:** Education – Vendor management – Maintenance.

Unit V
SOFTWARE SAFETY: Aspects of software safety – Safety issues -Safety requirements – Safety management. **Risk Management:** Types of risk – Risk management process. **Software Documentation:** Management documents – Development documents – Test documentation - User documentation – Training documentation – Documentation standards. **Quality System Implementation**: Planning the implementation – The quality charter – Changing the organizational culture – Organizational considerations – Development organization participation – Implementation strategies – SQS improvement.

Text Books:
1. John W. Horch, Practical Guide to Software Quality Management, Second Edition, Artech House Computer Library, 2003.
2. N.E. Fenton and S.L. Pfleeger, Software Metrics: A Rigorous and Practical Approach, Second Edition, PWS Publishing, 1998. ISBN 0-534-95425-1.

Reference Books:
1. Gerald M. Weinberg, Quality Software Management: Anticipating Change, Dorset House Publishing Company, May 1997.

2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Second Edition,Addison-Wesley Professional, 2002. ISBN: 0201729156.
3. John C. Munson, Software Engineering Measurement, Auerbach Publications, 2003.ISBN: 0849315034.
4. B A Kitchenham, Software Metrics: Measurement for Software Process Improvement, Blackwell Pub, 1996. ISBN: 1855548208.

12CS315 MODERN DIGITAL COMMUNICATION TECHNIQUES

Credit: 4:0:0

Course Objective:
- To introduce the advanced concepts of digital communication.
- To learn about communication channels and modulations techniques.

Course Outcome:
Students will be able to
- understand the representation of Signals.
- Acquire in depth knowledge in Coding theory and Modulation and M- ary signaling.

Unit I
COHERENT AND NON-COHERENT COMMUNICATION: Coherent receivers – Optimum receivers in WGN – IQ modulation & demodulation – Noncoherent receivers in random phase channels; MFSK receivers – Rayleigh and Rician channels – Partially coherent receives – DPSK,M-PSK,MDPSK– BER Performance Analysis

Unit II
BANDLIMITED CHANNELS AND DIGITAL MODULATIONS: Eye pattern– demodulation in the presence of ISI and AWGN– Equalization techniques – IQ modulations, QPSK- QAM- QBOM- BER Performance Analysis – Continuous phase modulation– CPFM, CPFSK, MSK- OFDM.

Unit III
BLOCK CODED DIGITAL COMMUNICATION: Architecture and performance – Binary block codes- Orthogonal, Biorthogonal, Transorthogonal – Shannon's channel coding theorem– Channel capacity–Matched filter–Concepts of Spread spectrum communication – Coded BPSK and DPSK demodulators –Linear block codes-Hamming, Golay, Cyclic, BCH , Reed – Solomon codes.

Unit IV
CONVOLUTIONAL CODED DIGITAL COMMUNICATION: Representation of codes using Polynomial-State diagram- Tree diagram- and Trellis diagram – Decoding techniques using Maximum likelihood – Viterbi algorithm – Sequential and Threshold methods – Error probability performance for BPSK and Viterbi algorithm–Turbo Coding.

Unit V
SPREAD SPECTRUM SIGNALS FOR DIGITAL COMMUNICATION: Model of spread Spectrum Digital Communication System – Direct Sequence Spread Spectrum Signals – Error rate performance of the coder – Generation of PN Sequences – Frequency-Hopped Spread Spectrum Signals –Performance of FH Spread Spectrum Signals in an AWGN Channel – Synchronization of Spread Spectrum Systems.

Text Book:

1. Marvin Kenneth Simon, Sami M. Hinedi, William C. Lindsey, Digital Communication Techniques: Signal Design and Detection, Prentice Hall India, New Delhi. 1995. ISBN: 81-203-1473-5.

Reference Books:
1. Simon Haykin, Digital Communications, John Wiley and sons, 1998.
2. Wayne Tomasi, Advanced electronic communication systems, Fourth Edition, Pearson Education Asia, 1998.
3. B.P.Lathi, Modern Digital and Analog Communication Systems, Third Edition, Oxford
4. University press, 1998.
5. John G. Proakis, Digital Communications, Fourth Edition, McGraw-Hill, New York, 2003.

12CS316 ADVANCED DATABASE LAB

Credits: 0:0:2

List of Experiments

1. Basic SQL Commands
2. Database Locks
3. Single-row and Multiple-row Functions
4. Sub queries & Advanced Sub queries
5. Views & Materialized Views
6. Procedures, Functions and Cursor Management
7. Tuning Queries and Performance Evaluation
8. Storage of large objects in Database
9. Simple application development using JDBC
10. Simple application development using ODBC

12CS317 OPERATING SYSTEMS AND NETWORKING LAB

Credit: 0:0:2

List of Experiments

1. TCP One & Two Way Communication
2. UDP One & Two Way Communication
3. File Transfer Protocol
4. Remote Method Invocation
5. Simple Http Server
6. Domain Name System
7. Rate & Deadline Monotonic Scheduling
8. Deadline Monotonic Scheduling
9. Earliest Deadline First Scheduling
10. Bankers Algorithm
11. Producer Consumer Problem
12. Dining Table Philosophy

12CS318 SOFTWARE ENGINEERING LAB
Credits: 0:0:2

Develop the following applications using the software engineering methodologies given below :
- Requirements Analysis

- Design Concepts
- Function Point Analysis
- Implementation
- Software Testing Techniques
- Error Tracking

Suggested list of applications
1. Library Management System
2. Bank Management System
3. Inventory System
4. Software for a Game
5. Text Editor
6. Natural Language Based Grammar Checker
7. Airline Reservation System
8. Online Survey
9. Financial Accounting System
10. Graphics Toolkit
11. Payroll Automation
12. Automating Students Attendance System
13. Automating HR System
14. Online Recruitment System
15. Electricity Billing System.

12CS319 SOFTWARE TESTING LAB

Credit: 0:0:2

List of Experiments
.
1. Setting Up The GUI Map
2. Recording Tests
3. Synchronizing Tests
4. Synchronizing Tests
5. Checking Bitmaps
6. Programming Tests With Tsl
7. Creating Data-Driven Tests
8. Reading Text
9. Creating Batch Tests
10. Maintaining Test Scripts

12CS320 SYSTEM DEVELOPMENT LAB

Credits: 0:0:2

List of Experiments

1. Railway Reservation Using Waterfall Model
2. ATM System Using Waterfall Model
3. Telephone Directory Using Spiral Model
4. Online Quiz Using Spiral Model
5. Student Automation Using Win-win Spiral Model
6. Library Management Using Win-win Spiral Model

7. Banking System Using Incremental Model
8. Employee Management Using Incremental Model
9. Dictionary Creation Using Prototype Model
10. Inventory System Using Prototype Model

12CS321 OBJECT ORIENTED CASE TOOLS LAB

Credits: 0:0:2

List of Experiments

1. Use-case Diagram and Class Diagram For ATM System
2. Sequence Diagram and Collaboration Diagram For ATM System
3. State Chart Diagram and Activity Diagram For ATM System
4. Component Diagram, Deployment Diagram, Forward Engineering And Reverse
   Engineering for ATM System
5. Use-case Diagram And Class Diagram For Library Management
6. Sequence Diagram And Collaboration Diagram For Library Management
7. State Chart Diagram And Activity Diagram For Library Management
8. Component Diagram, Deployment Diagram, Forward Engineering And Reverse
   Engineering For Library Management
9. Use-case Diagram And Class Diagram For Inventory System
10. Sequence Diagram And Collaboration Diagram For Inventory System
11. State Chart Diagram And Activity Diagram For Inventory System
12. Component Diagram, Deployment Diagram, Forward Engineering And Reverse
    Engineering For Inventory System

12CS322 WEB TECHNOLOGY LAB

Credit: 0:0:2

List of Experiments

1. Designing a Website
2. Designing a Scientific Calculator Using VB-Script
3. Form Validation Using VB-Script
4. Online Cake Shopping Using ASP
5. Online Shopping Using Cookies
6. Working with SSI
7. Online Shopping Using Cookies
8. Online Railway Ticket Reservation Using Server Object
9. Working with Ado Object
10. Introduction to Macromedia Flash
11. Movie Creation Using Macromedia Flash
12. Designing a Greeting Card Using Photoshop

12CS323 ADVANCED DATABASE TECHNOLOGIES

Credits: 3:0:0

Course Objectives:
- To provide extensive knowledge on Database Management Systems.
- To cover the advanced topics in database technologies.
- To provide an application-oriented and system-oriented approach towards database design.

Course Outcome:
- The students will have understanding on transaction management
- The students will be able to apply locks and isolation levels
- The students will be able to do projects where a proper implementation of databases will be required.
- The students will be able to normalize the tables

Unit I
OVERVIEW OF QUERY EVALUATION: The System catalog- introduction to Operator Evaluation- Algorithms for Relational Operators-Introduction to Query Optimization-Alternative Plans: A motivating example- What a typical optimizer Does-Overview of Transaction Management: The ACID Properties-Transactions and Schedules-Concurrent Execution of Transaction-Lock-Based Concurrency Control-Performance of Locking-Transaction Support in SQL-Introduction to Crash Recovery.

Unit II
CONCURRENCY CONTROL: 2PL, Serializability and Recoverability-Introduction to Lock Management-Lock Conversion-Dealing with Deadlock-Specialized Locking Techniques-Concurrency Control without Locking. Crash Recovery: Introduction To ARIES –The Log: Other Recovery-Related Structures-The Write-ahead Log Protocol –Check Pointing- Recovering from a System Crash –Media Recovery.

Unit III
PHYSICAL DATABASE DESIGN AND TUNING : Introduction to Physical Database Design – Guidelines for Index Selection-Clustering and Indexing –Tools to Assist Index Selection – Overview of Database Tuning –Choices in Tuning the Conceptual Schema-Choices in Tuning Queries and Views –Impact of Concurrency- Case Study: The Internet Shop. Security and Authorization: Introduction to Database Security-Access Control- Discretionary and Mandatory Access Control-Security for Internet Application – Additional Issues Related to Security

Unit IV
PARALLEL AND DISTRIBUTED DATABASES: Architecture for Parallel Databases-Parallel Query Evaluation- Parallelizing Individual Operations-Parallel Query Optimization-Types of Distributed Databases –Distributed DBMS Architecture-Storing Data in Distributed DBMS-Distributed Catalog management-Distributed Query Processing-Updating Distributed Data-Distributed Transaction-Distributed Concurrency Control-Distributed Recovery.

Unit V
INFORMATION RETRIEVAL AND XML DATA: Colliding Worlds: Databases, IR and XML – Introduction to Information retrieval –Indexing for Text Search-Web Search Engines- Managing Text in a DBMS-A Data Model for XML –X Queries: Querying XML Data – Efficient Evaluation of XML Queries. Spatial Data Management: Types of Spatial Data and Queries-Application involving Spatial Data-Introduction to Spatial Indexes-Indexing Based on Space Filling Curves-Grid files –R-Trees –Issues in High Dimensional Indexing.

Text Book:
1. Raghu Ramakrishnan & Johannes Gehrke, Database Management Systems, Third edition, Tata McGraw Hill, 2003. ISBN: 0-07-115110-9 (ISE).

Reference Books:

1. Elmasri & Navathae, Fundamentals of Database Systems, Third Edition, Pearson Education, 2004. ISBN: 81-297-0228-2.
2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, Database System Concepts, Fifth Edition, McGraw-Hill Publication, 2006. ISBN: 007-124476-X.
3. Thomas Connolly, Carolyn Begg, Database Systems – A Practical Approach toDesign, implementation, and Management, Third Edition, Pearson Education, 2002. ISBN: 81-7808-861-

12CS324 ADVANCED OPERATING SYSTEMS

Credits: 3:0:0

Course Objectives:
- To provide comprehensive and up-to-date coverage of the major developments in distributed Operating System, Multi-processor Operating System and Database Operating System
- To cover important theoretical foundations including Process Synchronization, Concurrency, Event ordering, Mutual Exclusion, Deadlock, Agreement Protocol, Security, Recovery and fault tolerance.

Course Outcome:
Students will be able to
- predict the solution for mutual exclusion
- predict the theoretical aspects of concurrency control

Unit I
PROCESS SYNCHRONIZATION: Overview-Synchronization Mechanisms, Architectures of Distributed Systems, Theoretical Foundations. Distributed Mutual Exclusion: Preliminaries, A Simple solution to distributed mutual exclusion, Non-Token Based Algorithm, Lamport's Algorithm, Ricart Agrawala algorithm. Distributed Deadlock detection, Agreement Protocols: System Model, Classification of Agreement Problem, solution to byzantine agreement problem.

Unit II
DISTRIBUTED RESOURCE MANAGEMENT: Distributed File Systems, Distributed Shared memory, Distributed Scheduling.

Unit III
FAILURE RECOVERY AND FAULT TOLERANCE: Failure Recovery, Fault Tolerance.

Unit IV
PROTECTION AND SECURITY: Resource Security and protection: Introduction, Preliminaries, Access Matrix Model, Implementation of Access Matrix, safety in Access matrix model. Multiprocessor Operating systems-Multiprocessor System Architectures.

Unit V
DATABASE OPERATING SYSTEMS: Introduction to Database Operating systems, Concurrency Control, Theoretical Aspects, Concurrency Control Algorithms.

Text Book:
1. Mukesh Singhal, Niranjan G.Shivaratri, Advanced Concepts in Operating Systems: Distributed, Database, and Multiprocessor Operating Systems, Tata McGraw-Hill, 2001. ISBN: 0-07-047268-8.

Reference Books:

1. Mary Gorman, Todd Stubbs, Introduction to Operating Systems: Advanced Course, Course Technology, 2001. ISBN: 0619059443.
2. **Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles, John Wiley and Sons, Seventh Edition, 2006. ISBN: 9812-53-176-9.**

12CS325 DISTRIBUTED SYSTEMS

Credits: 4:0:0

Course Objectives:
- To introduce the concepts of resource sharing, system modeling, inter-process communication and file systems in distributed systems.
- To inculcate the skill sets in name services and global states, distributed transaction and concurrency model, distributed shared memory and distributed multimedia system.

Course Outcome:
Students will be able to
- Obtain knowledge about distributed system and various issues in Distributed Systems
- Understand the different inter-process communication strategies

Unit I
INTRODUCTION: Introduction to Distributed systems - Examples of distributed systems, resource sharingand the web, challenges – System model – introduction - architectural models - fundamental models - Introduction to inter-process communications – API for Internet protocol - external data

Unit II
DISTRIBUTED OBJECTS AND FILE SYSTEM: Introduction - Communication between distributed objects - Remote procedure call - Events and notifications – case study – Operating system support – introduction – operating system layer – protection – process and threads – communication and invocation – architecture - Introduction to DFS - File service architecture - Sun network file system – Andrew file system – Enhancements and future developments.

Unit III
NAME SERVICES AND GLOBAL STATES: Introduction to Name Services- Name services and DNS - Directory services – case study – Introduction to peer-to-peer systems – Napster Department of Computer Science and Engineering 4 and its legacy – Peer-to-peer middleware – Routing overlays – case study – Introduction to time and global states - Clocks, Events and Process states - Synchronizing physicalclocks - Logical time and logical clocks - Global states - Distributed debugging.

Unit IV
DISTRIBUTED TRANSACTION AND CONCURRENCY CONTROL: Introduction to coordination and agreement - Distributed mutual exclusion – elections – multicast communication – consensus and related problems – Introduction to transaction and concurrency control - Transactions – Nested transaction – Locks - Optimistic concurrency control – Timestamp ordering - Comparison of methods for concurrency control - Introduction to distributed transactions - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks – Transaction recovery.

Unit V
REPLICATION AND DISTRIBUTED MULTIMEDIA SYSTEM: Introduction to Replication – System model and group communications – Fault tolerant services – Highly available services –

Transactions with replicated data - Distributed multimedia systems – characteristics of multimedia data – quality of service management – resource management – stream adaptation – case study - Distributed shared memory – design and implementation issues – sequential consistency and Ivy – release consistency and munin – other consistency models.

Text Book:
1. George Coulouris, Jean Dollimore, and Tim Kindberg, Distributed Systems Concepts and Design, Fourth edition, Addison-Wesley, 2005. ISBN: 0321263545.

Reference Books:
1. Andrew S. Tanenbaum and Maartenvan Steen, Distributed Systems: Principles and Paradigms, Second edition, Prentice Hall, 2006. ISBN: 0132392275.
2. William Buchanan, Distributed Systems and Networks, McGraw-Hill, 2001.ISBN: 0077095839.
3. Pradeep K. Sinha, Distributed Operating Systems: Concepts and Design, Wiley- IEEE Press, 1996. ISBN: 0780311191.

12CS326 REAL TIME SYSTEMS

Credits: 4:0:0

Course Objective:
- To study the fundamental concepts, the algorithms and protocols for scheduling and validating of real-time systems.
- To learn the design and evaluation issues in real-time systems.

Course Outcome:
Students will be able to
- acquire knowledge to schedule periodic, aperiodic and sporadic tasks.
- have the ability to understand the effects of practical factors while scheduling the tasks of the real-time system.
- apply the real-time scheduling knowledge in database and fault-tolerant system

Unit I
REALTIME SYSTEMS AND REAL TIME SCHEDULING: Introduction: A Car-Driver Example – Issues in Real-time Computing – Structure of a Real-Time System – Task Classes. Hard Versus Soft Real time Systems: Jobs and Processors – Real times, Deadlines and Timing constraints – Hard and Soft timing constraints – Hard Real time systems – Soft Real time systems – A Reference model of Real time systems: Processors and resources – Temporal parameters of Real time workload – Periodic task model – Precedence constraints and data dependency – Other types of dependencies – Functional Parameters – Resource Parameters of Jobs and Parameters of resources – Scheduling hierarchy. Commonly used approaches to Real time scheduling: Clock driven approach – Weighted round robin approach – Priority Driven approach – Dynamic versus Static systems – Effective Release times and Deadlines – Optimality of EDF and LST – Challenges in validating timing constraints in Priority driven systems – Offline versus Online scheduling.

Unit II
CLOCK-DRIVEN AND PRIORITY-DRIVEN SCHEDULING OF PERIODIC TASKS: Clock-driven scheduling: Notations and assumptions – Static Timer driven scheduler – General structure of Cyclic schedules – Cyclic executives – Improving average response time of Aperiodic jobs – Scheduling Sporadic jobs – Practical considerations – Algorithm for constructing Static schedules – Pros and Cons of Clock driven scheduling. Priority-driven scheduling of Periodic jobs:

Static assumptions – Fixed priority versus Dynamic priority algorithms – Maximum schedulable utilization – Optimality of RM and DM algorithms - Practical factors.

Unit III
SCHEDULING APERIODIC AND SPORADIC JOBS IN PRIORITY DRIVEN SYSTEMS:
Assumptions and Approaches – Deferrable servers – Sporadic servers – Constant Utilization, Total bandwidth and weighted fair – queuing servers – Slack stealing in Deadline-Driven Systems – Slack stealing in Fixed-Priority Systems.

Unit IV
RESOURCES AND RESOURCE ACCESS CONTROL: Assumptions on resources and their usage – Effects of resource contention and resource access control – Non-preemptive Critical Sections – Basic Priority Inheritance Protocol – Basic Priority Ceiling Protocol - Stack Based Priority ceiling Protocol – Use of Priority Ceiling Protocol in Dynamic Priority System – Preemption Ceiling Protocol - Controlling access to multiple unit resources - Controlling concurrent accesses to data objects.

Unit V
REALTIME DATABASE AND FAULT-TOLERANT SYSTEM: Real-time Databases: Introduction – Basic Definitions – Real-time vs. General-purpose databases – Main memory databases – Transaction priorities – Transaction aborts – Concurrency control issues – Disk Scheduling algorithms – A two-phase approach to improve predictability – Maintaining serialization consistency – Databases for hard real-time systems. Fault-tolerant Techniques: Introduction – What causes failures – Fault types – Fault Detection – Fault and Error Containment – Redundancy – Data diversity – Reversal Checks – Malicious or Byzantine Failures – Integrated failure handling.

Text Books:
1. Jane W.S. Liu, Real-Time Systems, Pearson Education, 2000. ISBN: 81 - 7758 - 575 - 4.
2. C. M. Krishna, Kang G. Shin, Real-Time Systems, McGraw-Hill International Edition. ISBN: 0-07-114243-6.

Reference Book:
1. Phillip A. Laplante, Real-Time Systems Design and Analysis, Prentice Hall of India, Third Edition, 2004. ISBN 0-471-22855-9.

12CS327 DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 4:0:0

Course Objective:
- To provide a rigorous introduction to advanced algorithms that implement strategies for solving
- more complicated problems including dynamic programming techniques, greedy algorithms, and amortized analysis.
- To develop classical graph and combinatorial algorithms for problems such as sorting, shortest paths and minimum spanning trees.
- To discuss engineering issues in algorithm design.

Course Outcome
Students will be able to
- Argue the correctness of algorithms using inductive proofs and loop invariants.

- Analyze worst-case running times of algorithms using asymptotic analysis. Compare the asymptotic behaviors of functions obtained by elementary composition of polynomials, exponentials, and logarithmic functions. Describe the relative merits of worst-, average-, and best-case analysis.
- Analyze average-case running times of algorithms whose running time is probabilistic. Employ indicator random variables and linearity of expectation to perform the analyses. Recite analyses of algorithms that employ this method of analysis.

Unit I
INTRODUCTION: Role of Algorithms in computing - Insertion sort - Analyzing algorithms - Designing algorithms - Growth of Functions - Recurrences - Probabilistic Analysis and Randomized Algorithms.

Unit II
SORTING TECHNIQUES: Heapsort – Maintaining and building the heap - The heapsort algorithm-priority Queues - Quicksort – description – performance - randomized version – analysis - Sorting in Linear Time - Elementary Data Structures - Hash Tables - Binary Search Trees.

Unit III
TREES: Red-Black Trees – properties – rotations – insertions – deletions - Dynamic Programming - Greedy Algorithms - aggregate analysis - the accounting method - the potential method – Dynamic tables - B-Trees - basic operations – deletion.

Unit IV
GRAPH: Elementary Graph Algorithms – representations - BFS – DFS - Topological sort - Strongly connected components - Minimum Spanning Trees - Single-Source Shortest Paths - Shortest path and matrix multiplication - The Floyd Warshall algorithm - Johnson's algorithm for sparse graphs.

Unit V
INTRODUCTION TO LINEAR PROGRAMMING: Standard and slack forms - Formulating problems as linear programs - The simplex algorithm – Duality - The initial basic feasible solution - Polynomials and the FFT -NP-completeness.

Text Book:
1. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms, Second Edition, Prentice-Hall India, 2001. ISBN: 8120321413.

Reference Books:
1. Thomas H.Cormen, Charles E.Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms, Third Edition, Prentice-Hall India, 2009. ISBN-10: 0262033844, ISBN-13: 978-0262033848.
2. Michael T. Goodrich, Roberto Tamasia, Algorithm Design, First Edition, John Wiley & sons, 2001. ISBN: 0471383651

12CS328 CRYPTOGRAPHY AND NETWORK SECURITY

Credits: 4:0:0

Course Objectives:
- To highlight on fundamental principles and practices of cryptography and network security.
- To understand the principles of cryptographic algorithms.

- To have a detailed knowledge about authentication, hash functions and application
- level security mechanisms.

Course Outcome:

Students will be able to
- learn various cryptographic algorithms
- have detailed knowledge about authentication, hash functions and application
  level security mechanisms.

Unit I

SECURITY TRENDS :OSI Security Architecture – Security Attacks – Security Services – Security mechanisms – A Model for Network Security – Symmetric Cipher Model – Substitution Techniques- Transposition Techniques - Block Cipher Principles – The Data Encryption Standard – The Strength of DES – Differential linear cryptanalysis Block cipher design principles – Evaluation criteria for AES - The AES Cipher.

Unit II

DATA CONFIDENTIALITY: Multiple Encryption and Triple DES – Block Cipher Modes of Operation – Stream cipher and RC4 – Placement of Encryption function - Traffic confidentiality - Key Distribution-Principle of Public Key Cryptosystems – The RSA Algorithm – Key management – Diffie Hellman Key Exchange – Elliptic curve cryptography.

Unit III

MESSAGE AUTHENTICATION AND HASH FUNCTIONS: Authentication requirements- Authentication functions - Message Authentication codes - Hash functions - Security of hash functions and MAC's - Secure hash Algorithm – Whirlpool – HMAC – CMAC – Digital Signatures – Authentication protocols –Digital signature standard - Kerberos – X.509 Authentication Service – Public Key Infrastructure.

Unit IV

DATA INTEGRITY: Pretty Good Privacy – S/MIME – IP Security Overview - IP Security Architecture –Authentication Header – Encapsulating Security Payload – Combining Security Associations, Key management.

Unit V

WEB SECURITY CONSIDERATIONS : Secure Socket Layer and Transport Layer Security – Secure Electronic Transaction – Intruders – Intrusion Detection – Password Management – Viruses and related threads – Virus countermeasures – Distributed denial of services attack - Firewall Design principles – Trusted System – Common Criteria for Information Technology Security Evaluation.

Text Book:
1. William Stallings, Cryptography and Network Security: Principles and Practices, Fourth Edition. ISBN: 978-81-7758-774-6.

Reference Books:
1. Man Young Rhee, Internet Security, Wiley, 2003. ISBN: 0-470-85285-2.
2. Bruce Schneier, Applied Cryptography: Protocols, Algorithms and Source code in C, Second Edition, Pearson Education. ISBN: 9971-51-348-X.

12CS329 DATABASE SECURITY

Credits: 4:0:0

Course Objectives:
- To learn the security issues pertaining with database servers.
- To survey the security problems existing in popular database systems.
- To know about various database securing technique

Course Outcome:

Students will be able to
- secure database systems in their network
- audit a customer's network for database security problems.

Unit I

INTRODUCTION: Need for Database Security, Oracle architecture, Attacking Oracle, Oracle: Moving Further into the Network, Securing Oracle.

Unit II

DB2: IBM DB2 Universal Database, DB2 Discovery, attack, Defense, Securing DB2.Informix: Information Architecture, Informix: Discovery, attack, defense, Securing Informix.

Unit III

SYBASE ASE: Sybase Architecture, Sybase: Discovery, Attack, and Defense, Moving further into the network, Securing Sybase.

Unit IV

MYSQL: MySQL Architecture, Discovery, attack and Defense, MySQL: Moving further into network, Securing MySQL.

Unit V

SQL SERVER: SQL server Architecture, Exploitation, Attack, Defense, Securing SQL Server.

Text Book:
1. David Litchfield, John Heasman, Defending Database Servers-The Database Hacker's Handbook, Wiley Dreamtech India (P) Ltd, 2005,ISBN: 81-265-0615-6.

Reference Books:
1. Ron Ben Natan, Implementing Database Security and Auditing, Elsevier, 2005. ISBN: 81-312- 0134-1.
2. Ramez Elmasri, Navathe, "Fundamentals of Database System", Fifth Edition, 2007. ISBN: 0-321- 36957-2.

12CS330 WEB SECURITY

Credits: 4:0:0

Course Objective:
- To have a wide understanding of the various threats in the internet.
- To provide security against threats at user and sever level.
- To have security at transaction level
- To know about commerce and legal issues in the web.

Course Outcome:

Students will be able to
- To apply the correct security measures for each threat.
- To design mechanisms to securely transfer information from the sender to the receiver.

Unit I

INTRODUCTION TO WEB SECURITY: The architecture of World Wide Web, Common threats on the Web, The Web Security Landscape-User Security, Web Server Security, Security of data transaction between user and the web server; Cryptography Basics, Cryptography and the Web.

Unit II

USER LEVEL SECURITY: Privacy-protection Techniques, Privacy-protecting Technologies, Backups and Antitheft, Mobile Code I: Plugin's, ActiveX; Mobile Code II: Java, JavaScript, Flash and Shockwave; Digital Certificates- Digital Identification Techniques, Certification Authorities and Server Certificates, Client Side Digital Certificates, Code signing and Microsoft's Authenticode.

Unit III

SERVER LEVEL SECURITY: Physical security of servers, Host security for servers, securing web applications, Deploying SSL server certificates, Securing your Web Service, Controlling access to your web content, Secure CGI/API programming.

Unit IV

TRANSACTION LEVEL SECURITY AND SECURITY INFRASTRUCTURE: SSL/TLS protocol, Secure Authentication and Messaging, understanding public key infrastructure, Firewall solutions, Intrusion Detection System, Disaster Recovery & Backups.

Unit V

COMMERCE AND LEGAL ISSUES: Digital Payments, Blocking Software and Censorship Technologies, Legal issues: civil; Legal issues: Criminal, Intellectual Property and Actionable Content.

Text Book
1. Simpson Garfinkel, Gene Spafford, Web Security, Privacy and Commerce, O'REILLY, Second Edition, 2002. ISBN: 978-0-596-00045-5.

Reference Books
1. Shweta Bhasin, Web Security Basics, Premier Press, 2003. ISBN: 1-59200-006-1.
2. Simpson Garfinkel, Eugene H. Spafford, Web Security and Commerce, O'REILLY, First Edition. ISBN:1-56592-269-7.

12CS331 INFORMATION SECURITY

Credits: 4:0:0

Course Objective:
- To provide students with an exposure about Security System Development Life Cycle.

Course Outcome:
Students will be able to
- have knowledge about various information security issues, ethical laws

Prerequisite: Basic concepts of security in computer applications.

Unit I

INTRODUCTION TO INFORMATION SECURITY: Introduction – The History of Information Security –What is Security – What is Information Security – Critical Characteristics of Information – NSTISSC Security Model – Components of an Information System – Securing the Components – Balancing Security and Access – Top-Down Approach to Security Implementation – The Systems Development Life Cycle – The Security Systems Development Cycle. The Need for Security: Introduction – Business Needs First, Technology Needs Last – Threats – Attacks.

Unit II

LEGAL, ETHICAL AND PROFESSIONAL ISSUES IN INFORMATION SECURITY: Introduction – Law and Ethics in Information Security – Types of Law – Relevant U.S Laws – International Laws and Legal Bodies – Policy Versus Law – Ethical Concepts in Information Security – Codes of Ethics, Certifications and Professional Organizations – Organizational Liability and the Need for Counsel. Risk Management: Identifying and Assessing Risk: Introduction – Risk Management – Risk Identification – Risk Assessment – Documenting Results of Risk Assessment.

Unit III

RISK MANAGEMENT: Assessing and Controlling Risk: Introduction – Risk Control Strategies – Risk Mitigation Strategy Selection – Categories of Controls – Feasibility Studies – Risk Management Discussion Points – Documenting Results – Recommended Practices in Controlling Risk. Blueprint for Security: Introduction – Information Security Policy, Standards and Practices – Information Classification – Systems Design – Information Security Blueprints – ISO 17799/BS 7799 – NIST Security Models – VISA International Security Model – Hybrid Framework for a Blueprint of an Information Security System – Security Education, Training and Awareness Program – Design of Security Architecture.

Unit IV

PLANNING FOR CONTINUITY: Introduction – Continuity Strategy – Business Impact Analysis – Incident Response Planning – Incident Reaction – Incident Recovery – Automated Response – Disaster Recovery Planning – Business Continuity Planning – Model for a Consolidated Contingency Plan – Law Enforcement Involvement. Security Technology: Introduction – Physical Design of the SecSDLC – Firewalls – Dial-up Protection – Intrusion Detection Systems – Scanning and Analysis Tools – Content Filters – Trap and Trace – Cryptography and Encryption-based solutions – Access Control Devices.

Unit V

PHYSICAL SECURITY: Introduction – Access Controls – Fire Safety – Failure of Supporting Utilities and Structural Collapse – Interception of Data – Mobile and Portable Systems – Special Considerations for Physical Security Threats. Security and Personnel: Introduction – The Security Function Within an Organization's Structure – Staffing the Security Function – Credentials of Information Security Professionals – Employment Policies and Practices – Security Considerations for Nonemployees – Separation of Duties and Collusion – Privacy and the Security of Personnel Data.

Text Book:
1. Michael E. Whitman, Herbert J. Mattord, Principles of Information Security, Thompson Course Technology, 2003. ISBN: 981-243-862-9.

Reference Book:
1. Timothy P. Layton, Information Security Design, Implementation, Measurement and Compliance, Auerbach Publications, 2007. ISBN: 0-8493-7087-6.

12CS332 INFORMATION SECURITY AUDIT AND ASSURANCE

Credits: 4:0:0

Course Objective:
- To introduce the basic concepts of Information Security.
- To introduce new approaches to solve a wide variety of research-oriented problem.

Course outcome:
Students will be able to
- propose best practices which utilize the means and methods of disguising information in order to protect confidentiality and integrity.

Unit I
INFORMATION TECHNOLOGY ENVIRONMENT: Controls and Audit – Audit and Review: It's Role in Information Technology – The Audit Process in an Information Technology Environment.

Unit II
IT STRATEGY AND STANDARDS – Planning and Controlling – Project Management.

Unit III
Quality Management - Software Acquisition – Application Risk and Controls.

Unit IV
IT OPERATIONS ENVIRONMENTS: Complexities and Control Issues – Operational Control Issues –Assessing Risk in IT Operations.

Unit V
THE LEGAL ENVIRONMENT AND ITS IMPACT ON INFORMATION TECHNOLOGY: From IT Crime Law to IT Contract Law to Netlaw – Security and Privacy of Information Technology: From the Individual to the Extranet/Intranet/Internet – IT Auditing: Career Planning and Development, Evaluating Audit Quality and Best Practices.

Text Book:
1. Frederick Gallegos, Sandra Senft, Daniel P. Mason, Carol Gonzales, Information Technology Control and Audit, Auerbach Publications, Second Edition, 2004. ISBN: 0-8493-2032-1.

Reference Book:
1. Jagdish Pathak, Information Technology Auditing: an Evolving Agenda, Springer,2005. ISBN: 3-540-22155-7.

12CS333 COMPUTING SECURITY LAB

Credits: 0:0:2

List of Experiments

1. Implement RSA Algorithm
2. Implement DES Algorithm
3. Write a java program to implement digital signatures.

4. Write a program based on CAPTCHA to prevent DOS attacks.
5. Demonstrate buffer overflow problem and write a program to prevent it.
6. Write a program to prevent simple SQL injection attacks.
7. Write a java program to provide secure group communication.
8. Write a program to address data aggregation problem in databases.
9. Create a web application that provides secure access to database.
10. Demonstrate the use of trusted applets.

12CS334 COMMUNICATION AND SWITCHING TECHNIQUES

Credits: 4:0:0

Course Objective:
- To learn Switching, Signaling and traffic in the context of telecommunication network.
- To expose through the evolution of switching systems from manual and electromechanical systems to stored-program-controlled digital systems.

Course Outcome:
- The students will learn about various switching techniques in the telecommunication network.
- This subject will enable the student to understand well the concepts of telecommunication traffic.

Unit I
INTRODUCTION: The development of telecommunications-Network structures-Network services-Regulation-Standards-The OSI reference model for open systems interconnection.Telecommunications Transmission: Power levels-Four wire circuits-Digital transmission-Frequency division multiplexing-Time division multiplexing-Transmission performance-Transmission systems

Unit II
EVOLUTION OF SWITCHING SYSTEMS AND TELECOMMUNICATIONS TRAFFIC: Message switching-Circuit switching-Manual systems-Functions of a switching system-The Strowger step by step system-Register translator senders-Distribution frames-Crossbar systems-A general trunking –Electronic switching-Reed electronic systems-Digital switching systems. The Unit of traffic-Congestion-Traffic measurement-A mathematical model-Lost call systems-Queuing systems-Simulation.

Unit III
SWITCHING NETWORKS: Single stage networks- Gradings- Link systems-Grades of service of link systems-Application of graph theory to link systems-Use of expansion-Call packing-Rearrangeable networks-Strict sense nonblocking networks-Sectionalized switching networks. Time division switching: Space and time switching-Time division switching networks-Grades of service of time division switching networks-Non blocking networks-Synchronization.

Unit IV
CONTROL OF SWITCHING SYSTEMS: Call processing functions-common control-Reliability, availability and security-Stored program control. Signaling: Customer line signaling-Audio frequency junctions and trunk circuits- FDM carrier systems-PCM signaling-Inter register

signaling-Common channel signaling principles-CCITT signaling system no. 6-CCITT signaling system no. 7-Digital customer line signaling.

Unit V
PACKET SWITCHING: Statistical multiplexing-Local area and wide area networks-Large scale networks-Broadband networks. Networks: Analog networks-Integrated digital networks-Integrated services digital networks-Cellular radio networks-Intelligent networks-Private networks-Numbering-Charging-Routing-Network Management.

Text Book:
1. J.E.Flood, Telecommunications Switching, Traffic and Networks, Pearson Education, 1999, Second Impression 2007 ISBN 978-317-0502-1.

Reference Books:
1. Thiagarajan Viswanathan, Telecommunication Switching Systems and Networks, Prentic Hall of India, 1992, ISBN 81-203-0713-5.
2. Robert G.Winch, Telecommunication Transmission System, Second Edition, Tata Mcgraw-hill Education Private Ltd,2004, ISBN-13:978-0070709706.
3. Wayne Tomasi, Advanced Electronics Communication System, Sixth edition, Prentice Hall of India, 2003. ISBN 013-0453501.

12CS335 DATA WAREHOUSE
Credits: 4:0:0

Course Objective:
- To understand different methods for handling unstructured data in a data warehouse.
- To learn the techniques to store the data across multiple storage media.
- To examine Relational and Multidimensional Models.
- To explore advanced topics, including data monitoring and testing.

Course Outcome:
Students will be able to
- learn techniques to store data in storage media
- learn methods for handling data in a data warehouse

Unit I
INTRODUCTION AND DESIGN: Evolution of Decision Support Systems - The Data Warehouse Environment – The Data Warehouse and Design.

Unit II
GRANULARITY, TECHNOLOGY AND DISTRIBUTED DATA WAREHOUSE: Granularity in the Data Warehouse - The Data Warehouse and Technology – The Distributed DataWarehouse.

Unit III
DATA MIGRATION: Executive Information Systems and The Data Warehouse – External Data and The Data Warehouse – Migration to the architectural Environment.

Unit IV
DATA WAREHOUSE AND THE WEB: The Data Warehouse and the Web – Unstructured Data and The Data Warehouse – The Really Large Data Warehouse.

Unit V
MULTIDIMENSIONAL MODELS: The Relational and the Multidimensional Models as a Basis for Database and design – Advanced Topics in the Data Warehouse.

Text Book:
1. William H.Inmon, Building the Datawarehouse, Wiley Dreamtech (P) Ltd, Fourth Edition,Reprint 2010, ISBN:81-265-0645-8.

Reference Books:
1. Claudia Imhoff ,Nicholas Galenno, Jonathan G.Geiger, Mastering data warehouse design, Wiley Publishing, First Edition, 2003,ISBN:81-265-0365-3.
2. Paulraj Ponniah, Data Warehousing Fundamentals – A Comprehensive guide for IT Professionals, John Wiley & Sons, First Edition, 2003, ISBN: 981-2-53-012-6.

12CS336 MAINFRAME SYSTEMS

Credits: 4:0:0

Course Objective:
- To understand the basic concepts of the mainframe, including its use and architecture
- To understand the fundamentals of z/OS, a widely used mainframe operating system
- To understand the mainframe workloads and various security issues.

Course Outcome:
Students will be able
- To learn mainframe operating system
- Learn various security issues.

Unit I

EVOLUTION OF MAINFRAME HARDWARE: Mainframe computer - key features - benefits - Evolution of Mainframes - Different hardware systems, **Mainframes OS and Terminology:** Operating systems on mainframes, Batch processing vs. online processing - mainframe operating system. - evolution - concepts of Address space, Buffer management - Virtual storage - paging - swapping - Dataset management in mainframes

Unit II

Z/OS AND ITS FEATURES: Z-operating system (Z/OS) - Virtual storage - Paging process - storage Managers - Program execution modes - Address space - Multiple virtual system (MVS), MVS address space, Z/OS address space - Dataset - sequential and partial dataset - Direct access storage device (DASD) -Access methods - Record formats - Introduction to virtual storage access methods (VSAM) - Catalog - VTOC

Unit III

COBOL PROGRAMMING:COBOL program Structure, steps in executing COBOL, Language Fundamentals – Divisions, sections, paragraphs, sections, sentences and statements, character set, literals, words, figurative constants, rules for forming user defined words, COBOL coding sheet, Data division – Data names, level numbers, PIC and VALUE clause, REDEIFNES, RENAMES and USAGE clause, Procedure Division – Input / Output verbs, INITIALIZE verb, data movement verbs, arithmetic verbs, sequence control verbs.

File processing – Field, physical / logical records, file, file organization (sequential, indexed and relative) and access mode, FILE-CONTROL paragraph, FILE SECTION, file operations, File handling verbs – OPEN, READ, WRITE, REWRITE, CLOSE, Table processing – Definition, declaration, accessing elements, subscript and index, SET statement, SEARCH verb, SEARCH ALL verb, comparison, Miscellaneous verbs – COPY, CALL, SORT, MERGE, STRING, UNSTRING verbs.

Unit IV

JCL: Introduction to Job Control language - Job processing - structure of JCL statements - Various statements in JCL - JOB statement - EXEC statement - DD statement - JCL procedures and IBM utility programs.

Unit V

DB2: Introduction to DB2 – System Service component, Database Service component, Locking Service component, Distributed Data Facility Services component, Stored Procedure component, catalogs and optimizer, DB2 Objects and Data Types - DB2 Objects Hierarchy, Storage groups, Database, Table space, Table, Index, Clustered index, Synonyms and aliases,   Views, Data Types, DB2 SQL programming – Types of SQL statements, DCL, DDL, DML, SPUFI utility, Embedded SQL programming – Host variable, DECLGEN utility, SQLCA, single/multiple row manipulation, cursors, scrollable cursors.

Mainframe Application Development guidelines: COBOL coding standards, relation between a COBOL file handling program and JCL, Different types of ABEND codes, COBOL-DB2 program pre-compilation, DBRM (Database Request Module), Application plan/packages, program execution methods (EDIT JCL, foreground and background modes).

Text Books:
1. Gary DeWard Brown, "JCL Programming Bible (with z/OS)", Fifth edition, Wiley India Dream Tech, 2002.
2. Nancy Stern and Robert A Stern, "Structured Cobol Programming", John Wiley & Sons, New York, 1973.
3. Craig S Mullins, "DB2 Developer's Guide", Sams Publishing, 1992.

Reference Books:
1. COBOL - Language Reference, Ver 3, Release 2, IBM Redbook.
2. COBOL - Programming Guide, Ver 3, Release 2, IBM Redbook.
3. M.K. Roy and D. Ghosh Dastidar, "Cobol Programming", Tata McGraw Hill, New York, 1973.
4. Newcomer and Lawrence, "Programming with Structured COBOL", McGraw Hill Books, New York, 1973.
5. Gabrielle Wiorkowski and David Kull, "DB2 Design & Development Guide", Addison Wesley, 1992.
6. C J Date and Colin J White, "A Guide to DB2", Addison Wesley.
7. IBM Manual: DB2 Application Programming and SQL guide.
8. IBM Manual: DB2 SQL Reference.

12CS337 ADVANCED DATA MINING

Credits: 4:0:0

Course Objective:
- To provide an in-depth knowledge of building data models, evaluating model's predictive quality and how to apply them in practice.
- To provide practical knowledge of how commercial systems work.

Course Objective:
Students will be able to
- learn how to building data models, evaluating model's predictive quality and how to apply them in practice.

Unit I

DATA MINING AND MACHINE LEARNING : Simple examples - Fielded applications - machine learning and statistics - Generalization as search - Data mining and ethics. Input: Concepts, instances, and attributes. Output: Knowledge representation.

Unit II
ALGORITHMS: Inferring rudimentary rules - Statistical modeling - Divide-and-conquer – Covering algorithm - Mining association rules - Linear model - Instance-based learning - clustering.

Unit III
CREDIBILITY: Training and testing - predicting performance, - cross-validation - other estimates - comparing data mining methods - predicting probabilities - counting cost - evaluating numeric prediction - The minimum description length principle - Applying the MDL principle to clustering.

Unit IV
IMPLEMENTATIONS: Real machine learning schemes: Decision trees - Classification rules – Clustering - Bayesian networks. Extension and applications.

Unit V
THE WEKA MACHINE LEARNING WORKBENCH: Introduction to Weka – The Explorer – The Knowledge Flow Interface

Text Book:
1. Ian H. Witten, Eibe Frank, Data Mining Practical Machine Learning Tools and Techniques,Elsevier, Second Edition, 2005, ISBN 81 – 312 – 0050 – 7.

Reference Books:
1. Jiawei Han, Micheline Kamber, Data Mining Concepts and Techniques, Chris Ullman, Morgan Kaufmann Publishers, 2001, ISBN 81 – 8147 – 049 – 4.
2. David Hand, Heikki Mannila and Padhraic Smyth, Principles of Data Mining, The MIT Press, 2001. ISBN-10: 026208290X

12CS338 PERVASIVE COMPUTING

Credits: 4:0:0

Course Objective:
- To gain an insight into future developments in the field of pervasive computing.
- To provide an in depth knowledge on pervasive computing and wireless networking.
- To describe the variety of pervasive services and applications.

Course Outcome:
Students will be able to
- learn pervasive services and applications.

Unit I
WHAT PERVASIVE COMPUTING IS ALL ABOUT: Times are Changing-Decentralization continues- Applied Pervasive computing-Pervasive computing principles-Pervasive Information Technology. Devices:Information Access Devices-Handheld Computers-Sub-Notebooks- Phones. Smart Identification**:**Smart Cards-Smart Labels. Embedded Controls: Smart sensors and Actuators-Smart Appliances-Appliances and Home Networking-Automotive Computing.

Unit II
ENTERTAINMENT SYSTEMS: Television Systems-Game Consoles. Operating Systems**:** Windows CE, -Palm OS-Symbian EPOC-Java Card-Windows for Smart Cards. Middleware Components:Programming Consumer Devices-Smart Card Programming-Messaging Components-DatabaseComponents.

Unit III
WAP: The WAP Architecture-Wireless Application Environment. Connectivity**:** Wireless Wide Area Networks-Short Range Wireless Communication-Home Networks. Service Discovery: Universal Plug and Play-Jini-Salutation.

Unit IV
GATEWAYS: Connectivity Gateway-Wireless Gateway-Transcoding-Residential Gateway. Web Application Servers: Architecture and Components-WebSphere Application Server WebSphere Everyplace Suite-Oracle Portal-to-Go. Device Management**:** Tasks of Device Management Systems-Tivoli Device Support Infrastructure-User Profiles and Directory Services.Synchronization: What Synchronization is all About-The Challenge of Synchronizing Data-Industry Data Synchronization Standards-Today's Synchronization Solution.

Unit V
PORTALS AND ACCESS SERVICES: Internet Portals-Wireless Portal-Broadcasting Portal. Home Services:The System View-Communication Services-Home Automation-Energy Services-Security Services-Remote Home Healthcare Services. Travel and Business Services: Travel Services-Business Services**.** Consumer Services: Interactive Advertisement-Loyalty-Shopping-PaymentServices.

Text Book:
1. Uwe Hansmann, Lothar Merk, Martin S. Nicklous, Thomas Stober, Pervasive Computing Handbook, Springer, 2001, ISBN 3-540-6712.

Reference Book:
1. Asoke K Talukder, Roopa R Yavagal, Mobile computing: Technology, Applications and Service Creation, Tata McGraw-Hill Publishing Company Limited, 2005, ISBN 0 – 07 - 058807 – 4.

12CS339 DIGITAL IMAGE PROCESSING

Credits: 4:0:0

Course Objective:
- To address the basic theory and algorithms that are widely used in digital image processing
- To develop critical thinking about short-comings of the state-of-the-art in image processing
- To provide the learners a useful skill-base to carry out further study and work in the field

Course Outcome:
Students will be able to
- learn algorithms that are widely used in digital image processing
- learn the state-of-the-art in image processing

Unit I
INTRODUCTION: Examples of Fields that use Digital Image processing-Fundamental Steps in Digital Image Processing -Components of an Image Processing System – Image Sensing and

acquisition-Image Sampling and Quantization-Basic Relationships between Pixels-Image Enhancement in the spatial domain.

Unit II
IMAGE ENHANCEMENT IN THE FREQUENCY DOMAIN: Introduction to the Fourier transform and Frequency Domain –Smoothing Frequency Domain Filters - Sharpening Frequency Domain Filters-Homomorphic filtering

Unit III
INTRODUCTION TO WAVELETS AND MULTI-RESOLUTION PROCESSING : Image compression: Fundamentals -Image compression models-Error free compression-Lossy compression.

Unit IV
IMAGE SEGMENTATION: Detection of discontinuities-Edge Linking and Boundary Detection -Thresholding -Region-Based Segmentation -The Use of Motion in Segmentation

Unit V
REPRESENTATION AND DESCRIPTION: Representation - Boundary Descriptors - Regional Descriptors-Use of Principal Components for Description-relational Descriptors.

Text Book:
1. Rafael .C.Gonzalez and Richard.E.Woods, Digital Image Processing, Second Edition, Addison Wesley, 2002. ISBN 81-7758-168-6.

Reference Book:
1. William K.Pratt, Digital Image Processing, Third Edition, John Wiley, 2002. ISBN 9-814-12620-9.

12CS340 MICROWAVE ENGINEERING

Credits: 4:0:0

Course Objective:
- To learn about microwave and its characteristics
- To analyze microwave network theory and passive devices.
- To learn the applications of microwave.

Course Outcome:
Students will be able to
- learn microwave and its characteristics
- learn applications of microwave

Unit I
INTRODUCTION TO MICROWAVE-BASIC TRANSMISSION LINE THEORY: Transmission Line Equations-Characteristic and Input Impedances – Reflection and Transmission Coefficients – Standing Wave– Mismatch Losses in Transmission Lines - Smith Chart – High Frequency Lines; Propagation of Electromagnetic Waves: Wave Impedance and Propagation – Electromagnetic Wave - Equation, Energy and Power Flow – Poynting Theorem – Equivalent Circuit Parameters of Propagation Lines – Boundary Conditions – Polarization of Waves – Plane Waves in Unbounded medium –Lossy Dielectric – Lossless Dielectric – Good Conductor – Plane Waves at the Interface of two Media – Propagation of Microwaves in Ferrite – Faraday Rotation in Ferrites.

Unit II

MICROWAVE TRANSMISSION LINES: Ideal Coaxial Line – Planar Transmission Lines – Wave Guides Types: Rectangular, Circular, Ridge, Surface – Power Handling Capability of Microwave Transmission Lines; Impedance Transformations for Matching: General Condition-Narrow Band and Broad Band Matching – Tapered Transmission Lines.

Unit III
MICROWAVE NETWORK THEORY AND PASSIVE DEVICES: Symmetrical Z and Y Matrices for Reciprocal Network – Scattering or S Matrix Representation of Multiport Network – Microwave Passive Devices

Unit IV
MICROWAVE RESONATORS: Coaxial Resonators – Waveguide Cavity Resonators – Cavity Excitation and Tuning – Q-Factor of Microwave Cavities – Loaded and External Q – Coupled Cavities – Re-Entrant Cavity – Hole and Slot Cavity – Microstrip Resonators.

Unit V
MICROWAVE FILTER: Filter Parameters – Mismatch Effects – Microwave Realization of the Filter Elements – Filter Design – Microwave filters: Low-pass, High-pass, Band-pass and Band-stop filters; Applications of Microwaves: Microwave Radar Systems – Microwave Communication Systems – Industrial Application of Microwaves.

Text Book:
1. Annapurna Das and Sisir K Das, Microwave Engineering, Tata McGraw Hill Publishing Company Ltd, 2000, ISBN 0-07-463577-8.

Reference Books:
1. David M. Pozar, Microwave Engineering, Third Edition, John Wiley, 2005, ISBN 0-471-17096-8.
2. Robert E. Collin, Foundations for Microwave Engineering, Second Edition, McGraw Hill International Edition, 1992, ISBN 0-07-112569-8.

12CS341 OPTICAL FIBER COMMUNICATION
Credits: 4:0:0

Course Objective:
- To study the advantages of Optical Fiber Communication
- To understand how data is being carried out through light pulses in Optical Fiber cables
- To understand the existing problems and future possibilities of Optical Fiber Communication

Course Outcome
Students will be able to
- understand, describe, analyze, and compare the most important devices like light sources, fibers and detectors from both physical and system point of view.
- design digital fiber optic links and to establish an efficient optical link

Unit I
OVERVIEW OF OPTICAL FIBER COMMUNICATION: Basic Network Information Rates – The Evolution of Fiber Optic Systems – Elements of an Optical Fiber Transmission Link – Simulation and Modeling Tools. Optical Fibers: Structures, Wave guiding, and Fabrication: The Nature of Light – Basic Optical laws and definitions – Optical fiber modes and configurations – Mode theory for circular waveguides – single –mode fibers – Graded-Index fiber structure.

Unit II
SIGNAL DEGENERATION IN OPTICAL FIBERS: Attenuation – Signal distortion in optical waveguides –Pulse broadening in graded-index waveguides-Mode coupling. Optical Sources – Light – Emitting Diodes (LEDs)-Laser Diodes.

Unit III
PHOTODETECTORS: Physical principles of photodiodes-Photo detector- Noise-Detector response time- Avalanche multiple noises. Optical Receiver Operation: Fundamental receiver operation – Digital receiver performance –Preamplifier Types – Analog receivers.

Unit IV
DIGITAL TRANSMISSION SYSTEMS: Point-to-Point links – Line coding- Noise Effects on System Performance WDM Concepts and Components: Operational principles of WDM-Passive Components – Tunable sources – Tunable Filters.

Unit V
OPTICAL AMPLIFIERS: Basic Applications and Types of Optical Amplifiers – Semiconductor Optical Amplifiers – Erbium-Doped Fiber Amplifiers Optical Networks: Basic Networks – SONET/SDHBroadcast- and-Select WDM Networks – Wavelength-Routed Networks-Optical CDMA.

Text Book:
1. G. Keiser, Optical Fiber Communications, 3rd Edition, McGraw Hill, 2000, ISBN 0-07-116468- 5.

Reference Book:
1. G.P. Agarwal, Fiber Optic Communication Systems, Second Edition, John Wiley & Sons, New York, 1997, ISBN: 0-471-21571-6.

12CS342 PARALLEL COMPUTING

Credits: 4:0:0

Course Objective:
- To provide a complete end-to-end source on almost every aspect of parallel computing.
- To explain both traditional computer science algorithms as well as scientific computing algorithms.
- To explain MPI, Pthreads and Open MP, the three most widely used standards for writing portable parallel programs.

Course Outcome:
Students will be able to
- learn MPI, Pthreads and Open MP, the three most widely used standards for writing portable parallel programs

Unit I
INTRODUCTION TO PARALLEL COMPUTING: Motivating Parallelism -Scope of Parallel Computing. Parallel Programming Platforms: Implicit Parallelism: Trends in Microprocessor Architectures - Limitations of Memory System Performance- Dichotomy of Parallel Computing Platforms - Physical Organization of Parallel Platforms -Communication Costs in Parallel Machines – Routing Mechanisms for Interconnection Networks.

Unit II

PRINCIPLES OF PARALLEL ALGORITHM DESIGN : Preliminaries - Decomposition Techniques - Characteristics of Tasks and Interactions - Mapping Techniques for Load Balancing – Methods for Containing Interaction Overheads - Parallel Algorithm Models-Basic Communication Operations :One-to-All Broadcast and All-to-One Reduction -All-to-All Broadcast and Reduction – Linear Array and Ring- All-Reduce and Prefix-Sum Operations - Scatter and Gather- All-to-All Personalized Communication-Circular Shift - Improving the Speed of Some Communication Operations .

Unit III

PROGRAMMING USING THE MESSAGE-PASSING: Principles of Message-Passing Programming – The Building Blocks: Send and Receive Operations - MPI: the Message Passing Interface – topologies and Embedding - Overlapping Communication with Computation. Collective Communication and Computation Operations - Groups and Communicators.

Unit IV

PROGRAMMING SHARED ADDRESS SPACE: Thread Basics -Why Threads? The POSIX Thread API - Thread Basics: Creation and Termination - Synchronization Primitives in Pthreads – Controlling Thread and Synchronization Attributes - Thread Cancellation - Composite Synchronization Constructs - Tips for Designing Asynchronous Programs OpenMP: a Standard for Directive Based Parallel Programming.

Unit V

SORTING: Issues in Sorting on Parallel Computers - Sorting Networks - Bubble Sort and its Variants- Quicksort - Bucket and Sample Sort - Other Sorting Algorithms Graph Algorithms: Definitions and Representation - Minimum Spanning Tree: Prim's Algorithm - Single-Source Shortest Paths:Dijkstra's Algorithm – All-Pairs Shortest Paths- Transitive Closure- Connected Components -Algorithms for Sparse Graphs.

Text Book:
1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, Introduction to Parallel Computing, Second Edition, Pearson Education, 2004.ISBN 81-297-0407-2

Reference Books:
1. Michael J. Quinn, Parallel computing second edition: theory and practice,1994.ISBN:0-07-051294-9
2. Peter Arbenz**,** Wesley Petersen, W. P. Petersen, Introduction To Parallel Computing, 2004**.**ISBN: 0198515774

12CS343 ADVANCED COMPUTER ARCHITECTURE

Credits: 4:0:0

Course Objective:
- To have a detailed study on computer architecture concepts
- To study on different architectures and design principles
- To study on pipelining, parallel computer models and memory concepts

Course Outcome:
Students will be able to
- learn computer architecture concepts, design principles

Unit I

PARALLEL COMPUTER MODELS: Introduction, Flynn's classification, Parallel & Vector Computers system Attributes to performance, implicit & Explicit parallelism, shared, Memory Multiprocessors. Uniform and Non-uniform Memory Access and Cache only Memory Access Models, distributed Memory Multicomputers Multivector & SIMD Computers, PRAM and VLSI Models.

Unit II
FUNDAMENTALS OF COMPUTER DESIGN: Introduction – Measuring and Reporting performance – Quantitative Principles of computer design. Instruction set Principles and Examples: Introduction–Classifying Instruction set Architectures – Memory Addressing – Addressing Modes for signal processing – Type and size of operands

Unit III
PIPELINING: Introduction – The Major Hurdle of pipelining – pipeline Hazards – Implementation –Extending the MIPS pipeline to handle multicycle operations

Unit IV
INSTRUCTION – LEVEL PARALLELISM: concepts and challenges – overcoming data Hazards with Dynamic scheduling – Dynamic scheduling: Examples and the Algorithm – Reducing Branch costs with Dynamic Hardware Prediction – High Performance instruction delivery – Taking advantage of More ILP with Multiple Issue – Hardware – Based speculation – Studies of the Limitations of ILP – Limitations of ILP for Realizable processors – thread level parallelism

Unit V
PROCESSORS AND MEMORY HIERARCHY: CISC & RISC Architectures, CISC Family, RISC scalar processors, Super Scalar Processors and their features. Very Long Instruction word Architecture vector & Symbolic processors, Memory Hierarchy.

Text Books:
1. John L. Hennessy and David Patterson, Computer Architecture, A Quantitative Approach,Fourth Edition, Elsevier, 2006. ISBN-13: 9780123704900.
2. Kai Hwang, Advanced Computer Architecture, Parallelism, Scalability, Programmability, McGraw-Hill, ISBN 0070316228.

Reference Books:
1. Barry Wilkinson and Michael Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, 2nd Edition, Prentice Hall, 2005. ISBN 0-13-140563-2.
2. K.IIWANG & E.A.BRIGGS, Computer Architecture and Parallel Processor, McGraw-Hill,New York, 1984.
3. H.S.STONE, High Performance Computer Architecture, Addison Wesley, Reading Mass, 1999.
4. W.STALLINGS, Computer Organization & Architecture, Second Edition, 1990.

12CS344 ASP .NET
Credits: 4:0:0

Course Objective:
- To gain experience about developing dynamic websites with ASP.NET in the .Net 3.5 platform.
- To help students to understand about State Management, Building Web forms, Master Pages, Themes, Website navigations, ADO.Net etc.

Course Outcome:

Students will be able to

- learn developing dynamic websites with ASP.NET in the .Net 3.5 platform.

Unit I

DEVELOPING ASP.NET APPLICATIONS – Visual Studio - Web Form Fundamentals-Web Controls.

Unit II

DEPLOYMENT AND ERROR HANDLING: State Management - Error Handling, Logging, and Tracing: Deploying ASP.Net Applications:ASP.Net Applications and the Web Server.

Unit III

BUILDING BETTER WEB FORMS – Validation - Rich Controls - User Controls and Styles – Themes –Master Pages

Unit IV

WEB SECURITY AND WEB NAVIGATION - Website Security – Security Fundamentals – Membership – Profiles

Unit V

WORKING WITH DATA - Data Binding - The Data Controls.

Text Book:
1. Matthew MacDonald, Beginning ASP.NET 3.5 in C# 2008. Apress, Berkeley, CA, USA, Second Edition. ISBN: 978-81-8128-902-5

Reference Books:
1. William Sanders, William B. Sanders, ASP.Net 3.5: A Beginner's Guide, McGraw-Hill Professional, 2008, Second Edition, ISBN : 978-00-7159-194-2.
2. Imar Spaanjaars, Beginning ASP.Net 3.5 In C# And VB, Wiley-India, 2009, ISBN: 978 81-2651-624-7.
3. Bill Evjen, Scott Hanselman, Devin Rader, Professional ASP.Net 3.5: In C# and VB, John Wiley & Sons, 2008, ISBN : 978-04-7018-757-9.

12CS345 INTERNETWORKING LAB

Credits: 0:0:2

List of Experiments

1. Study of IP Addressing and Subnetting
2. Simulation of ICMP Messages
3. TCP/IP Chatting
4. Simulation of Static Routing
5. OSPF Based Dynamic Routing
6. RIP V2 based Dynamic Routing
7. FTP for File Uploading and Downloading
8. SMTP Mailing System
9. Calculation of Throughput in a LAN
10. Calculation of Packet Delay Ratio in a LAN
11. Simulation of Wireless Adhoc Network
12. Simulation of Wired-cum Wireless Network

12CS346 COMPUTER COMMUNICATION LAB

Credits: 0:0:2

List of Experiments

1. Study of Magic Tee
2. Study of Directional Coupler
3. Microwave Antenna System Measurement
4. DC Characteristics of Pin PD
5. DC Characteristics of APD
6. DC Characteristics of Laser
7. PI Characteristics of LED and Laser
8. TDM through fiber optic link
9. Levinson Durbin Recursion
10. Study of principles of OTDR operation and optical fiber events

12CS347 DIGITAL SIGNAL PROCESSING LAB

Credits: 0:0:2

List of Experiments

1. Digital Modulation for ASK and FSK using MatLab
2. Digital Modulation for PSK and QPSK using MatLab
3. Digital Modulation for FSK using Simulink
4. Spread Spectrum of a CDMA system
5. Orthogonal Property of a CDMA system
6. Interpolation and Decimation of a signal
7. Measurement of Statistical Parameters of a signal
8. Least Mean Square Algorithm
9. Levinson Durbin Recursion
10. FSK Modulation in AWGN Channel
11. Quadrature Mirror filter
12. Linear and cyclic codes using Simulink

12CS348 ADVANCED OPERATING SYSTEM LAB

Credits: 0:0:2

List of Experiments

1. Shell Programming – Command Syntax, Write simple functions, Basic Tests
2. Shell Programming –loops, Patterns, expansions, substitutions.
3. Write programs using the following system calls of UNIX operating system: **fork**, exec, getpid, exit, wait, close, stat, opendir, readdir.
4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)
5. Write C programs to simulate UNIX commands like ls, grep, etc.
6. Develop an application using Inter Process communication (using shared memory, pipes or message queues)

7. Implement the Producer – Consumer problem using semaphores (using UNIX system calls).
8. Unix / Linux sources – build, run kernel – small modifications.
9. Implement some memory management schemes
10. Implement any file allocation technique (Linked, Indexed or Contiguous)
11. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.
12. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.

12CS349 NETWORKING AND SECURITY LAB

Credits: 0:0:2

List of Experiments

1. Implement TCP and UDP Client-Server programs for following services:
   Printing the Host ID, local port, also the client should indicate connection status
      a. Echo Service
      b. Day Time Service
      c. Chargen Service
2. Implement Client-Server programs for demonstrating working of Concurrent Connection Oriented servers using single process as well as multiple processes.
3. Develop a simple web server capable of accepting request from standard client like IE, Netscape, Opera etc (use standard protocol HTTP).
4. Implement Telnet Server program for providing different types of Telnet Services.
5. Develop an application for transferring files over RS232.
6. Develop a network application using RAW SOCKET.
7. Implement TCP SYN FLOOD Attack and analyze the anomaly using some sniffer.
8. Implement RSA Algorithm
9. Implement Simplified DES
10. Demonstrate man in the middle attack on Diffie Hellman Key Exchange.
11. Develop a configurable proxy server which can allow connection to only selective ports to a web server which runs behind it.
12. Analysis of various protocols using protocol analyzer. (Wireshark, tcpdump, iperf...)

12CS350 MAINFRAME SYSTEMS LAB

Credits: 0:0:2

List of Experiments
1. Demonstration of basic skills of Cobol Programming.
2. Structured Program development using COBOL for handling iterations and formatting.
3. Arithmetic Operations, Dates handling.
4. String operations using COBOL.
5. Structured COBOL Programming for table handling, including Single and Multilevel tables.
6. Structured COBOL Programming for table handling, including Indexed tables.
7. COBOL program development using COPY and sub-programming.
8. Basic File Handling using COBOL for Sequential Files.
9. Basic File Handling using COBOL for Indexed files.
10. Basic File Handling using COBOL for Relative Files.

11. Sorting and merging files using COBOL.
12. Report Generation using Files.

LIST OF SUBJECTS

Sub. Code	Name of the Subject	Credits
12CS351	Remote Sensing	4:0:0
12CS352	Software Architecture Restructuring	4:0:0
13CS101	Fundamentals of Computing and Programming	3:0:0
13CS102	Fundamentals of Computing and Programming Lab	0:0:2
13CS201	Design Patterns	3:0:0
13CS202	Mobile Application Development Lab	0:0:2
13CS301	Theory of Automata, Formal Languages and Computation	3:1:0

12CS351 REMOTE SENSING

Credit: 4:0:0

Objective:
- To familiarize the principles of remote sensing, data acquisition and analysis of satellite data.
- To provide exposure to data models and data structures used in GIS and to introduce various Raster and Vector capabilities of GIS.
- To familiarize with the techniques used in Radar development and image interpretation.

Outcome:
The students are enabled
- To develop various remote sensing applications.
- To process the data using GIS concepts
- To assess the data quality and to manage the spatial data errors using GIS.

Unit I
INTRODUCTION TO REMOTE SENSING AND PHOTOGRAMMETRY: Introduction – Energy Sources and Radiation Principles – Energy Interactions in the Atmosphere and Earth Surface – Data Acquisition and Interpretation – Characteristics of Remote Sensing Systems – Basic Geometric Characteristics of Aerial Photographs – Photographic Scale – Ground Coverage of Aerial Photographs – Area Measurement – Relief Displacement of Vertical Features – Image Parallax – Ground Control for Aerial Photography – Mapping with Aerial Photographs – Flight Planning

Unit II
DATA ACQUISITION: Across-track Scanning – Along-track Scanning – Operating Principles of Across-track Multispectral Scanners – Geometric Characteristics of Across Track Scanner Imagery – Geometric Characteristics of Along-Track Scanner Imagery – Radiometric Calibration of Thermal Scanners – Landsat Satellite Program Overview – LANDSAT – SPOT – Other Earth Resource Satellites

Unit III
SCATTERING SYSTEM AND DATA ANALYSIS: Radar Development – Side-Looking Radar System Operation – Synthetic Aperture Radar – Geometric Characteristics of Side-Looking Radar Imagery – Transmission Characteristics of Radar Signals – Radar Image Interpretation – Interferometric Radar – Radar Remote-Sensing from Space – Seasat-1 – Shuttle-imaging Radar – Almaz-1 – ERS – Envisat – JERS – ALOS – Shuttle Radar Topography Mission – Spaceborne Radar – Passive Microwave Sensing – Lidar.

Unit IV

BASICS OF GIS AND DATA MODEL AND INTPUT: Maps – Coordinate Systems – Map Projections – Digital Representation of Geographic Data – Concepts and Defintions of Data Quality – Components of Geographic Data Quality – Assessment of Data Quality – Managing Spatial Data Errors – Raster Based GIS Data Processing.

Unit V

DATA ANALYSIS AND OUTPUT: Vector-based GIS Data Processing – Cartography in context of GIS – Visualization of Geographic Information – Principles of Cartographic Design and GIS – Remote Sensing and GIS Integration – Digital terrain Modelling.

Text books:
1. Thomas M.Lillesand, Ralph W. Klefer, Jonathan W. Chipman, Remote Sensing and Image Interpretation, V Edition, Wiley Student Edition.
2. C.P. Lo, Albert K. W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice Hall India, 2006

Reference books:
1. Charles Elachi and Jacob J Van Zyl, Introduction to the Physics and Techniques of Remote Sensing, Wiley Series in Remote Sensing and Image Processing, II Edition, 2006.
2. Paul Longley, Michael F. Goodchild, David J Maguire, David W. Rhind, Geographic Information Systems and Science, John Wiley and Sons, 2 edition, abridged, 2005.
3. Robert Shcowebgerdt, Remote Sensing models and methods for Image Processing, Academic Press; 3 edition , 2006.

12CS352 - SOFTWARE ARCHITECTURE RESTRUCTURING

Credit :4:0:0

Objective:
- To change the software structure without affecting the behavior of system
- To improve the design of the code after it has been written
- To learn about the basics of software clustering

Outcome:

Students will be able to
- understand the principles of refactoring.
- understand the impact of refactoring on the design of a system
- understand the software clustering

Unit I

INTRODUCTION TO REFACTORING: Introduction, The First Step in Refactoring, Decomposing and Redistributing the Statement Method, Replacing the conditional logic with Polymorphism, Case study – Price code

Unit II

PRINCIPLES IN REFACTORING AND BAD SMELLS IN CODE: Defining Refactoring, Necessity of Refactoring, Indirection and Refactoring, Problems with Refactoring, Refactoring and Design, Refactoring and Performance, Case study - Optimizing a Payroll System, Duplicated Code, Long Method, Large Class, Long Parameter List, Divergent Change, Shotgun Surgery, Feature Envy, Data Clumps, Primitive Obsession, Case Statements, Parallel Inheritance Hierarchies, Lazy Class, Speculative Generality, Temporary Field, Message Chains, Middle Man, Inappropriate Intimacy, Alternative Classes with Different Interfaces, Incomplete Library Class, Data Class, Refused Bequest, Meta programming Madness, Disjointed API, Repetitive Boilerplate.

Unit III

MOVING FEATURES BETWEEN OBJECTS & BUILDING TESTS: Move Method, Move Field, Extract Class, Inline Class, Hide Delegate, Remove Middle Man, Test::Unit Testing Framework

Unit IV

DEALING WITH GENERALIZATION: Pull Up Method, Push Down Method, Extract Module, Inline Module, Extract Subclass, Introduce Inheritance, Collapse Heirarchy, Form Template Method, Replace Inheritance with Delegation, Replace Delegation with Hierarchy, Replace Abstract Superclass with Module.

Unit V

GRAPH CLUSTERING AND MODEL-DRIVEN SOFTWARE DEVELOPMENT: Graphs, Graph Clusterings, Clustering Algorithms, Applications of Graph Clustering, Modeling Concepts, Model Transformations, Architecture in Model-Driven Software Development, Interoperability Metamodels for Reengineering, Model-Driven Reengineering Approaches.

Text Books:
1. Jay Fields, Shane Harvie, Martin Fowler, Kent Beck, Refactoring, First Edition, Addison- Wesley, 2009.
2. Niels Streekmann, Clustering-Based Support for Software Architecture Restructuring, First Edition, Vieweg+Teubner Verlag, 2012.

Reference Books:
1. Michael C.Feathers, Working Effectively with Legacy Code First edition, Pearson Education, 2004.
2. Robert C. Seacord, Daniel Plakosh and Grace A Lewis, Modernizing Legacy Systems: Software Technologies, Engineering Processes, And Business Practices. First Edition Pearson Education, 2003.

13CS101 FUNDAMENTALS OF COMPUTING AND PROGRAMMING

Credits: 3:0:0

Objective:
- 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

Outcome:
Students will be able to
- Understand the fundamentals of Computer models
- Understand the basics of C programming language
- Understand the emphasis of conceptual design and implementation of programming languages.

Unit I
FUNDAMENTALS OF COMPUTERS: Introduction to computers: Characteristics – Evolutions – Generations – Classifications – Applications –Basic Computer Organization – Number System, Computer Software: Introduction – Types of Software – Terminologies – Installing and Uninstalling Software – Software piracy and copyrights – Software Developmental steps - Hardware: Input-Output – CPU and Storage Devices**.** Information Technology and Internet: Components – Roles in various sectors and services– Careers. Internet: Evolution –Basic Internet Terms – Types of Internet Connection – Services.

Unit II
INTRODUCTION TO PROGRAMMING: Languages – Translators – Problem solving Techniques – Algorithm, Flow chart and Pseudo code – Program Control Structures. C – Character Set, Delimiters, Keywords, Identifiers, Variables and Constants – Rules for defining Variables – Data Types –Structure of a C Program – Declaring and Initializing variables – Dynamic Initialization – Type Conversion – Operators and Priority - Use of Logical Operators – Conditional Operators, Bitwise Operators – Input and Output in C.

Unit III
CONTROL INSTRUCTIONS: The decision control statements: if-statement, if-else statement, Nested if-else statements - The loop control statements: Loops – while loop – for loop- do-while loop – break statement- continue statement – Decisions using switch – goto statement.

Unit IV
FUNCTIONS, ARRAYS AND STRINGS: Functions: Definition – Prototypes – return statement – Types of functions – Call by value and Reference. Arrays: – Definition – Initialization – Characteristics – One dimensional Array – Two dimensional Array – Functions with Pointers – Recursion – Pointer to Function – Strings – Declaration and Initialization – String standard functions – Storage classes in C.

Unit V
STRUCTURES AND UNIONS: Enumerated Data Type - Renaming Data Types with typedef. **Structure:** Introduction - Array of Structures – Additional Features of Structures – Union.

Text Book
1. Ashok N. Kamthane. "Computer Programming", Second Edition, 2012, Pearson Publications, New Delhi.

Reference Books
1. Byron S. Gottfried, "Programming with C", Indian Adapted Edition 2006, Tata McGraw Hill.
2. Herbert Schildt, "The Complete Reference C", Fourth Edition, 2007, McGraw-Hill Publications.

13CS102 FUNDAMENTALS OF COMPUTING AND PROGRAMMING LAB

Credits: 0:0:2

Objective:
- To apply basic concepts of C program in problem solving
- To apply Control Structures in C programming
- To utilize effectively Pointers and Functions in C programming
- To create user define datatypes using Arrays and Structures in C

Outcome:
Students will be able to
- Implement the concepts of programming in C
- Implement the structured data types programs in C
- Design and implement a given scenario

The faculty conducting the Laboratory will prepare a list of experiments [10/5 for 2/1 credit] and get the approval of HoD and notify it at the beginning of each semester.

Credits: 3:0:0

Objective:
- To provide an overview of the concepts, processes, and techniques associated with formal design pattern and to learn about the design pattern strategies of the Object Oriented concepts.
- To develop skills that will enable to construct different types of patterns like creational, structural and behavior patterns.
- To experience object oriented concepts in different perspective.

Outcome:
The students will be able to
- Design a reusable object oriented software that can be adaptable to any type of project needs.
- Handle the object oriented programming language like C++ and Java to use with the current design needs.

Prerequisite: Object Oriented Programming and Object Oriented Analysis and Design.

Unit I
INTRODUCTION TO DESIGN PATTERN AND DESIGNING DOCUMENT EDITOR:
Introduction-Design Pattern-Smalltalk MVC- -Describing Design Patterns- The Catalog –Organizing the Catalog- Pattern Solve Design Problems - Select a Design Pattern - Use Design Pattern - Design Problems- Document structure- Formatting-User interface- Look and Feel Standards- Multiple Window Systems-User Operations-Spelling Checking And Hyphenation.

Unit II
CREATIONAL PATTERNS: Abstract Factory-Builder-Factory Method-Prototype-Singleton-Discussion of Creational Patterns

Unit III
STRUCTURAL PATTERNS: Structural Patterns - Adapter-Bridge-Composite-Decorator-Facade-Flyweight-Proxy- Discussion of Structural Patterns.

Unit IV
BEHAVIORAL PATTERNS: Chain of Responsibility-Command-Interpreter-Iterator-Mediator-Memento-Observer.

Unit V
BEHAVIORAL PATTERNS AND EXPECTATONS: State-Strategy-Template Method-Visitor-Discussion of Behavioral Patterns- Conclusion - The Pattern Community-An Invitation-A Parting Thought.

Text Book:
1. Erich Gamma, Richard Helm,Ralph Johnson,John Vissides, "Design Patterns - Elements Reusable Object Oriented Software",2011,Edition:12.

Reference Books:
1. Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra. "Head First Design Patterns", 2004, O'Reilly Media.
2. Wolfgang Pree. "Design Patterns for Object Oriented Software Development",1995, Addison - Wesley Publishing.
3. JohnVlissides, "Pattern Hatching: Design Patterns Applied", 1998, Addison-Wesley Publishing.

13CS202 MOBILE APPLICATION DEVELOPMENT LAB

Credit: 0:0:2

Objective:
The objective of this lab is to develop an understanding of how to design, implement, and debug/test applications for mobile devices and how to exploit the many capabilities of modern mobile devices to produce creative solutions to everyday challenges.

Outcome:
After the end of the course, the students will be able to:
- Independently manage all phases of mobile project development, including proposal, design, implementation, progress reports, debugging, evaluation, documentation, and presentation.
- Develop mobile applications for various platforms, including small communication devices (smart phones) and larger MIDs (mobile Internet devices).
- Develop mobile applications using modern mobile development tools for either the Android or Java platforms.
- Develop applications that effectively combine mobile device capabilities such as communication, computing, and sensing.

The faculty conducting the Laboratory will prepare a list of experiments [10/5 for 2/1 credit] and get the approval of HoD and notify it at the beginning of each semester.

13CS301 THEORY OF AUTOMATA, FORMAL LANGUAGES AND COMPUTATION

Credits: 3:1:0

Objective:
1. To understand the mathematics behind the theory of computation.
2. To provide an insight in to the computability and complexity theories.

Outcome:
At the end of the course, the student will be able to
1. Formalize mathematical models of computations, use these formalisms to explore the inherent limitations of computations and describe some major current approaches to investigate feasible computation.
2. Demonstrate their understanding of key notions, such as algorithm, computability, decidability and complexity through problem solving.

Prerequisite: Nil

Unit I
REGULAR LANGUAGES: Finite Automata – Non-determinism - Regular Expressions - Non-regular Languages

Unit II
CONTEXT-FREE LANGUAGES AND TURING MACHINE: Context-free Grammars – Pushdown Automata – Non-context-free Languages, The Church-Turing Thesis: Turing Machines – Variants of Turing Machines – The Definition of Algorithm

Unit III
DECIDABILITY AND REDUCIBILITY: Decidable languages – The Halting problem - Undecidable Problems from Language Theory – A simple Undecidable Problem – Mapping Reducibility.

Unit IV
TIME COMPLEXITY: Measuring Complexity – The Class P – The Class NP – NP-completeness – Additional NP-complete Problems.

Unit V
SPACE COMPLEXITY AND INTRACTABILITY: Savitch's Theorem – The Class PSPACE – PSPACE-completeness – The classes L and NL – NL-completeness – NL equals coNL. Hierarchy Theorems – Relativization – Circuit Complexity.

Text Book:
1. Michael Sipser, Introduction to the Theory of Computation, 2/E, Cengage Learning, 2012.

Reference Books:
1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages and Computation, 3/E, Pearson Education, 2009.
2. Peter Linz, An Introduction to formal Languages and Automata, 4/ E, Narosa Publishing House, 2009.
3. Kamala Krithivasan, Rama R, Introduction to Formal Languages, Automata Theory and Computation, Pearson, 2009.