DIVISION OF ELECTRONICS & COMMUNICATION ENGINEERING
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<th>Code No.</th>
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**EC101 BASIC ELECTRONICS**

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

**Unit I : Introduction to Semiconductor:**  

**Unit II : IC**  

**Unit III : Digital Systems**  
Number system – Boolean algebra – logic gates – semiconductor memory – microprocessor – digital computer principles.
Unit IV : Measurement

Unit V : Communication

Text books

Reference Books

EC102 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Unit I : DC and AC Circuits

Unit II : Electrical Machines

Unit III : Introduction to Semiconductor
Covalent bond – N type & P type semiconductor – conduction in semiconductor – semiconductor devices : diode, transistor, FET, MOSFET, UJT.

Unit IV
Unit V : Communication

Text Books

Reference Books

EC103 BASIC ELECTRONICS
Credit: 3:0:0
Marks: 40 + 60

Unit I : Introduction to Semiconductor
Covalent bond – N type & P type semiconductor – conduction in semiconductor – semiconductor devices : diode, transistor, FET, MOSFET, UJT.

Unit II : Integrated Circuits

Unit III : Digital Systems
Number system – Boolean algebra – logic gates – semiconductor memory – microprocessor – digital computer principles.

Unit IV : Modem
Introduction to Noise – modulation and demodulation techniques of AM & FM.

Unit V : Communication

Text Books
Reference Books

EC104 - BASIC ELECTRONICS
Credit : 3:0:0

UNIT-I: Semiconductors
Semiconductor Theory: Introduction to semiconductor-energy band description of semiconductor-types of semiconductor (intrinsic and extrinsic)-p-n junction and its properties
Semiconductor Devices: Semiconductor diode (p-n junction diode and Zener diode)-Transistor: -different configurations and characteristics-FET-MOSFET and Unijunction transistor:-Basic operation and characteristics.

UNIT-II: Integrated Circuits
Integrated circuits-advantages – classification - Monolithic IC Fabrication Techniques.
Linear IC: Introduction to op-amp (Operational amplifier)-inverting and non-inverting op amp. Applications: Scalar, Adder, Subtractor, Differentiator, and Integrator.

UNIT-III: Digital Systems
Basic Principles Of Digital Computer: Introduction to computer-Organization of computer memory-central processing unit-Introduction to microprocessor-architecture of 8085.

UNIT-IV: Communication
Basic block diagram of a communication system-modulation-need for modulation-Types of modulation:-Amplitude and Frequency Modulation (AM & FM)-Demodulation:-Essentials in demodulation-AM diode detector-AM radio receiver-Types of radio receivers:-Straight and Super heterodyne receivers.

UNIT-V: Electronic Instruments And Transducers
Transducers: Introduction to Transducers-Capacitive transducers-Inductive transducers and Linear Variable Differential Transformer (LVDT).

Text Books
Reference Books

EC201 ELECTRON DEVICES
Credit: 4: 0 : 0
Marks: 40 + 60

Unit I : Theory Of PN Diodes

Unit II : Theory Of Junction Transistors

Unit III : Transistor Models

Unit IV : Theory Of FET, UJT And SCR

Unit V : Special Semiconductor Devices (Qualitative Treatment Only)

Text Books
Reference Books

EC202 ELECTRON DEVICES LABORATORY
Credit: 0 : 0 : 2
Marks: 50 + 50
1. PN Diode Characteristics and Half and Full Wave Rectifiers.
2. Zener Diode Characteristics and Voltage Regulator.
3. Transistor Biasing with and without stabilisation.
4. Transistor (common emitter characteristics) and H parameter evaluation.
5. Transistor as an Amplifier.
6. FET characteristics and Evaluation of its parameters.
7. MOSFET characteristics.
8. FET biasing methods.
9. BJT and FET as a switch.
11. UJT characteristics & relaxation Oscillator.
12. SCR characteristics.

EC203 ELECTRONIC CIRCUITS
Credit: 3 : 1 : 0
Marks: 40 + 60
Unit I: Bias Stability And Device Stabilization
Biasing circuits for BJT, DC, and AC Load linear stability factor analysis, Temperature compensation methods, Biasing circuits of FET’s and MOSFET’s.

Unit II: Small Signal Low Frequency Analysis And Design
Transistor, FET and MOSFET Amplifiers, Equivalent circuits, input and output characteristics and analysis of mid-band gain, input and output impedances of various amplifiers, cascade amplifiers, Darlington Bootstrapping, Differential amplifier, CMRR measurement of current source in Emitter.

Unit III: Large Signal Amplifiers
Class A, AB, B, C and D type of power amplifiers. Class A amplifier with resistive and transformer coupled load, efficiency of Class B, complementary symmetry amplifiers, MOSFET power amplifiers, heat sinks.

Unit IV: Frequency Response Of Amplifiers & Analysis Using Spice
High frequency equivalent circuit for BJT and FET amplifiers, calculation of lower and higher cutoff frequencies, Bode plot of frequency response, Relations bandwidth and rise time, compensation to improve the low frequency and higher frequency response of...
amplifiers, HF amplifiers, Video amplifiers, Optocouplers, BJT modeling, the sinusoidal and pulse Analysis of CE amplifier using SPICE.

Unit V: Rectifiers And Power Supplies
Half and full wave rectifiers, Ripple factor calculation for C, L, L-C and SYMBOL 112f “symbol” filters, switch mode power supplies, linear electronic voltage regulators, power control using SCR.

Textbooks

References

EC204 ELECTRONIC CIRCUITS LABORATORY
Credit: 0 : 0 : 2
Marks: 50 + 50

1. Semiconductor diode and zener diode characteristics
2. Input and output characteristics of a BJT in CE configuration
3. Characteristics of JFET, UJT and SCR
4. Non-linear wave shaping techniques - clipper and clamper
5. Single phase half wave and full wave rectifier with filter
6. Series voltage regulator
7. R-C coupled and Class A transformer coupled power amplifier
8. Complementary symmetry class B power amplifier
9. R-C phase shift oscillator
10. Hartley oscillator

EC205 SOLID STATE CIRCUITS –I
Credit: 4 : 0 : 0
Marks: 40 + 60

Unit I: Rectifiers and Filters

Unit II: Transistor And FET Biasing
Transistor Biasing: Location of the Q point – Fixed bias circuit – Collector to base circuit – Self bias circuit – Graphical DC bias analysis – Design of DC bias circuit.
FET biasing : Self biasing – Voltage feedback biasing.
Unit III: Amplifiers

Unit IV: Feedback Amplifiers & DC Amplifiers
Positive and Negative feedback – Current and Voltage feedback – Effect of feedback on gain – Input and Output impedance – Noise and Distortion.

Unit V: Oscillators And Tuned Amplifiers

Text Books

Reference Books

EC206 SOLID STATE CIRCUITS II
Credit: 4 : 0 : 0
Marks: 40 + 60

Unit I: Linear Wave Shaping Circuits

Unit II: Bistable And Schmitt Trigger Circuits
Unit III: Monostable and Astable Circuits

Unit IV: Voltage and Current Time Base Generators

Unit V: Blocking Oscillator Circuits and Sampling Gates

Text Books

Reference Books

EC 207 ELECTRONICS LAB
Credit: 0 : 0 : 2
Marks: 50 + 50

1. Study of half-wave and full-wave rectifiers with and without filters.
2. Voltage Regulators (Zener Diode, Transistor – Series and Shunt type)
3. Design and Testing of BJT amplifiers (RC Coupled)
5. Design & Testing of Feedback amplifiers. (Voltage and Current, Series and Shunt type)
7. Design & Testing of m-derived filters.
8. Emitter Follower.
10. Design and testing of single tuned amplifiers.
11. Design and testing of power amplifiers. (Class A, B, AB, C, complementary-symmetry pushpull amplifiers)
12. High frequency oscillator design & Testing.
13. Low frequency oscillator design & Testing.
EC208 OPTO ELECTRONIC DEVICES

Unit I: Elements Of Light And Solid State Physics

Unit II: Display Devices And Lasers

Unit III: Optical Detection Devices
Photo detector, Thermal detector, Photon Devices, Photo Conductors, Photo Diodes, Detector Performance.

Unit IV: Optical Amplifiers And Network Components
Types – semiconductor laser amplifiers, Erbium – doped fiber amplifiers, Raman fiber amplifiers, Brillouin fiber amplifier, comparison, Applications, Noise in Optical amplifiers, Noise figure of amplifier, wavelength converters, Optical bistable devices.

Unit V: Opto Electronic Integrated Circuits
Introduction, hybrid and Monolithic Integration, Applications of Opto Electronic Integrated Circuits, Integrated transmitters, Guided wave devices.

Text Books

Reference Books
EC209 DIGITAL ELECTRONICS

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

Unit I : Number Systems & Boolean Algebra
Review of binary, octal, & hexadecimal number systems - representation of signed numbers - floating point number representation - BCD-ASCII-EBCDIC-Excess 3 codes - gray code - error detecting & correcting codes.
Boolean Algebra:
Postulates & theorems of Boolean Algebra - canonical forms - simplification of logic functions using karnaugh map Quine McClusky method.

Unit II : Combinational Logic Design
Logic gates - implementation of combinational logic functions - encoders & decoders - multiplexers & demultiplexers - code converters - comparator - half adder, full adder - parallel adder - binary adder - parity generator/checker - implementation of logical functions using multiplexers.

Unit III : Counters & Registers

Unit IV : Sequential Logic Design
Basic models of sequential machines - concept of state table - state diagram - state reduction through partitioning & implementation of synchronous sequential circuits - Introduction to asynchronous sequential logic design.

Unit V : Programmable Logic Devices
LOGIC FAMILIES: RTL, DTL, TTL families, schottky - clamped TTL, Emitter Coupled (ECL), Integrated Injection Logic (IIL), MOS inverters, CMOS inverters, comparison of performance of various logic families.

Text Books

Reference Books
EC210 DIGITAL ELECTRONICS LAB

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

1. Study of Logic gates. (AND, OR, NOT, NAND, NOR, XOR, EXNOR) Minimisation and realisation of switching functions using NAND, NOR gates.
2. Half adder and Full adder.
3. Code convertors. (BCD to 7 segment, BCD to Excess-3, Gray to binary, Binary to Gray)
4. Encoders and Decoders.
5. Multiplexers and Demultiplexers.
6. Study of Flip flops using
   (a). Universal gates.  
   (b). FF ICs.
7. Counters. (MOD N)
8. Shift registers.
9. IC timer.
10. Parity generation and checking.
11. Arithmetic logic unit
12. Analog to Digital Converter.
13. Digital to Analog Converter.
15. Random Access Memory.
16. EPROM.

EC211 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

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

Unit I : Integrated Circuit Technology

Unit II : OP-AMP Characteristics And Applications
Applications: inverting and non-inverting amplifiers, inverting and non-inverting summers, difference amplifier, differentiator and integrator, Log and antilog amplifiers. Multiplier and divider, analog computers.
Unit III : Comparators And Signal Generators
Comparators, regenerative comparators, input output characteristics, astable multivibrator, Monostable multivibrator, Triangular wave- generators, RC-phaseshift oscillator, Wein’s bridge oscillator.

Voltage Regulator
Series op amp regulator, IC voltage regulator, 723 general purpose regulator, Switching Regulator.

Unit IV : Active Filters, Timers And Multipliers
Low pass, High pass, Band pass and Band Reject filters, Butterworth, Chebychev filters, first and second order filters-switched capacitor filters.
555 Timer functional diagram, monostable and astable operation, multiplier - application.

Unit V : PLL, ADC And DAC
PLL- basic block diagram and operation, capture range and lock range simple applications of PLL, AM detection, FM detection and FSK demodulation.
Weighted resistor DAC, R-2R and inverted R-2R DAC, monolithic DAC.
Flash ADC, counter type ADC, successive approximation ADC, dual slope ADC, conversion times of typical ADC.

Text Book

Reference Books

EC212 LINEAR INTEGRATED CIRCUITS LAB
Credit : 0 : 0 : 2
Marks: 50 + 50

1. Measurement of Op-amp Parameters. (Gain, Input offset Voltage, Input offset current, Bias Current, CMRR, Output Voltage, Slew rate)
3. Operational Amplifier applications I (Inverter, Non-inverter, summer, Buffer, Subtractor, Integrator, Differentiator)
4. Operational Amplifier applications II (Logarithmic amplifier, Antilog Amplifier, Precision Rectifier)
5. Instrumentation Amplifier.
7. Astable Mutivibrator using op-amp - Square, Triangular & rectangular Wave Generators.
8. Sinusoidal Oscillators - RC Phase shift and Wien Bridge.
10. IC Voltage Regulator.
11. Voltage Controlled Oscillator.
12. Phase Locked Loop.
14. ALU
15. Display System
16. Digital Voltmeter

EC213 ELECTRONICS AND MICROPROCESSORS
Credit: 4 : 0 : 0
Marks: 40 + 60

Unit I : Review Of Semiconductor Devices-Electronics Circuits
(Qualitative Study Only)

Unit II : Transducer And Measuring Instruments
(Qualitative study only)-classification-working principle of potentiometer, strain gauges, piezoelectric crystals, thermistors, photodiodes, phototransistors- microphone and loud speakers. Study of working principle (using block diagram of multimeters, digital voltmeters, signal generators, CRO).

Unit III : Digital Electronics
Comparison between analog and digital systems-Number representation-Binary Octal, Hexadecimal number system –Logic gates-Flip-flops-Registers,Counters, Multiplexers, Decoders, and Encoders-Half and full adders.

UNIT IV : Introduction To Microprocessor
Block diagram of Microcomputer - Architecture of Intel 8085 - Instruction formats, Addressing methods- types of Instruction - Intel 8085 - Instruction set - Development of simple assembly language programs and examples.

Unit V : I/O Devices
Memory and I/O devices and interfacing RAM, ROM, EPROM – Floppy disks-CRT terminals- Printers-I/O ports-Key boards-ADC/DACs-memory interfacing-Asynchronous
and synchronous data transfer schemes-interrupt driven data transfer- DMA data transfer-
Simple applications of Microprocessors.

Text Books

Reference Books

EC214 ELECTRONICS AND MICROPROCESSOR LABORATORY

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

2. Characteristics of zener diode.
4. Study of Bridge Rectifiers.
5. Transistors as a Switch and Amplifier.
7. Verifications of truth tables of logic gates AND, OR, NOT, NAND exclusive OR.
8. Combination logic realisation: Adder, Subtractor.
9. Sequential logic: Counters, Shift Registers with display devices.
10. Study of Microprocessor Kits.
11. Programming Exercise on 8085 and Trainer Kits.

EC215 MICROPROCESSORS AND MICRO CONTROLLERS

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

Unit I : 8085 Microprocessor

Unit II : 8086 Microprocessor
Organisation of 8086 microprocessor – memory segmentation – Addressing bytes and words – Address formation –Address modes in 8086 – Assembly language programming.
– minimum mode and maximum mode – Bus arbitration in minimum mode and maximum mode – multiprocessing.

**Unit III : Interfacing of I/O Devices**

**Unit IV : Data Transfer Schemes**
Data transfer schemes – Programmed data transfer – Synchronous transfer – Asynchronous transfer – Interrupt driven I/O – types of interrupts: 8085 and 8086 – direct memory access data transfer – DMA transfer in a 8085 based system – DMA protocols in 8086 in minimum and maximum mode – types of DMA.

**Unit V : Microcontrollers**
Organisation of 8031 and 8051 microcontrollers – I/O ports-External memory – Counter and Timers – Serial data input and output – Interrupts – Instruction set – Addressing modes – Assembly language programming; simple applications.

**Text Books**

**Reference Books**

**EC216 MICROPROCESSOR INTERFACING TECHNIQUES**
**Credit: 4 : 0 : 0**
**Marks: 40 + 60**

**Unit I : Micro Computer Communication Techniques**
Micro computer communication techniques and Interfacing - Methods of parallel data transfer - Programmable parallel ports-8255 PPI - Serial communication - Asynchronous - synchronous - 8251A Programmable communication interface -DMA -8237 - Programmable DMA Controller.
Unit II : Support Peripherals
8259A Programmable interrupt controller - 8279 Programmable Keyboard/display interface - 8253 programmable interval timer - 8295 printer controller chip - 8275 - CRT Controller.

Unit III : Co-processors
Co-processors-8087 NDP - Data types - Processor architecture - Instruction set-8089 - I/O Processor - IOP architecture - communication between CPU and IOP - IOP instruction set - 8288 - Bus controller - 8289 Bus arbiter.

Unit IV : Interface Standards

Unit V : I/O Interface
Input/Output Interface - Printer interface using 8295 - CRT interface - Keyboard/display interfacing - A/D and D/A interface - Data acquisition systems - Interfacing high power devices - Microprocessor development system - applications - Temperature controller - Stepper motor controller. Interfacing Techniques (8051) for microcontrollers.

Text Books

Reference Books

EC217 MICROPROCESSOR LAB-I
(Write programs using assemblers for 8085, 8086 and 8051)
Credit: 0 : 0 : 2
Marks: 50 + 50

8085 Assembly Language program
1. Multibyte Addition and Subtraction Multibyte decimal addition and subtraction.
2. Multiplication and division - repetitive addition and use of a register shifting operation
- Signed and unsigned numbers.
3. Code conversion - BCD to Binary, Binary to BCD, Binary to Gray, Gray to Binary, Binary to Excess code, BCD to seven segment code.
4. Searching, Sorting and data transfer.
5. Square root of a number, Sum of first N-natural Numbers, Average, LCM and BCD, Factorial and delay loops.
6. 8086 Assembly Language Program: Search and Sort, Programs involving string instructions.

7. Simple program using 8051 Assembly Language.
8. Study of programmable I/O ports of 8051 microcontroller.
9. Study of interrupt structure of 8085, 8086, 8031 and 8051.

EC218 MICROPROCESSOR LAB II

1. Study of 8255 PPI Square wave generation using mode 0. Parallel data transfer between two microprocessor kits using mode 1 and mode2.
2. Study of 8253 Timer - Six modes of operation - Measurement of unknown frequency of a square wave Programmable square wave generation.
4. 8279 Keyboard/display controller - Keyboard scan - blinking and rolling display.
6. Unencoded keyboard interface and multiplexed seven segment display.
7. D/A converter and waveform generation.
10. DC motor speed controller interface.
11. Temperature monitoring and control.
12. Study of IBM PC bus - IBM PC compatible cards (I/O card, D/A & A/D card, Timer card)
13. EPROM Programmer.
14. Interfacing High power devices to microcomputer port lines LED, Relays, Solenoids, Solid state relays and LCD display.
15. Study of Microcomputer development system.
Unit I : Wave Filters
Theory of T & Pi sections – Filter fundamentals – Constant ‘K’ low pass and high pass filters – m derived filters – Composite filters – Bandpass and Band elimination filters – Crystal and Lattice filters – Cross over filters – attenuators and equalisers.
TIME VARYING FIELDS AND MAXWELL’S EQUATIONS: Faraday’s law and Maxwell’s first equation – Gauss law and Maxwell’s second equation – Ampere’s law and inconsistency in Ampere’s law – Maxwell’s third and fourth equations.

Unit II : Plane Wave Propagation In A Homogeneous And Isotropic Medium
Plane waves and the wave equation – Solution for free space conditions – Sinusoidal time variations – Intrinsic impedance – The wave equation for a conducting medium – Propagation in good conductors – Skin depth – Polarization, linear, elliptical and circular – Poynting vector – Instantaneous, average and complex Poynting vectors.

Unit III : Reflection And Refraction Of Plane Waves
Reflection and transmission of waves at a boundary for normal incidence – Oblique incidence at a boundary between two dielectrics – Reflection and transmission for polarisation with E in the plane of incidence – Total reflection – Brewster angle.
GUIDED WAVES: Waves between parallel planes – TE, TM, and TEM waves and their characteristics – Attenuation in parallel plane guide for TE, TM and TEM waves – Wave impedances – Phase and group velocities.

Unit IV : Waveguides And Cavity Resonators

Unit V: Electromagnetic Interference & Compatability

Text Books
Reference Books

EC220 COMMUNICATION ENGINEERING II
Credit: 3 : 1 : 0
Marks: 40 + 60

Unit I: Introduction
Need for wireless transmission and modulation – Concept of baseband and bandwidth – Multichannel transmission.

Amplitude Modulation Systems

Unit II: Angle Modulation Systems

Unit III: Pulse Modulation Systems
Pulse Analog modulation methods – TDM, FDM interchannel cross talk, brief ideas of PCM, DM and DPCM.


Unit IV: Receivers
Classification of receivers – Block diagram – characteristics and measurement of sensitivity, selectivity and fidelity – Tuned radio frequency receivers – Super heterodyne receivers – Merits and demerits of different receivers.

Unit V: FM Receivers & Radio Telemetry
Block diagram of FM receiver – Automatic frequency control – FM detectors: Radio
detector FM discriminators – Limiters – diversity reception techniques – Spurious
response in receivers – Multiplexers: TDM and FDM – A typical PCM-FM telemetry
system – Self-tuning of transmitters and receivers.

Text Books
   1995.

Reference Books
3. Carlson, “Communication Systems: An Introduction to signals and noise in

EC221 COMMUNICATION ENGINEERING III
Credit: 3: 1: 0
Marks: 40 + 60

Unit I: Radiation Principle And Antenna Terminologies
Principle of Radiation, Isotropic radiator – Antenna terminologies – Reciprocity theorem
– Friis formula. ANTENNA FUNDAMENTALS: Radiation from an oscillating dipole –
Short linear antennas – Half wave dipole as a basic radiating element – Folded unipole
and dipole antennas – Shunt fed dipoles – Slot antennas – Loop antennas – Standing
wave radiators.

Unit II: Antenna Arrays & Practice
Pattern multiplication – Arrays of two driven antennas – Broadside arrays – end fire
arrays – Collinear arrays – Parasitic Arrays – Antenna for low & medium frequencies –
Tower antenna – Effects of ground on antenna performance – Ground systems – Top
loading – Excitation methods – Antenna couplers, baluns – Yagi antenna – corner
reflector – Biconical antennas – Tumstile antennas – Helical antennas – Parabolic
reflectors.

Unit III: Propagation
Propagation in free space – Propagation around the earth – Surface wave and its
propagation – Surface of the ionosphere – Propagation of plane waves in an ionised
medium – Determination of critical frequencies – Maximum usable frequency – Effect of

**Unit IV : Microwave Tubes And Solid State Devices**

**Unit V : Microwave Communication Systems**

**Text Books**

**Reference Books**

**EC222 ELECTRONICS & COMMUNICATION LAB**
Credit : 0 : 0 : 2
Marks: 50 + 50

2. Clipping and clamping circuits.
3. Astable, monostable, bistable multivibrators (Transistor version)
4. Voltage and Current sweep generators.
5. Full wave power control circuit using SCR.
6. Amplitude modulation and detection.
7. Frequency modulation and detection.
8. Pre-emphasis, De-emphasis circuits.
9. IF amplifier / mixer circuits.
10. Attenuators and equalisers.
EC223 DSP AND COMMUNICATION LABORATORY

Programs using MATLAB

1. Representation of time series; computation of convolution.
2. Response of a difference equations to initial conditions; stability.
3. DFT computation.
4. Computational experiments with digital filters.
5. DSP processor implementation
7. FIR & IIR filters implementation.
9. Quantization noise.
10. Adaptive filters.
11. Multirate signal processing.
12. DSP projects.
13. Delta and delta sigma modulation.
15. Scrambler and unscrambler.
17. Huffmann, Minimum redundancy Technique.

EC224 OPTICAL COMMUNICATION

Unit I : Basic System Concepts

Unit II : Optical Sources & Receivers
Characteristics and requirements – spontaneous and stimulated emission – Source classifications: Homo and Hetero structures, LASER Diodes and LEDs characteristics, comparison and applications.
Optical Receivers
Unit III: Modulation Techniques

Unit IV: Transmission Media
Fiber-Optics Vs Coaxial cables- Optical fiber modes and configurations – Light propagation – Fiber transmission properties, Attenuation and pulse dispersion, Choice of wave length for fiber-optic transmission – Cable configurations – Splicers, connectors and couplers.

Unit V: System Configurations

Text Books

Reference Books

EC225 MICROWAVE & OPTICAL COMMUNICATION LAB
Credit: 0 : 0 : 2
Marks: 50 + 50

A. Microwave Experiments
2. Characteristics of Gunn Diode Oscillator.
3. Study of Power Distribution in directional coupler, E/H Plane Tee, Magic Tee
4. Frequency measurement.
5. Impedance measurement by Slotted Line Method.

B. Optical Communication Experiments
2. Optical transmission using Analog Modulation.
4. Data transmission through Fiber Optic Link.
5. Time Division Multiplexing.
6. PI Characteristics of LASER diode.
EC226 DIGITAL COMMUNICATION SYSTEMS

Unit I: Introduction
Schemes – comparison: Course objective/overview.
SYNCHRONISATION: Need for synchronisation – Synchronisation methods – Bits, word and frame synchronisation – Synchronisation using PN sequences.

Unit II: Baseband Signalling Techniques
Need for lineshaping of signals, Signaling formats – RZ/NRZ, Duobinary, Split phase (Manchester) and high density bipolar coding – Scrambling and unscrambling – channel equalisation, tapped delay line and transversal filters.

Unit III: Quantization And Encoding
Signal sampling, PCM generation and recovery using match filter – Analysis of uniform and non uniform quantizers – Delta modulation – Analysis of delta modulators – Delta sigma and adaptive delta modulators – Linear predictive coding – DPCM – Comparison of PCM and DM on the basis of speech signals.

Unit IV: Digital Data Transmission
Concept of baseband signaling – Detection using matched filters for signals via AWGN channels – Analysis of coherent and non-coherent detection Schemes for ASK, FSK, PSK, DPSK – M-ary signaling – Quadriphase system.

Unit V: Error Control Coding

Text Books

Reference Books
EC227 SIGNALS AND SYSTEMS

Unit I : Introduction
Continuous Time (CT) signals – CT signal operations – Discrete Time(DT) signals – Representation of DT signals by impulses – DT signal operations – CT and DT systems – Properties of the systems – Linear Time Invariant(LTI) and Linear Shift Invariant(LSI) systems – Continuous and Discrete Convolutions – CT system representations by differential equations – DT System representations by difference equations.

Unit II : Fourier Analysis of CT Signals And Systems

Unit III : Discretisation of CT Signals
Representation of CT signals by samples – Sampling Theorem – Sampling Methods – Impulse, Natural and Flat Top Sampling – Reconstruction of CT signal from its samples – Effect of under sampling – Aliasing Error – Discrete Time processing of CT signals.

Unit IV : Fourier Analysis of DT Signals And Systems

Unit V : Transform Operations of DT Signals and Systems

Text Books

References:
EC228 DIGITAL SIGNAL PROCESSING

Unit I : Introduction

Unit II : Discrete Time Systems
Representations - classifications - time domain and frequency domain characterization - transfer functions - Z-transform and applications.

Unit III : Frequency Analysis Of Signals
Analysis of analog and discrete signals - using Fourier series, Fourier transform, Fourier transform of discrete sequence and discrete Fourier transform - properties of transforms - computation of discrete Fourier transforms - Radix 2 FFT algorithms.

Unit IV : Digital Processing Of Continuous Signals
Sampling of continuous signals - analog filter design - anti aliasing filters - sample and hold circuit - reconstructing filters - analog to digital and digital to analog converters.

Unit V : Digital Filters
Discretization of analog filters - direct discrete design - IIR and FIR structures - window functions - filter realization - introduction to digital signal architecture.

Text Book

Reference
EC229 DIGITAL IMAGE PROCESSING

Unit-I

Unit-II

Unit-III

Unit-IV

Unit-V

Text Book

Reference Book
EC230 VLSI DESIGN

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

Unit I : Introduction to MOS Technology

Unit II : Layout Design

Unit III : Design of System

Unit IV : Tools for Design

Unit V : CMOS Design Projects & Fast VLSI Circuits

Text Book

Reference Books
EC231 LINEAR AND DIGITAL IC LAB

1. Performance characteristics of op-amp IC – input offset voltage, bias current, slew rate, differential gain etc.
2. Instrumentation amplifier, using op-amp ICs.
3. Maximally flat active filter, using op-amp IC.
4. Precision full wave and half wave rectifier, using op-amp IC.
5. Wien’s bridge oscillator using op-amp IC.
6. Astable multivibrator and Schmitt trigger, using op-amp IC
7. Frequency multiplier and FM detector, using PLL IC
8. Realization of different flip-flops, using logic gates.
9. Realization of simple switching functions, using NAND or NOR gates.
11. Synchronous decade counter
12. Shift register and ring counter
13. Multiplexer and demultiplexer
14. Analog to Digital converter
15. Digital to Analog converter

EC232 DIGITAL SIGNAL PROCESSING

Unit I : Discrete Time Signals and Systems

Unit II : Design of Finite Impulse Response Filters
Linear phase response and its implications-FIR design using window method-frequency sampling method-design of optimal linear phase FIR filters-realisation structures of FIR Filters-transversal and linear phase structures.

Unit III : Design of Infinite Impulse Response Filters

Unit IV : Quantization Effects and Implementation
Representation of numbers in registers-ADC quantization noise-coefficient quantization error – Product quantization error – Limit cycles due to product round-off error, Round off noise reduction scheme – Addition over flow errors – Principle of scaling –

**Unit V: Special Types of Signal Processing Techniques**


*Prerequisite EC227 Signals & Systems*

**Text Books**


**Reference Books**


**EC233 ELECTROMAGNETIC FIELDS**

**Credit: 3 : 1 : 0**

**Marks: 40 + 60**

**UNIT – I: Static Electromagnetic Fields**


**UNIT – II: Static Magnetic Field**

UNIT – III: Electric Field In Dielectrics
Permitivity, Polarization, Boundary relation, Capacitance, Dielectric strength, Energy and energy density, Poisson's and Laplace equations and applications, Electric Current, Current Density, Ohms law at a point, Resistance and Conductance, Continuity relations for current problems.

UNIT – IV: Magnetic Field In Ferromagnetic Materials

UNIT – V: Time Varying Electric And Magnetic Fields

Text Books

Reference Books

EC234 – ELECTRONICS AND MICROPROCESSORS LABORATORY

Credit: 0:0:1  Marks: 40+60

2. Characteristics of Zener Diode.
3. Study of Half-wave and Full-wave Rectifier.
4. Study of Bridge Rectifiers.
5. Transistor as a Switch and Amplifier.
7. Verifications of truth tables of logic Gates AND, OR, NOT, NAND, exclusive OR.
10. Study of Microprocessor Kits.
11. Programming Exercise on 8085 and Trainer Kits.

**EC301 ADVANCED DIGITAL SIGNAL PROCESSING**

**Credit: 3 : 1 : 0**

**Marks: 40 + 60**

**UNIT I: Introduction To Digital Signal Processing**


**UNIT II: Discrete Transforms**


**UNIT III: Digital Filter Design**


**UNIT IV: Multirate Signal Processing And Adaptive Digital Filters**


**UNIT V: DSP Processors And DSP Applications**

General purpose Digital Signal Processors: Texas Instruments TMS320 family – Motorola DSP 56333 family – Analog devices ADSP 2100 family – Instruction set of...

**Text Book**


**Reference Books**


**EC302 DIGITAL SYSTEM DESIGN AND TESTING**

**Unit I : Programmable Logic Devices**

Basic concepts – Programming technologies - Programmable Logic Element(PLE) – Programmable Logic Array(PLA) – Programmable Array Logic(PAL) – Structure of standard PLD’s – Complex PLD’s(CPLD) – Altera Max 7000 series – AMD Mach 4 Structure.

**Unit II : System Design using PLD’s**

Design of combinational and sequential circuits using PLD’s – Programming PAL devices using PALASM – Design of state machines using Algorithmic State Machines (ASM) chart as a design tool.

**Unit III : Introduction to Field Programmable Gate Arrays**

Types of FPGA – Xilinx XC3000 series – Logic Cell Array (LCA) – Configurable Logic Blocks(CLB) – Input/Output Blocks(I/OB) – Programmable Interconnection Points(PIP) – Introduction to ACT 2 family and Xilinx XC4000 families – Design examples.

**Unit IV : Introduction to VHDL**


**Unit V : Fault Testing in Digital circuits**


Text Books

References
3. "Programmable logic devices databook and design guide" National semiconductors, 1989

EC303 ADVANCED COMPUTER ARCHITECTURE

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

Unit I : Register Transfer and Micro Operations
Register transfer language - Inter register transfer- Arithmetic micro operations - Logic micro operations - Shift micro operations - Control Functions.
Arithmetic and Logic Unit: Binary arithmetic unit - BCD arithmetic unit - Floating point arithmetic unit.
Memory Unit: Memory hierarchy - Solid state memeories - RAMs, ROMs, EPORMs - Backup store units - Virtual memeory systems - Cache memory - Associative memory - Multiple module memories – Interleaved memory - Memory management hardware.

Unit II : Control Unit
Processor bus configuration - Data transfer and manipulation - Hardwired and microprogrammed control.
Input-Output Unit: Characteristics of I/O Subsystem - I/O procesors - I/O channels - I/O interface - Asynchronous data transfer - Direct memory access - Interrupt handling.
Unit III: Parallel Processing
Basic Uniprocessor Architecture - Parallel processing Mechanisms - Balancing of subsystem Bandwidth - Parallel computer structures - Architectural classifications - Parallel processing Applications.

Unit IV: Pipelining and Vector Processing
Linear Pipelining - Pipeline processors - Instruction and Arithmetic Pipelines - Instruction prefetch and Branch handling - Data buffering and busing structures - Hazard Detection and Resolution - Job sequencing and collision prevention - Vector Processing - Requirements, Characteristics.

Unit V: Array Processing
SIMD Array processors - Parallel Algorithms for Array processors - Associative Array Processing.

Text Book

References

EC304 MICROCONTROLLERS AND APPLICATIONS
Credit: 3 : 1 : 0
Marks: 40 + 60

Unit I: Intel 8051

Unit II
Unit III: Motorola 68HC11
68HC11 features – Different modes of operation and memory map - Functions of I/O ports in single chip and expanded multiplexed mode – Timer system of 68HC11- Input capture, output compare and pulsed accumulator features of 68HC11.

Unit IV
Serial peripheral and serial communication interface – Analog to digital conversion features – Watchdog feature.

Unit V: 8096 Controller
Typical Applications: Stepper Motor Control - DC Motor Control – AC Power Control – Introduction to micro controller development tools.

Text Books

References

EC305 MICROCONTROLLER & DSP LAB
Credit: 0 : 0 : 2
Marks: 50 + 50

1. Speed control of DC motor using microcontrollers.
2. Speed control of stepper motor using micro controllers
3. Determination of pulse width using timer of 8031
4. Waveform generation using 8031.
5. Arranging numbers in an array.
6. FFT implementation in TMS processor. (TMS320XX)
7. FIR filter design in TMS processor. (TMS320XX)
8. Convolution algorithms implementation in TMS processor.
9. Counting number of pulses using timer of 8031.

EC306 ADVANCED TOPICS IN VLSI
Credit: 4 : 0 : 0
Marks: 40 + 60

Unit I: Testing and Testable Design of Digital Systems
Unit II: Testing For Single-Stuck-At Faults

Unit III: Design of Testability
Adhoc design for testability techniques – Controllability and observability by means of scan registers – Storage cells for scan designs – Level – Sensitive scan design – LSSD – Partial scan – Boundary scan.

Unit IV: Logic Synthesis And Optimization

Unit V: Two Level Combinational Logic Minimization

Text Books

References

EC307 DIGITAL IMAGE PROCESSING & MATLAB
Credit: 0 : 0 : 2
Marks: 50 + 50

1. Calculating the FFT of a given sequence using DIT and DIF algorithms.
2. a) Finding convolution between two sequences by circular and linear convolution.
   b) Proving convolution in time domain is equal to multiplication in frequency domain.
3. FIR filter design using windowing methods.
4. IIR filter design using bilinear transformation and impulse invariant methods.
5. Calculating FFT of an image and displaying its spectrum.
6. Demonstrating low pass and high pass filtering of images.
7. For the given image, add impulse, noise and filter the noise.
8. Find the histogram for the given image.
9. Detect the edges using sobel operator for the given image.

EC308 ADAPTIVE SIGNAL PROCESSING

Unit I : Introduction

Unit II : Adaptation Theory (Stationary Signals)
Input correlation matrix, eigen values and eigen vectors and their geometric significance – Methods of searching the performance surface – Gradient search methods – stability – rate of convergence – the learning curve.

Unit III
Newton’s method (Multi dimensional space) and method of steepest descent for gradient search – Comparison of learning curves – Gradient estimation from measurement derivatives – performance – penalty with multiple weights – variance of gradient estimate and its effect on weight vector solution – time constants and misadjustment – Comparision of Newton’s method and method of steepest descent.

Unit IV : Adaptive Algorithms And Structures

Unit V : Applications Of Adaptive Signal Processing
Text Book

Reference Book

EC309 ARTIFICIAL NEURAL NETWORKS

Unit I : Basic Concepts

Unit II : Perceptions

Unit III : Feedback Networks

Unit IV : Self Organising Networks

Unit V : Ann Implementation
Neuro computing Hardware Requirements – IC Synaptic connections – analog storage of adjustable weights – Digitally Programmable weights.

Text Book
Reference Books
1. J.A. Freeman and D.M. Skapura, “Neural Algorithm Applications & Programming Techniques”.

EC310 ADVANCED SOLID STATE DEVICES
Credit: 4 : 0 : 0
Marks: 40 + 60

Unit I: Diodes
PN diode, Heterojunction diode, Tunnel diode, PIN diode, MS diode, MIS diode, Varactor diode, CCD.

Unit II: Transistors Construction and Characteristics
BJT, JFET, MOSFET, NMOS, CMOS, MESFET, HFET, Amorphous silicon devices.

Unit III: Power Electronic Devices Construction and Characteristics
PNPN diodes, SCR, DIAC, TRAIC.

Unit IV: Microwave Devices Construction and Characteristics
READ diode, IMPATT, TRAPATT, GUNN diode.

Unit V: Photonic Devices
LED, Injection laser, Photodiode, Phototransistor, Photoconductors, Solar cells.

Text Books

Reference Books

EC311 VLSI DESIGN LAB
Credit: 0:0:2
Marks: 50 + 50

1. Design and testing of Flip-Flops
2. Design and testing of Registers
3. Design and testing of memory units
4. Design and testing of circuits for combinational logic circuits
5. Design and testing of programmable logic arrays
6. Design and testing of 8 bit ALU
7. Design and testing of Adders and Multipliers
8. Design and testing of parity generator
9. Design and testing of counters
10. Design and testing of A/D and D/A converters

EC312 – ADVANCED DIGITAL SYSTEM DESIGN

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

UNIT – I: Advanced Topics In Boolean Algebra
Shannon’s expansion theorem, Consensus theorem, Octal Designation, Run measure, INHIBIT / INCLUSION / AOI / Driver / Buffer Gates, Gate Expander, Reed Muller Expansion, Synthesis of multiple output combinational logic circuits by product map method, Design of static hazard free and dynamic hazard free logic circuits.

UNIT – II: Threshold Logic
Linear seperability, Unateness, Physical implementation, Dual comparability, Reduced functions, Various theorems in threshold logic, Synthesis of single gate and multigate threshold Network.

UNIT – III: Symmetric Functions
Elementary symmetric functions, Partially symmetric and totally symmetric functions, McCluskey decomposition method, Unity ratio symmetric ratio functions, Synthesis of symmetric function by contact networks.

UNIT – IV: Sequential Logic Circuits
Mealy machine, Moore machine, Trivial / Reversible / Isomorphic sequential machines, State diagrams, State table minimization, Incompletely specified sequential machines, State assignments, Design, of synchronous and asynchronous sequential logic circuits working in the fundamental mode and pulse mode, Essential hazards Unger’s theorem.

UNIT – V: Programmable Logic Devices
Basic concepts, Programming technologies, Programmable Logic Element (PLE), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Structure of standard PLD’s, Complex PLD’s (CPLD). Design of combinational and sequential circuits using PLD’s.
Type of FPGA – Xilinx XC3000 series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) Input/Output Blocks (I/OB) – Programmable Interconnection Points (PIP) – Introduction to ACT 2 family and Xilinx XC4000 families – Design examples.

References

**EC313 – INTRODUCTION TO VLSI DESIGN**

**UNIT – I: MOS Technology And Circuits**
MOS Technology and VLSI - Process parameters and considerations for BJT, MOS and CMOS- Electrical properties of MOS circuits and Device modeling.

**UNIT – II: MOS Circuit Design Process**
MOS Layers- Stick diagram- Layout diagram- Propagation delays- Examples of combinational logic design - Sealing of MOS circuits.

**UNIT – III: Digital Circuits And Systems**
Programmable Logic Array (PLA) and Finite State Machines-Design of ALU - Memories and Registers.

**UNIT – IV: Analog VLSI and High Speed VLSI**
Introduction to Analog VLSI- Realization of Neural Networks and Switched Capacitor filters- Sub-micron Technology and GaAs VLSI Technology.

**UNIT – V: Hardware Description Languages**
VHDL background and basic concepts- Structural specifications of hardware design organization and parameterization.

**References**
EC314 – DIGITAL CONTROL ENGINEERING

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

UNIT – I: Principles Of Controllers
Review of frequency and time response analysis and specifications of control systems- need for controllers- continuous time compensations- continuous time PI, PD, PID controllers- digital PID controllers.

UNIT – II: Signal Processing In Digital Control
Sampling- time and frequency domain description- aliasing- hold operation- mathematical model of sample and hold- zero and first order hold- factors limiting the choice of sampling rate- reconstruction.

UNIT – III: Modeling and Analysis Of Sampled Data Control Systems

UNIT – IV: Design Of Digital Control Algorithms

UNIT – V: Practical Aspects Of Digital Control Algorithms
Algorithm development of PID control algorithms- software implementation- implementation using microprocessors and Microcontrollers- finite word length effects- choice of data acquisition systems- Microcontrollers and Microcontroller based temperature control systems- Microcontroller based motor speed control systems.

Text Books

Reference Books
EC315 – DIGITAL IMAGE PROCESSING

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

UNIT – I: Continuous and Discrete Images and Systems

UNIT – II: Image Transforms
2-D orthogonal and Unitary transforms, 1-D and 2-D DFT, Cosine, Sine, Walsh, Hadamard, Haar, Slant, Karhunen-loeve, Singular value Decomposition transforms.

UNIT – III: Image Enhancement
Point operations – contrast stretching, clipping and thresholding density slicing, Histogram equalization, modification and specification, spatial operations – spatial averaging, low pass, high pass, band pass filtering, direction smoothing, medium filtering, generalized spectrum and homomorphic filtering, edge enhancement using 2-D IIR and FIR filters, color image enhancement.

UNIT – IV: Image Restoration
Image observation models, sources of degradation, inverse and Wiener filtering, geometric mean filter, non linear filters, smoothing filters and interpolation, constrained least squares restoration.

UNIT – V: Image Data Compression And Image Reconstruction From Projections
Image data rates, pixel coding, predictive techniques transform coding and vector DPCM, Block truncation coding, wavelet transform coding of images, color image coding. Random transform, back projection operator, inverse random transform, back projection algorithm, fan beam and algebraic restoration techniques.

Reference Books
EC316 – ANALYSIS AND DESIGN OF ANALOG INTEGRATED CIRCUITS

Unit – I: Circuit Configuration For Linear IC
Current sources, analysis of difference amplifiers with active load, supply and temperature independent biasing techniques, voltage references.

Unit – II: Operational Amplifiers
Analysis of Operational amplifier circuits, slew rate model and high frequency analysis, operational amplifier noise analysis and low noise operational amplifiers.

Unit – III: Analog Multiplier And PLL
Analysis of four quadrant and variable transconductance multiplier, voltage controlled oscillator, closed loop analysis of PLL.

Unit – IV: MOS Analog ICs
Design of MOS Operational Amplifier, CMOS voltage references, MOS Power amplifier and analog switches.

Unit – V: MOS Switched Capacitor Filters
Design techniques for switched capacitor filter, CMOS switched capacitor filters, MOS integrated active RC Filters.

Reference Books

EC317 – SOFT COMPUTING

Unit – I: Artificial Neural Networks

Unit – II: Fuzzy Systems
Unit – III : Neuro – Fuzzy Modeling

Unit – IV: Genetic Algorithms

Unit – V: Softcomputing And Conventional AI

Reference Books

EC318 - LOW POWER VLSI DESIGN
Credit: 3 : 0 : 0
Marks: 40 + 60

UNIT-I
Introduction - Simulation - Power Analysis–Probabilistic Power Analysis.

UNIT-II

UNIT-III

UNIT-IV
UNIT-V

Text Books

EC319 – DIGITAL COMMUNICATION
Credit: 4 : 0 : 0
Marks: 40 + 60

Unit – I: Random Process And Noise

Unit – II: Waveform Quantization & Coding

Unit – III: Information Theory & Coding
Entropy – Mutual Information Channel Capacity – Hartley – Shannon Law – Source Coding – Channel coding – Block codes – Cyclic codes – Convolutional codes, Coded modulation techniques.

Unit – IV: Digital Signaling Schemes

Unit – V: System Design Issues
Synchronization Technique: Bit synchronization – Scramblers – PN Sequence Generators – Frame Synchronization.

Reference Books

EC320 - MEDICAL SYSTEMS AND SIGNAL PROCESSING
Credit: 4 : 0 : 0
Marks: 40 + 60

Unit – I: Electro Physiology

Unit – II: Cardio Pulmonary Physiology
Electrical basis of cardiac activities – Cardiac muscle and conduction system – Electrical potential on surfaces – projections of cardiac vector – Frontal plane projections – Unipolar chest leads – Electrical axis of the hear – Vector cardiography – ECG waveform and related heart action.

Unit – III: Neurophysiology

Unit – IV: Signal Classification And Recognition
Statistical Signal Classification - Linear Discriminated Function – Direct Feature Selection and Ordering.

Unit – V: Adaptive Filtering, Wavelet Detection & Applications

References
Unit – I: Elements of Satellite Communication
Satellite systems, Orbital description and Orbital mechanics of LEO, MEO and GSO, Placement of a satellite in a GSO, Satellite – description of different Communication Subsystems, Bandwidth allocation.

Unit – II: Transmission, Multiplexing, Modulation, Multiple Access And Coding
Different modulation and multiplexing schemes, Multiple Access Techniques – FDMA, TDMA, CDMA and DAMA, coding Schemes.

Unit – III: Satellite Link Design
Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.

Unit – IV: Mobile Communication Systems
Cellular engineering concepts, Mobile radio environment – propagation losses and multipath fading, Frequency Management and Channel Assignment, Co-channel Interference and Handoff.

Unit – V: Case Studies
GPS Satellite Scheme, Mobile Communication Standards – GSM, WCDMA and PCS.

References
EC322 - COMPUTER NETWORKING AND ATM

Credit: 3 : 2 : 0
Marks: 40 + 60

Unit – I: Introduction

Unit – II: Network Layer

Unit – III: Transport Services And Applications

Unit – IV: Integrated Services Digital Network (ISDN)
Services- History of ISDN- Subscriber access to the ISDN: B channel, D channel, H channel, user interface –ISDN Layers – Broad band ISDN.

Unit – V: ATM Networks

References
## ADDITIONAL SUBJECTS

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<td>EC323</td>
<td>Advanced Digital System Design &amp; Testing</td>
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<td>EC341</td>
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</table>
EC235 ELECTRON DEVICES AND CIRCUITS LAB

Credits: 0:0:2  
Marks: 50+50

12 experiments will be notified by HOD from time to time
EC236 MEASUREMENTS AND INSTRUMENTATION

Credits 4:0:0

Marks 40+60

UNIT I : Transducers
Measurements, Instrumentation, Errors in measurements, Calibration and standard, Classification and characteristics of Transducers, Digital, Electrical, Electronic Weighing System, AC / DC Bridge measurement and their applications

UNIT II : Signal Generator and Signal Analyzers
A.F. Generator, Pulse Generator, AM/FM Signal generator, Function generator, Sweep frequency generator, wave analyzers, Spectrum Analyzers, Logic Analyzers, Distortion Analyzers.

UNIT III : Digital Instruments
Digital Voltmeters and Multimeters, Automation in Voltmeters, Accuracy of DVM, Guarding Techniques, frequency, period, time interval and pulselwidth measurements, automatic vector voltmeter.

UNIT IV : Data Display and Recording System

UNIT V : Computer Controlled Test System
Testing and Audio amplifier, Testing a Radio Receiver, Instrument used in Computer Controlled Instrumentation, Digital Control Description, Microprocessor based measurements, Case studies in Instrumentation.

Text Books

References
EC237 MEASUREMENTS AND INSTRUMENTATION LAB

Credits: 0:0:2

Marks 50+50

12 Experiments will be notified by HOD from time to time

EC238 MICROPROCESSORS AND APPLICATIONS

Credit: 4:0:0

Marks: 40+60

UNIT I : 8085 Microprocessor


UNIT II: 8086 Microprocessor

Organisation of 8086 microprocessor – memory segmentation – Addressing bytes and words – Address formation – Address modes in 8086 – Assembly language programming – minimum mode and maximum mode – Bus arbitration in minimum mode and maximum mode.

UNIT III: Microprocessor Interfacing Techniques

Microcomputer communication techniques and Interfacing - Methods of parallel data transfer - Programmable parallel ports - 8255 PPI – Serial communication – Asynchronous Synchronous - 8251A Programmable communication interface - DMA - 8237 - Programmable DMA Controller.

UNIT IV: Programmable Peripheral Devices

8259A Programmable interrupt controller - 8279 Programmable Keyboard/display interface - 8253 programmable interval timer - 8295 Printer Controller – 8275 CRT Controller

UNIT V: Interfacing Memory and I/O Devices and Microprocessor Applications


Text Books


References

4. Rafiquzzaman M., "Microprocessor Theory And Applications-Intel And Motorola", PHI, 2002

EC239 MICROCONTROLLERS AND APPLICATIONS

Credits 4:0:0

UNIT I: Intel 8051
Architecture of 8051 - Memory Organization – Register Banks-Bit addressable area – SFR area - Addressing Modes – Instruction Set - Programming examples.

UNIT II: MCS51 Family Features

UNIT III: Motorola 68HC11
68HC11 features – Different modes of operation and memory map – Functions of I/O ports in single chip and expanded multiplexed mode – Timer system of 68HC11 – Input capture, output compare and pulsed accumulator features of 68HC11.

UNIT IV: Interface Techniques
Serial peripheral and serial communication interface - Analog to digital conversion features – Watchdog timer feature.

UNIT V: PIC Microcontroller
Typical applications: Stepper motor control – DC motor control – AC power control using any microcontroller mentioned above.

Text Books

References
EC240 MICROPROCESSORS LAB
Credits: 0:0:2
Marks: 50+50

12 Experiments will be notified by HOD from time to time

EC241 MICROCONTROLLERS LAB
Credits: 0:0:2
Marks: 50+50

12 Experiments will be notified by HOD from time to time

EC242 COMMUNICATION THEORY AND SYSTEMS
Credits: 4:0:0
Marks: 40+60

UNIT I: Base Band Signals and Systems
Introduction, Definition of communication, Communication system block diagram – Need for wireless communication – Need for modulation – General definition of modulation – Types of modulation. General concepts about base band signal and bandwidth of signals.

UNIT II: Analog Modulation Techniques
Theory of PM, PM obtained from FM – Comparison of AM & FM, Comparison of PM & FM.

UNIT III: Modulation and Demodulation Techniques
Amplitude Modulation: Introduction – generation of AM signal – low level and high level modulation – square law diode modulation – AM in amplifier circuits – suppressed carrier AM generation (Balanced Modulator, Ring Modulator, Product Modulator)
AM Demodulation: Square law detector, envelope (or) diode detector – distortion in diode detectors – synchronous demodulation.
FM Demodulation: Direct methods frequency demodulation (Travis detector, Balanced slope detector, Foster seeley discriminator, ratio detector, limiters), Indirect methods (Detection using PLL, zero crossing detector)
UNIT IV: AM & FM Transmitters and Receivers

**AM Transmitter and Receiver:** Allocation of frequency for various services- AM transmitters-block schematic- high level and low level transmitters- class C- R.F tuned amplifiers- frequency multiplier- SSB transmitters- ISB transmitters.


**FM Transmitter and Receivers:** Block diagram of FM transmitter and methods of frequency stabilization – Armstrong FM transmitter system – Pre-emphasis.


**UNIT V : Noise**

Noise and Interference-Thermal and Shot noise-Signal to Noise ratio - Noise figure - Noise temperature.

**Noise in AM and FM:** SSB-SC - calculation of output signal to noise ratio. DSBSC- calculation of output signal to noise ratio-figure of merit-frequency modulation-calculation of output signal to noise ratio-comparison of SNR with respect to AM and FM.

**Text Books**


**References**


**EC243 TRANSMISSION LINES AND ANTENNA SYSTEMS**

**Credits: 4:0:0**

**Marks: 40+60**

**UNIT-I: Transmission Line Theory & Parameters**

Introduction to different types of transmission lines - Definition of line parameters, the transmission line - General Solution - Physical Significance of the equations - the infinite line - input impedance - loading of transmission line - waveform distortion - Distortion less transmission line - input and transfer impedance - Reflection phenomena - Line losses - Return loss - reflection loss - insertion loss.
UNIT-II: Transmission Line at Radio and Power Frequencies
Parameters of open wire line and Coaxial line at high frequencies; Line constants for dissipation less line - voltages and currents on dissipation less line - standing waves and standing wave ratio - input impedance of open and short circuited lines - power and impedance measurement on lines. Reflection losses on unmatched line - single and double stub matching - smith chart - problem solving using smith chart.

UNIT-III: Guided Waves and Wave Guides:
Waves between parallel planes, Characteristics of TE, TM and TEM waves, Attenuation in parallel plane guides, Rectangular & Circular wave guide - Excitation of modes.

UNIT-IV: Antenna Terminologies, Antenna Arrays and Propagation
Isotropic Radiator - Radiation pattern - Directivity - Gain - Radiation resistance - Effective aperture - Terminal impedance - Reciprocity theorem - Frii’s formula.
Arrays of point sources (driven elements): - Array factor, directivity and beam width - Pattern Multiplication – Broad side array - End fire array.
Propagation: Sky wave and space wave and its characteristics.

UNIT-V: Types of Antenna

Text Books

References
EC244 MICROWAVE AND OPTICAL COMMUNICATION ENGINEERING

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

UNIT I: Microwave Passive Devices
Review of electromagnetic theory on Transverse magnetic and electric waves in rectangular and circular wave-guides.

UNIT II: Microwave Vacuum Tube Devices
Introduction, Two cavity Klystron Amplifier – Mechanism and mode of Operation, Power output and Efficiency, Reflex Klystron Oscillator – Mechanism and mode of Operation, Modulation of Reflex Klystron; Applications, TWT amplifier, Principle of Operation gain and applications; Magnetron Oscillator – Hull cut-off voltage, Mechanism of Operation, Mode separation.

UNIT III: Microwave Solid State Devices and Measurement
Microwave diodes – Crystal diode, Schottky diode, Harmonic Mixer; PIN diode – Gunn diode – Mode of operation, Oscillator Circuit, TRAPAT, IMPATT and BARITT diodes, – Mechanism of Operation, Application as Oscillator and Amplifiers, Microwave transistors – Unipolar and Bipolar, Applications. Power measurements – Low and High power measurement, Insertion loss and Attenuation measurement, VSWR measurement – Low and High VSWR, Impedance measurement. Frequency measurement.

UNIT IV: Optical Communication

UNIT V: Optical Transmitters and Receivers
Text Books

References

EC245 DIGITAL SIGNAL PROCESSING
Credits: 3:1:0  Marks: 40+60

UNIT I: Introduction to DSP and Fourier Transform

UNIT II: Finite Impulse Response Digital Filters

UNIT III: Infinite Impulse Response Digital Filters

UNIT IV: Finite Word Length Effects

UNIT V: Special Topics in DSP And DSP Processors
Text Books

References

EC246 DIGITAL SIGNAL PROCESSING LABORATORY
Credits: 0:0:2 Marks: 50+50
12 experiments will be notified by HOD from time to time

EC247 ADVANCED COMMUNICATION LABORATORY
Credits: 0:0:2 Marks: 50+50
12 experiments will be notified by HOD from time to time

EC248 EMBEDDED SYSTEM
Credits: 4:0:0 Marks: 40+60

UNIT I: Introduction to Embedded Systems
An Embedded System – Processor in the System – Other hardware units – Software embedded into a System – Exemplary Embedded Systems - Embedded System On Chip and in VLSI circuit

UNIT II: Real Time Systems
UNIT III : Real Time Operating Systems
Task and Task States, tasks and data, semaphores and shared Data Operating system Services- Application of Semaphores -Message queues-Timer Function-Events – Memory management – Real time and Embedded System Operating Systems - Interrupt Routines in RTOS Environment

UNIT IV : Programming Languages and Tools

UNIT V : Programming Concepts and Embedded Programming in C and C++
Software programming in Assembly Language and in High level language – C Program Elements – Queues – Stacks – lists and ordered lists – Embedded programming in C++

Text Books

References

EC249 DIGITAL COMMUNICATION
Credits: 4:0:0 Marks: 40+60

UNIT I : Sampling And Bandlimited Signalling
Review of Sampling Theorem, PAM and TDMA Principles, Quantization, PCM, DPCM and Delta Modulation – International standard (CCITT, CEPT) Power Spectra of PAM signals - Inter symbol Interference - Ideal Nyquist channel - Raised cosine channels - Correlative coding and precoding.

UNIT II : Digital Modulation

UNIT III : Data Transmission – Detection and Estimation
Base band signal receiver – Probability of error – Optimum filter – White noise: Matched filter – Probability of error of the matched filter – Coherent reception: Correlation – Phase-
shift Keying – Non-coherent detection of FSK – Differential PSK – Four phase PSK (QPSK)

UNIT IV : Information Theory and Coding
Discrete messages - amount of information - average information - entropy information rate - Shannon’s theorem - capacity of gaussian channel - bandwidth - S/N trade off - coding - parity check bit coding - block codes - coding and decoding probability of error with coding - Convolution codes – Cyclic codes.

UNIT V : Spread Spectrum Systems
Psuedo Noise sequences, generation and correlation properties - direct sequence spread spectrum systems - Frequency Hop systems - processing gain - antijam and multipath performance.

Text Books

References

EC250 DIGITAL SYSTEM DESIGN USING VHDL

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

UNIT I : Programmable Logic Devices
Introduction - Programming Technologies - Programmable Read only Memory (PROM or PLE) - Programmable Logic Array (PLA) - Programmable Array Logic (PAL).
System Design using PLD’s: Design of Combinational and Sequential circuits using PLD’s - Design of state machines using ASM chart - Minimal logic realization of ASM chart.

UNIT II : Programmed Logic
UNIT III : FPGA And CPLD
Semi custom and full custom IC design- Xilinx XC3000 series, Xilinx XC4000 series -Logic cell Array (LCA)-Configurable Logic block (CLB) - Input and output block (IOB) – Programmable Interconnection Point (PIP) – structure of PLD and Complex PLD – Altera 7000 series – Introduction to ACT2 family.

UNIT IV : Introduction to VHDL

UNIT V : Data Flow, Behavioral and Structural Modeling

Text Books

References

EC251 SATELLITE COMMUNICATION
Credits: 4:0:0 Marks: 40+60

UNIT I: Communication Satellite - Orbit and Description
Kepler’s laws- Orbital period and velocity – Azimuth and elevation - orbital patterns– Placement of satellite in a geo-stationary orbit – satellite description – transponder subsystem – Telemetry, Command and ranging subsystem – Attitude control and electrical power

UNIT II : Earth Station
UNIT III: Satellite Link Analysis and Design
Basic link analysis – Interference analysis – Carrier to noise plus interference ratio – Terrestrial interference – Cross polarization interference – Adjacent channel and inter symbol interference – Rain Induced attenuation – Path diversity – Up link power control – Rain induced cross polarization interference – Satellite link design – Link without frequency reuse – Link design with frequency reuse.

UNIT IV: Multiple Access Techniques
Frequency Division multiple access (FDMA) – Time division multiple access (TDMA) and code division multiple access (CDMA) – SPADE – Performance comparison of various multiple access schemes.

UNIT V: Applications and Services
Very small aperture terminal (VSAT) networks – Technologies & configurations – Mobile satellite (MSAT) networks – Low orbital satellites – Domestic satellite systems-the INSAT System-International systems-INTELSAT / INMARSAT

Text Books

References

EC252 DIGITAL IMAGE PROCESSING
Credits: 4:0:0 Marks: 40+60

UNIT I: Digital Image Fundamentals

UNIT II: Image Enhancement
Definition – Spatial domain methods – Frequency domain methods – Histogram modification
technique – Neighbourhood averaging Media filtering – Lowpass filtering – Averaging of
multiple images – Image sharpening by differentiation and high pass filtering.

UNIT III: Image Restoration
Definition – Degradation model – Discrete formulation – Circulant matrices – Block circulant
matrices – Effect of diagonalization of circulant and block matrices – Unconstrained and

UNIT IV: Image Encoding
Objective and subjective fidelity criteria – Basic encoding process – The mapping – The
quantizer – The coder Differential encoding – Contour encoding – Run length encoding –
Image encoding relative to fidelity criterion – Differential pulse code modulation.

UNIT V: Image Analysis and Computer Vision
Typical computer vision system – Image analysis techniques – Spatial feature extraction –
Amplitude and Histogram features – Transform features – Edge detection – Gradient
operators – Boundary extraction – Edge linking – Boundary representation – Boundary
matching – Shape representation.

Text Books
   2002

References
   edition, Indian Reprint, 2002

EC254 DIGITAL DESIGN USING VHDL LAB
Credit: 0:0:2 Marks: 50+50

12 experiments will be notified by HOD from time to time

EC255 VLSI DESIGN
Credit: 4:0:0 Marks: 40 + 60

UNIT I: Overview of VLSI Design Methodology
VLSI Design Process – Architectural Design – Logical Design – Physical Design – Layout
Styles – Full Custom Semi Custom Approaches – Overview of wafer fabrication – Wafer
processing – Silicon gate NMOS process – CMOS process – N well – P well – Twin Tub –
Silicon On Insulator

UNIT II : Basic Electrical Properties of MOS And CMOS Circuits
NMOS and PMOS enhancement transistors – Threshold voltage – MOS device equations –
Basic DC equations – Second order effect – Small signal AC characteristics – NMOS and
CMOS inverter – Inverter delay – Pass Transistor – Transmission gate

UNIT III : Layout Design Rules
Need for design rules – Mead Conway design rules for the Silicon gate NMOS process-
CMOS N well / P well design rules – Sheet resistance – Area Capacitance – Wiring
Capacitance

UNIT IV : Logic Design
Switch logic- Gate Logic – Inverter – Two input NAND and NOR gate- Other forms of
CMOS logic – Dynamic CMOS logic – Clocked CMOS logic – Precharged domino CMOS
logic – Structure Design – Simple combinational logic design examples – Parity generator –
Multiplexer – Clocked sequential circuits – 2 Phase clocking – Charge storage – Dynamic
Register Element – NMOS and CMOS dynamic shift register

UNIT V : Sub System Design Process
Design of a 4 bit shifter – 4 bit arithmetic processor – ALU Subsystem – Implementing ALU
functions with an Adder – Carry look ahead adders – Multipliers – Serial/ Parallel Multipliers
– Pipelined multiplier array – Precharged domino CMOS logic – Structure Design – Simple combinational
logic design examples – Parity generator – Multiplexer – Clocked sequential circuits – 2 Phase clocking – Charge storage – Dynamic
Register Element – NMOS and CMOS dynamic shift register

Text Books
Edition, 2004
System Perspective”, Addison Wesley, 2nd edition, 2002

References
2. Caver Mead and Lynn Conway, “Introduction to VLSI Systems”, Addison Wesley
1980

EC256 NEURAL NETWORKS AND FUZZY SYSTEMS

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

UNIT I : Fundamentals of Artificial Neural Network
Artificial neuron, Biological Neural networks, Applications, Typical architectures, Training,
Common activation functions, Single layer net, Back Propogation neural net.
UNIT II: Neural Nets for Pattern Classification & Pattern Association

UNIT III: Neural Nets for Clustering

UNIT IV: Fundamentals of Fuzzy Logic
Fuzzy sets, Fuzzy Relations, Fuzzy Equivalence Relations, Membership functions, Defuzzification methods, Extension principle, Approximate Reasoning, Rule based systems, Fuzzy Associative Memories (FAMs)

UNIT V: Fuzzy Logic Applications
Fuzzy classification, Fuzzy Pattern Recognition, Fuzzy Control systems, Fuzzy image processing, Fuzzy optimization.

Text Books

References

EC257 COMPUTER COMMUNICATION

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

UNIT I: Introduction
UNIT II: Local Area Networks

UNIT III: Data Communication Techniques
Asynchronous and synchronous communication – BISYNC , SDLC , HDLC – x 2.5 protocols – Error control coding.

UNIT IV: Inter – Networking

UNIT V: Broadband Networks

Text Books

References

EC323 ADVANCED DIGITAL SYSTEM DESIGN AND TESTING

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

UNIT I: Programmable Logic Devices
Basic concepts, Programming techniques, Programmable Logic Element (PLE), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Structure of Standard PLD’s, Complex PLD’s (CPLD), Altera Max-7000 Series. Design of combination and sequential circuits using PLD’s.
Type of FPGA – Xilinx XC3000 Series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) Input/Output Blocks (I/OB) – Programmable Interconnection Points (PIP) – Xilinx XC4000 families – Design examples.
UNIT II: Sequential Logic Circuits
Mealy machine, Moore machine, State diagrams, State table minimization, Incompletely specified sequential machines, State assignments, Design of synchronous and asynchronous sequential logic circuits working in the fundamental mode and pulse mode.

UNIT III: Symmetric Functions
Elementary symmetric functions, Partially symmetric and totally symmetric functions, McCluskey de-composition method, Synthesis of symmetric function by contact networks.

UNIT IV: Fault Testing in Digital Circuits

UNIT V: Developing Test Pattern and Fault Simulation Techniques
Series, Single-fault propagation, Deductive, Parallel and concurrent simulation.

Text Books

References

EC324 ADVANCED VLSI DESIGN

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

UNIT I: MOS Transistor Theory

UNIT II: CMOS Circuit and Logic Design and Design Methods
UNIT III: CMOS Testing
Need for testing – Manufacturing test principles – Design Strategies for test – chip level test techniques - System level test techniques.

UNIT IV: CMOS Subsystem Design
Subsystem design principles – Combinational shifters – Adders – Multipliers – High Density memory – Finite state machines – PLA Control Implementation – ROM Control Implementation

UNIT V: CMOS System Design Examples

Text Books

References

EC325 ANALYSIS & DESIGN OF ANALOG INTEGRATED CIRCUITS

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

UNIT I: Basic Building Blocks of Linear ICs
Types of current mirrors: Simple, Beta helper, Degeneration, Cascode, Wilson Active Loads: complementary, depletion, diode connected
Voltage References: Bipolar widlar, peaking, MOS widlar & peaking
Supply Insensitive Biasing: Widlar and other voltage standards.

UNIT II: Bipolar Operational Amplifiers
Analysis and design of OP. AMP: DC Analysis, small-signal analysis, offsets, CMRR Analysis of Slew Rate: Limitations, methods, improvement in Bipolar and MOS Frequency Response Models: Compensation techniques and Root Locus methods.

UNIT III: Analog Multipliers
Types of Analog Multipliers: Limitations, squared, logarithmic, PH/PW & Tran-conductance
Analysis and Design of Monolithic Multiplier Circuits: EC coupled pair, DC analysis of Gilbert Multiplier cell, complete analog multiplier.
UNIT IV: MOS Operational Amplifier
Analysis and design of OP. AMP: Resistances, voltage gain, CMRR, PSRR
MOS Power Amplifier: Class AB output stage, CD, CS and CD-CS Amplifier.

UNIT V: Phase Locked Loop
Basic principles and orders of PLL: Basic concepts and first and second orders
Analysis and Design of Monolithic PLLs: IC PLL, analysis of Monolithic PLL

Text Book

Reference Books

EC326 EMBEDDED SYSTEM DESIGN

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

UNIT I: Introduction
An Embedded system, processors and other hardware units, software embedded in the
system, Exemplary embedded systems, SOC and VLSI concepts

UNIT II: Embedded Organisation and Architecture
Processor and Memory Organization, Devices and Buses for device networks, Device drivers
and Interrupts servicing Mechanisms.

UNIT III: Embedded Software Development Process
Modeling Processes for software Analysis, Response time constrained RT programs,
Software Algorithms complexity, Software Analysis, Software Design, Software Testing,
validating and Debugging, Software Project Management

UNIT IV: Real Time Operating Systems
I/O Subsystems, Network Operating systems, Interrupt Routines in RTOS Environment,
Performance Metrics in Scheduling Models, IEEE Standards, Preemptive Scheduler,
Embedded Internals, OS Security

UNIT V: Case Studies and Hardware-Software Co-Design
Case Studies in FOUR diverse applications, Embedded system design and co-design, Design
cycle, ICE, Scopes and Logic Analysers, General issues in ES Design
Text Book

References

EC327 ASIC DESIGN
Credit: 4 : 0 : 0    Marks: 40 + 60

Unit I : Introduction to ASICS,CMOS Logic and ASIC Library Design

Unit II : Programmable ASICS, Programmable Asic Logic Cells And Programmable ASIC I/O Cells
Anti fuse – static RAM – EPROM technology – Actel ACT – Xilinx LCA – Altera FLEX – Altera MAX-Xilinx I/O blocks

Unit III : Programmable ASIC Interconnect, Programmable ASIC Design Software and Low Level Design Entry

Unit IV : Simulation and Testing
Types of simulation – boundary scan test – fault simulation – automatic test pattern generation.

Unit V : ASIC Construction, Floorplanning, Placement and Routing

Text Book
References

EC328 MEDICAL ELECTRONICS
Credit: 4 : 0 : 0  Marks: 40 + 60

UNIT I: Physiology and Bio-Electric Concepts

UNIT II: Body Potential Measurement

UNIT III: Prosthesis

UNIT IV: Blood Parameter Measurement

UNIT V: Medical Imaging

Text Book

Reference Books
EC329 EMBEDDED SYSTEM LABORATORY

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

12 experiments will be notified by HOD from time to time

EC330 STATISTICAL DIGITAL SIGNAL PROCESSING

Credits: 3:1:0 Marks: 40+60

UNIT – I: Discrete Random Signal Processing

UNIT – II: Spectrum Estimation

UNIT – III: Linear Estimation And Prediction

UNIT – IV: Adaptive Filters

UNIT – V: Multirate Digital Signal Processing
Mathematical description of change of sampling rate-Interpolation and Decimation-continuous time model - Direct digital domain approach - Decimation by an integer factor - Interpolation by an integer factor - Single and multistage realization - Poly phase realization - Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.
Text Books

References

EC331 DIGITAL SYSTEM DESIGN

Credits: 3:1:0          Marks: 40+60

UNIT – I: PROGRAMMABLE LOGIC DEVICES & FPGA
Basic concepts - Programming techniques - Programmable Logic Element (PLE) - Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - Structure of Standard PLD’s - Design of combination and sequential circuits using PLD’s.
Type of FPGA – Xilinx XC3000 Series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) Input/Output Blocks (I/OB) – Programmable Interconnects - CPLD - Altera Max 7000 Series – Introduction to Actel Act-1 Logic Module – Xilinx XC4000 Series.

UNIT – II: SEQUENTIAL LOGIC CIRCUITS
Mealy machine - Moore machine - State diagrams - State table minimization - Incompletely specified sequential machines - State assignments - Design of synchronous and asynchronous sequential logic circuits working in the fundamental mode and pulse mode.

UNIT – III: SYMMETRIC FUNCTIONS
Elementary symmetric functions - Partially symmetric and totally symmetric functions - Mc Cluskey de-composition method - Synthesis of symmetric function by contact networks.

UNIT – IV: INTRODUCTION TO VHDL

UNIT – V: Introduction to VERILOG

Text Books

References
EC332 CMOS VLSI DESIGN

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

UNIT – I: Introduction to CMOS Circuits

UNIT – II: Circuit Characterization and Performance Estimation
Introduction Resistance Estimation Capacitance Estimation - Inductance - Switching characteristics CMOS - Gate Transistor sizing - power Dissipation - Sizing Routing Conductors - Charge Sharing - Design Margining - Reliability.

UNIT – III: CMOS Circuit and Logic Design
CMOS Logic Design - Basic Physical Design of Simple Gate – CMOS Logic Structures Clocking Strategies - I/O Structures - Low Power design.

UNIT – IV: Systems Design and Design Method

UNIT – V: CMOS Sub System Design

Text Books

References

EC333 ADVANCED COMPUTER ARCHITECTURE

Credits: 3:0:0  Marks: 40+60

Unit – I: Parallel Computer Models
Evolution of computer architecture – system attributes to performance – Multiprocessors and Multi computers – Multivector and SIMD computers – PRAM and VLSI models –
Parallelism in programming – conditions for parallelism – Program Portioning and Scheduling – Program Flow mechanisms.
Performance metrics and measures – Speedup performance laws – Memory bounded speedup model – Scalability metric and goals.

Unit – II: Memory Systems
Memory hierarchy – virtual storage systems – Bus - Cache and shared memory concepts – Back plane bus system – Cache coherence and synchronization – shared memory organizations.

Unit – III: Advanced Processors

Unit – IV: Multiprocessors And Multicomputers
Multiprocessor system interconnects – Hotspot problem – Cache coherence and synchronization mechanisms – Message passing mechanisms.
Pipelined processors – Linear Pipeline – Non-linear pipeline – Instruction Pipeline Design – Arithmetic pipeline design architectures.

Unit – V: Multithreaded and Dataflow Computers

Text Books

References

EC334 ANALOG VLSI DESIGN

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

UNIT – I: VLSI Technology

UNIT – II: Device Modeling & Circuit Simulation
UNIT – III: Analog Systems

UNIT – IV: Design Automation and Verification


Text Books

References

EC335 HDL LABORATORY

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

12 experiments will be notified by HOD from time to time
EC336 ANALYSIS & DESIGN OF ANALOG INTEGRATED CIRCUITS

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

UNIT – I: Basic Building Blocks of Linear ICs
Types of current mirrors - Active loads - Voltage references - Supply and temperature insensitive biasing techniques.

UNIT – II: Bipolar Operational Amplifiers
Analysis and design of OP. AMP (Bipolar treatment) - Analysis of slew rate and frequency response models – Noise analysis.

UNIT – III: Analog Multipliers and PLL
Types of analog multipliers – Analysis and design of monolithic multiplier circuits – Basic principles and orders of PLL – Analysis and design of monolithic PLLs.

UNIT – IV: MOS Operational Amplifier
Analysis and design of OP. AMP. (MOS treatment) - MOS power amplifier and Analog switches.

UNIT – V: MOS Switched Capacitor Filters
Design techniques for switched capacitor filter - CMOS switched capacitor filters - MOS integrated active RC Filters.

Text Books

References

EC337 VLSI SIGNAL PROCESSING

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

UNIT – I
Introduction to DSP systems-Iteration Bound - Pipelined and parallel processing.

UNIT – II
Retiming – Unfolding - Algorithmic strength reduction in filters and transforms.
UNIT – III
Systolic architecture design - Fast convolution - Pipelined and parallel recursive and adaptive filters.

UNIT – IV
Scaling and round off noise - Digital lattice filter structures - Bit level arithmetic architecture-Redundant arithmetic.

UNIT – V
Numerical strength reduction - Synchronous wave and asynchronous pope lines - Low power design - Programmable digital signal processors.

Text Books

References

EC338 LOW POWER VLSI DESIGN
Credits: 3:0:0 Marks: 40+60

UNIT – I: Simulation Power Analysis
Need for low power VLSI chips – Short circuit current – Leak age current – Static current – Basic principles of low power design – Simulation power analysis at all levels – Data correlation in DSP system – Monte Carlo simulation.

UNIT – II: Circuit Logic Level Estimation
Circuits – Transistor and gate sizing – Pin ordering – Network restructuring and reorganization – Special latches and flip-flops.

UNIT – III: Architecture and System Level Estimation

UNIT – IV: Circuit Design Techniques And SRAM Architecture
Circuit design – Leakage current in deep submicrometer transistor – Design issues – Low voltage circuit design – Multiple supply voltages.
MOS static RAM cell – Banked SRAM – Reducing voltage swing – Reducing power in write drives and sense amplifier.
UNIT – V: Energy Recovery And Software Design For Low Power

Energy recovery circuit design – Design with partially reversible logic – Source of software power dissipation – Software power estimation – Software power optimization – Codesign for low power.

Text Books

References

EC339 COMPUTER AIDED VLSI DESIGN

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

UNIT – I: Introduction to VLSI Design

UNIT – II: Automation Tools and Algorithms

UNIT – III: Combinational Optimization

UNIT – IV: Simulation and Synthesis
Simulation – Logic synthesis – Verification – High level synthesis – Compaction.

UNIT – V: Design Automation

Text Books

References

EC340 SIMULATION LABORATORY

Credit: 0:0:2  Marks: 50+50
12 experiments will be notified by HOD from time to time

EC341 ADVANCED COMMUNICATION ENGINEERING

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

Unit I: Digital and Data communications
Digital communications-Introduction, Digital communication, Shannon limit for information capacity, Digital radio, Digital amplitude modulation, Frequency shift keying, Phase shift keying, Quadrature amplitude modulation, Bandwidth efficiency, Carrier recovery, differential phase shift keying, Clock recovery, Probability of error and bit error rate - History of data communication standards organizations for data communication, Data communication circuits, Data communication codes, Error control, Synchronization, Data communication hardware, Serial interfaces, Parallel interfaces, The telephone network, The telephone circuit, Data modems

Unit II: Data Communication protocols and network configurations
Open systems interconnection, Data transmission modes, Asynchronous protocols, Synchronous protocols, Public data network, CCITT X.25 user-to-network interface protocol, Integrated services digital network, Local area networks, Token passing ring, Ethernet, Fiber distributed data interface.

Unit III: Digital Transmission and Multiplexing:
Pulse modulation, Pulse code modulation, Delta modulation PCM, Adaptive Delta modulation PCM, Differential pulse code modulation, Pulse transmission, Signal power in binary digital signals, Time-division multiplexing, T1 digital carrier system, CCITT time division multiplexed carrier system, Codecs, Combo chips, North American digital hierarchy line encoding, T carriers, Frame synchronization, Bit Interleaving versus word interleaving, Statistical time-division multiplexing, Frequency division multiplexing, AT&T’s FDM hierarchy, Composit base band signal, Formation of a master group, hybrid data.

Unit IV: Microwave Radio Communications & system gain, Optical fiber Communications
Frequency Vs Amplitude modulation, Simplified FM microwave radio system, FM microwave radio repeaters, Diversity, Protection switching, FM microwave radio stations, Path characteristics, System gain, History of fiber optics, Optical fibers Vs metallic cable facilities, Electromagnetic spectrum, Optical fiber communications system, Light propagation, Propagation of light through an optical
fiber, Optical fiber configurations, Acceptance angle and acceptance cone, Losses in optical fiber cables, Light sources, Light detectors, Lasers.

**Unit V: Satellite Communication**
History of satellites, Orbital satellites, Geostationary satellites, Orbital patterns, Look angles, Orbital classification, Spacing & frequency allocation, Radiation patterns: Footprints, Satellite system parameters, Satellite system link equations, Link budget, FDM/FM Satellite systems, Multiple accessing, Channel capacity, Satellite radio navigation.

**Text book**
ADDITIONAL SUBJECTS

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<th>Code No.</th>
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<td>Matlab &amp; VHDL Lab</td>
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<td>EC342</td>
<td>Testing and Testability of Electronics Systems</td>
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<td>Designing with Gate Array and ASIC</td>
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<td>Cellular Mobile Communication</td>
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<tr>
<td>EC347</td>
<td>Multimedia Compression Techniques</td>
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EC258 DIGITAL SYSTEM DESIGN USING VHDL

Credit : 2:0:0 Marks: 40+60

Unit: I Programmable Logic Devices
Introduction – Programming Technologies- Programmable Read only Memory (PROM or PLE)- Programmable Logic Array (PLA) – programmable Array Logic (PAL.)

Unit II : FPGA and CPLD
Semi custom and full custom IC design –Xilinx XC3000 series, Xilinx XC4000 series – Logic cell Array (LCA)-Configurable Logic block (CLB) – Input and output block (IOB) –Programmable Interconnection Point (PIP)- structure of PLD and Complex PLD- Altera 7000 series.

Unit III : Introduction to VHDL

Unit IV : Data Flow, Behavioural Modeling
Concurrent signal assignment – conditional signal assignment - selected signal assignment - concurrent and sequential statements – Data flow, Behavioral Modeling.

Unit V: Structural Modeling
Structural Modeling – Test bench – Examples – CPU- Traffic light controller

Text Books

Division of Electronics and Communication Engineering
Reference

EC259 MATLAB & VHDL LAB
Credits: 0:0:2 Marks: 50+50
12 Experiments will be notified by HOD from time to time

EC342 TESTING AND TESTABILITY OF ELECTRONICS SYSTEMS
Credits: 4:0:0 Marks: 40+60

Unit I : Introduction
Motivation for testing and design for testability – Fault models – Functional tests – Example of a functional test program.

Unit II : Test Generation Algorithms for Combinational Logic Circuits

Unit III : Fault Simulation Techniques
Serial, Single-fault propagation, Deductive, Parallel and Concurrent Simulation.

Unit IV : Special Testing Problems:

Unit V : Design for Testability
Key testability concepts – Scan-in Scan-out design – Signature analysis – Built-in self-test - Testability features for board test.

References
EC343 HIGH SPEED VLSI DESIGN

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

Unit I
Clocked Logic Styles, Single-Rail Domino Logic Styles, Dual-Rail Domino Structures, Latched Domino Structures, Clocked pass Gate Logic

Non Clocked Logic Styles, Static CMOS, DCVS Logic, Non-Clocked pass Gate Families.

Unit II
Circuit Design Margining, Design Induced Variations, Process Induced Variations, Application Induced Variations, Noise.

Unit III

Unit IV
Signaling Standards, Chip-to-Chip Communication Networks, ESD Protection, Skew Tolerant Design

Unit V
Clocking Styles, Clock Jitter, Clock Skew, Clock Generation, Clock Distribution, Asynchronous Clocking Techniques.

References
2. Evan Sutherland, Bob Stroll, David Harris, Logical Efforts, Designing Fast CMOS Circuits, Kluwer, 1999
3. David Harris, Skew Tolerant Domino Design.

EC344 MIXED SIGNAL PROCESSING

Credits 4:0:0  Marks: 40+60

Unit I: Introduction
Introduction – Modeling Basic analog concepts – Analog circuit analysis – network independent – dependent data sampled analog systems, loading effects.

Unit II: Analog and Mixed Signal Extensions To VHDL
Introduction– Language design objectives – Theory of differential algebraic equation – the 1076.1 Language – Tolerance groups – Conservative systems – Time and the simulation
cycle – A/D and D/A Interaction – Question Point – Frequency domain modeling and examples.

Unit III: Analog Extensions to Verilog:

Unit IV: Behavioural Generic Model of Operational Amplifiers

Unit V: Non-Linear State Space Averaged Modeling of 3-State Digital Phase – Frequency Detector:

Reference:

EC345 DESIGNING WITH GATE ARRAYS AND ASICS

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

Unit I: Hardware and Mixed Logic Convention:
Gate Hardware – mixed logic as a design tools and descriptive conventions – Uses of mixed logic in trouble shooting

MSI & LSI Elements
Multiplexes – Decoders and demultiplexers – ROM

Unit II: Timing Diagram
Introduction – micro timing diagrams – Hazards – macro timing diagrams- timing simulations - Feedback in combinational circuits

Combination of Flip Flops
Registers – Parallel Serial Conversion – Ripple Counters - Rate Multipliers - RAM

Unit III: Application Specific Devices
Programming technologies – PROMs & EPROMs – PLA – PAL Gate arrays – Programmable gate arrays and applications – Antifuse FPGA – Synthesis methods for FPGA- Full Custom design

Unit IV : Design of Simple State Machines
Traditional state machine design with D-flip-flops – Design with JK flip flops –Design for PLD – ASM chart – Design from an ASM chart : Boolean implementation for minimal number of flip flops, one-hot controller implementation – clock skew in state machines, implementation and lockout in state machines

Unit V : Electronically Programmable Functions
Introduction basic components – Arithmetic logic units- Programmable Registers – problem in electronically Programmable Circuits.

Textbook

References

EC346 CELLULAR MOBILE COMMUNICATION

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

Unit I : Introduction to Wireless Mobile Communications
History and evolution of mobile radio systems. Types of mobile wireless services/systems- Cellular, WLL, Paging, Satellite systems, Standards, Future trends in personal wireless systems

Unit II : Cellular Concept and System Design Fundamentals
Cellular concept and frequency reuse, Multiple Access Schemes, channel assignment and handoff, Interference and system capacity, Trunking and Erlang capacity calculations

Unit III : Mobile Radio Propagation
Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading and Base band impulse response models, parameters of mobile multipath channels, Antenna systems in mobile radio

Unit IV: Modulation and Signal Processing
Analog and digital modulation techniques, Performance of various modulation techniques-Spectral efficiency, Error-rate, Power Amplification, Equalizing Rake receiver concepts, Diversity and space-time processing, Speech coding and channel coding
Unit V : System Examples and Design Issues
Multiple Access Techniques-FDMA,TDMA and CDMA systems, operational systems, Wireless networking, design issues in personal wireless systems

References
1. K. Fehér, Wireless digital communications, PHI, New Delhi, 1995
4. Schiller, Mobile Communications; Pearson Education Asia Ltd., 2000

EC347 MULTIMEDIA COMPRESSION TECHNIQUES

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

Unit I: Introduction

Unit II: Text Compression

Unit III: Audio Compression
Audio compression techniques—frequency domain and filtering—basic subband coding—application to speech coding—G.722—application to audio coding—MPEG audio—progressive encoding for audio—silence compression—speech compression techniques—Vocoders

Unit IV: Image Compression
Predictive techniques—PCM, DPCM, DM. Contour based compression—quadtrees, EPIC, SPIHT, Transform coding—JPEG, JPEG-2000, JBIG

Unit V: Video Compression
Video signal representation, Video compression techniques—MPEG, Motion estimation techniques—H.261. Overview of Wavelet based compression and DVI technology, Motion video compression, PLV performance, DVI real time compression

References
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<td>EC352</td>
<td>Advanced Digital System Design and Testing</td>
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EC260 ANALOG ELECTRONICS

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

UNIT – I: Rectifier – Regulators – Wave Shaping Circuits:-
Rectifiers – Half wave rectifier – Full wave rectifier – Filters – Voltage and current regulators – High pass and Lowpass RC circuits – Response for step, pulse, square wave, ramp and exponential signals as input – High pass circuit as a differentiator – Lowpass circuit as integrator – attenuators – Non-Linear Waveshaping Circuits: Diode and transistor clippers – clamping circuits

UNIT – II: Theory of BJT, FET, UJT, TRIAC, SCR, IGBT:

UNIT – III: Amplifiers and Oscillators:

UNIT- IV: OP Amp Characteristics and Applications:
Characteristics of ideal OP amp – Bias – Offset and drift – Bandwidth and Slewrate – Frequency Compensation – Log and antilog amplifiers – Multiplier and Divider
Applications: Inverting and non-inverting amplifiers – summers – differentiator and integrator.

UNIT – V: Comparators and Signal Conditioners:-

Text Books:

References:

EC261 ELECTRONIC INSTRUMENTATION
Credits: 4:0:0 Marks: 40+60

UNIT – I: Introduction to Measurements:
Introduction to measurement systems – Classification and characteristics of Instruments – Errors in measurements – Standards of measurement – Electronic weighing system – AC/DC Bridge measurements.

UNIT – II: Transducers:

UNIT – III: Signal Generators and Analyzer:
Generator: Audio frequency generator – Pulse generator – Function generator – Sweep generator.

UNIT – IV: Oscilloscopes and Recorders:

UNIT – V: Digital Instruments and Computerized Test Systems:
Digital voltmeters – Digital measurement of frequency and period.
Text Book:

Reference Books:

EC262 COMMUNICATION SYSTEMS

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

UNIT – I: Amplitude Modulation:

UNIT – II: Frequency Modulation:

UNIT – III: Digital Communication:

UNIT – IV: Wireless Communication:

UNIT – V: Noise in Communication Systems:

Text Books:

References:

EC263 COMPUTER ARCHITECTURE

Credits: 4:0:0

UNIT-I: Introduction:
Basic structure of Computer Hardware-Von-Neumann Architecture-Functional units-
Instruction formats and types-Addressing modes.

UNIT-II: Arithmetic And Logic Unit:
Fixed point arithmetic operation-addition, substraction, multiplication, division-Floating
point arithmetic operation- Bit-slice processors.

UNIT-III: Processor Unit:
Data path implementation-Control unit-hardwired control, microprogrammed control,
nanoprogramming- Concepts of pipelining.

UNIT-IV: Memory System:
Memory hierarchy-Internal organization of RAM, ROM, Interleaved memory-Cache and
associative memories- Virtual memory.

UNIT-V: Input / Output and Peripherals
Basic concepts-programmed I/O-Interrupts and DMA-I/O processors-input devices-
display devices-printers-magnetic disk drives-optical drives.

Text Books:

References:
EC264 COMPUTER NETWORKS

UNIT 1: Data Communication:

UNIT II: Data Link Layer:

UNIT III: Network Layer:
Internet works – Packet switching and Datagram approach – IP addressing methods – Subnetting – Routing-Distance vector Routing – Link State Routing – Routers

UNIT IV: Transport Layer:

UNIT V: Application Layer:
Domain Name Space (DNS) – SMTP, FDP, HTTP, WWW – Security – Cryptography.

Text Books:

References:

EC265 TELEVISION AND VIDEO ENGINEERING

UNIT I: Fundamentals of Television
UNIT – II: Monochrome Television Receiver
Transmission and Propagation of TV signal, TV antenna, Receiver: VHF Tuners, Vision IF subsystem, Inter carrier sound system. Video amplifiers, Synchronous separation AFC and deflection Oscillators frame and line deflection circuits.

UNIT – III: Colour Television Systems
Color Characteristics – Color cameras Color picture tubes, Color signal generation and encoding, NTSC, PAL and SECAM Systems.

UNIT – IV: Colour Television Receivers

UNIT – V: Special Topics in Television

Text Book:

References:

EC266 DIGITAL ELECTRONICS LAB
Credits: 0:0:2 Marks: 50+50
12 experiments will be notified by HOD from time to time

EC267 ELECTRONICS LAB
Credits: 0:0:2 Marks: 50+50
12 experiments will be notified by HOD from time to time

EC348 ADVANCED COMPUTER ARCHITECTURE
Credits: 4:0:0 Marks: 40+60
UNIT – I: Parallel Computer Models
Evolution of computer architecture - System attributes to performance - Multiprocessors and Multicomputers - Multivector and SIMD computers - PRAM and VLSI models - Parallelism in programming - Conditions for parallelism - Program partitioning and scheduling - Program Flow mechanisms. Performance metrics and measures - Speedup
Amdahl's law - Gustafson's law - Memory bounded speedup model - Scalability metric and goals.

UNIT – II: Advanced Processors
Instruction set architectures - CISC scalar processor - RISC scalar processors - super scalar processors - VLIW architecture - Multi-vector and SIMD computers - Vector processing principles - Memory access schemes - SIMD computer - Models - Inter processor communication.

UNIT – III: Memory Systems
Memory hierarchy - Virtual memory technology - Back plane bus specification - Arbitration, Transaction and Interrupt - Cache memory organization - Shared memory organizations.

UNIT – IV: Multiprocessors and Multicomputers

UNIT – V: Software for Parallel Programming and Multithreading

Text Book:

References:

EC349 ANALOG VLSI DESIGN

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

UNIT I: VLSI Technology

UNIT II: Device Modeling
Modeling-MOS Models: dc, small signal and high frequency model, Measurement of MOSFET Parameters- Diode models: dc, small signal and high frequency diode model –

UNIT III: Analog Systems

UNIT IV: Design Automation and Verification

UNIT V: Analog Signal Processing Circuits & Analog Cell Layout
Modulators- Oscillators- Phase locked loops-Layout Techniques- Resistor layout- Capacitor Layout- Analog cell layout.

Text Book:

Reference Books:

EC350 LOW POWER VLSI DESIGN
Credits: 4:0:0 Marks: 40+60

UNIT – I: Simulation Power Analysis
Need for Low Power VLSI chips – Charging and discharging capacitance – Short circuit current – Leakage current – Static current – Basic principles of low power design – Gate level logic simulation – Architecture level analysis.

UNIT – II: Circuit and Logic Level Power Estimation
UNIT – III: Power Estimation and Behavioral level Transforms

UNIT – IV: Circuit Design Techniques and SRAM Architecture
Circuit design style – Leakage current in deep sub-micrometer transistors – Deep sub-micrometer device design issues – Low voltage circuit design techniques – Multiple supply voltages.

MOS static RAM memory cell – Banked SRAM – Reducing voltage swing – Reducing power in write drives and sense amplifier.

UNIT – V: Energy Recovery and Software Design for Low Power
Energy recovery circuit design – design with partially reversible logic – source of software power dissipation – software power estimation – software power optimization – co-design for low power.

Text Books:

References:

EC351 DIGITAL IMAGE PROCESSING
Credits: 4:0:0 Marks: 40+60

UNIT-I: Continuous And Discrete Images And Systems

UNIT-II: Image Transforms

UNIT-III: Image Enhancement
Contrast stretching, clipping and thresholding, intensity level slicing, Histogram equalization, modification and specification, spatial averaging, low pass, high pass, band pass filtering, Directional smoothing, median filtering, generalized cepstrum and...
homomorphic filtering, pseudo coloring, edge enhancement using 2-D IIR and FIR filters, color image enhancement.

UNIT-IV: Image Restoration And Image Reconstruction From Projections
Image observation models, sources of degradation, inverse and Wiener filtering, geometric mean filter, non linear filters, smoothing splines and interpolation, constrained least squares restoration. Radon transform, back projection operator, inverse radon transform, back projection algorithm, fan beam and algebraic restoration techniques.

UNIT-V: Image Data Compression
Image raw data rate, compression ratio. Sub sampling, coarse quantization, frame repetition and interlacing. PCM, Entropy coding, Run-length coding, Bit-plane coding. DPCM, Delta modulation. Transform coding, zonal and threshold coding, Hybrid coding and color image coding.

Text Book:

References:

EC352 ADVANCED DIGITAL SYSTEM DESIGN AND TESTING

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

UNIT I: Programmable Logic Devices
Basic concepts, Programming techniques, Programmable Logic Element (PLE), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Structure of Standard PLD’s, Complex PLD’s (CPLD), Altera Max-7000 Series. Design of combination and sequential circuits using PLD’s. Type of FPGA – Xilinx XC3000 Series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) Input/Output Blocks (I/OB) – Programmable Interconnection Points (PIP) – Xilinx XC4000 families – Design examples.

UNIT II: Sequential Logic Circuits
Mealy machine, More machine, State diagrams, State table minimization, Incompletely specified sequential machines, State assignments, Design of synchronous and asynchronous sequential logic circuits working in the fundamental mode and pulse mode.

UNIT III: Symmetric Functions
Elementary symmetric functions, partially symmetric and totally symmetric functions, Mc Cluskey de-composition method, Synthesis of symmetric function by contact networks.
UNIT IV: Testing and Simulation Techniques in Digital Circuits

UNIT V: Introduction to VHDL

Text Books

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EC268 MASS COMMUNICATION

Credits 4:0:0  Marks 40+60

Unit I: Communication
Definition, history and Background; Nature, Process of mass Communication; functions and objects of communication, kinds of mass communication, Communication today.

Unit II: Models of Communication
Models of communication; needs of models and their importance

Unit III: Theories of Mass Communication
Theories of mass communication; diverse systems of media; issues and organizations of modern media.
Unit IV: Social Systems and Media Responsibility
Social systems and media responsibility; philosophy and influence; information, communication and Entertainment/Education (ICE) and the resultant implications; Gatekeepers.

Unit V: Comparative Theories
Eastern and western theories, comparison and critique

Text Book:

References:

EC269 AUDIO PRODUCTION AND PRESENTATION

Credits 4:0:0  Marks 40+60

Unit I: Basics of Radio Programming
Characteristics of radio - radio and other media; Assessment and analysis of target audience; Basics of radio Programming - from conception to execution of ideas; Research - collection of background materials; Formats and styles in radio production.

Unit II: News Writing and Interview
Writing for the ear – Basic rules or radio Writing; audio script – types of audio scripts; News – Concept and definition, elements of news values, news gathering and writing ; Interview, types of interviews.

Unit III: Radio Jingle
Radio jingles production; Radio Drama – Fiction and Drama, Drama audition; Discussion programmes – selection of subjects for discussion; phone-in programes.

Unit IV: Documentary
Radio Feature and Documentary – Difference between feature and documentary; Public Service announcements; Day parting; Media fusion; Planning and scripting for educational radio programmes, programmes for special occasions.

Unit V: Radio Station Organisation and Management
Radio Station Organisation and Management; Use of effects; Use of background music; Advanced radio production techniques – Using digital technologies, Creating audio special Effects.
Text Book:

References:

EC270 SATELLITE AND COMMUNITY RADIO

Credits 4:0:0

Marks 40+60

Unit I:
Introduction to community radio - Technology for community radio - Managing your stations.

Unit II:
Money and monitoring accountability - Broad casting Rules and laws.

Unit III:
Programming Volunteer support - Access and Disability - Developing communities.

Unit IV:
Training Individuals - Finding community Radio

Unit V:
Selling your service - Rural radio

Text Books:
1. David Page william Crawely “Saellites over south Asia” sage publication(1999)
2. Rural radio Parama Roy “Indian Traffic” sage publication (2000)

References:
1. Ananda Mitra “India Through The western lens” sage publication (2000)

EC271 STUDIO MANAGEMENT

Credits 4:0:0

Marks 40+60

Unit I:
Assisting with production planning -consulting on logistics. -Ensuring all staging, furniture and props are ready before the show starts. -Ensuring all equipment is in place and technical checks have been done. -Briefing presenters and talent. -Preparing the audience. -Coordinating rehearsals.

Unit II:
Relaying information between the control room, floor staff and talent. -Providing cues, timing and other information to presenters and talent.
Unit III:
Informing the director of any relevant off-camera action. -Preparing for upcoming parts of the show.

Unit IV:
Maintaining control of the audience and ensuring they are looked after.

Unit V:
Overseeing safety issues on the floor. -In outside broadcasts; liaising with venue staff, organizing talent, etc.

Text Book:
1. David French Michal Richards “Television in contemporary Asia” sage publication (1999)

Reference:

EC272 VIDEO PRODUCTION AND EDITING

Credits 4:0:0 Marks 40+60

Unit I: Evolution of Video
The evolution of Video. Analog & Digital mode production of a programme & its stages. Shot, scene, story-board & scripting. Pre-production, Treatment, Draft preparation, Selecting personnel, Area of research, Script development, Project management, selection of concept, programme treatment, crew members, Equipments required, set direction & colour correction if needed, location scouting, budget & scheduling, finalizing props, use of lights, costumes, hair style & make-up.

Unit II: Production

Unit III: Post-Production:
Footage review, Final scripting, Video Editing, Video tape format, Basic software & Hardwares required, editing, re-recording, audio mixing-music also, Voice-over, graphics, etc. Knowing the tracks A/V International tracks & its use in dubbed programmes. A-B roll & its advantages. Chroma-Keying. Final master output – mixed & unmixed version.

Unit IV: Video & Audio Codecs
Various formats & types available, CD/DVD/BD9Blue-ray Disc) Defining – montage, promos, special promos, credits & end scroll, music bed. Various stages a programme undergoes after mixed master-Script committee approval, production & technical FT (Fit for Telecast) certificate Capsule/Packaging.
Unit V: The Final Steps
Curtain raiser, teaser, Medley, peppier fonts for supers with the right colour strips. Luminescense & chrominance, end scroll 7 credits with innovative ways. Test-run transmission, launching & pipeline of a programme, Marketing-getting sponsors. Publicity-stills & write-ups. Syndicated programmes.

Text Book:

References:

EC273 GRAPHICS AND ANIMATION
Credits 4:0:0 Marks 40+60

Unit I: Animation History
Evolution of Disney animation – Types of animation – styles of animation – Principles of 2-D animation – Animation market today

Unit II: Different Animation Styles

Unit III: Pre Production
Scripting – story board – screen Play – timing – Duration Character designs – Turn Around - Color Schemes – Attitudes > Props

Unit IV: Tools for 2D Animation

Unit V: Compositing

Text Books:
References:

EC274 WEB DESIGNING AND PRODUCTION
Credits 4:0:0 Marks 40+60

Unit I: Introduction to Internet
Introduction of Internet, History of Internet, Technologies and applications of world wide web, basics of web site designing, style and formats for web designing, applications in web designing, web standards and languages of HTML, XML, Action script and java script.

Unit II: Fundamentals of Web Designing
Web Architecture, Web design templates, designing, implementing and evaluating user centred tools and techniques, HTML tags, interaction between HTML user, client and server, introduction to CSS, style and style sheets with CSS.

Unit III: Managing Database on the Web
Introduction to data base and concepts, data on the web, key concepts of web scripting languages, data types, variables, expressions, operation and functions. Introduction to server side scripting languages, features of java, OOP principles. Interactive web pages, basics of data base query language SQL, browser side language java script, interactive web pages, web based production.

Unit IV: Content and Style of Web Writing
Web templates and colours, content, structure and presentation elements in design of a simple web site, basics of creating content for website, writing entertainment content, edutainment content, news content and blogs, writing for online advertisements, writing for banner advertisements, organizing content and headlines, integrating graphic content, maintaining on line document.

Unit V: Business Applications in Website
E-commerce, e-content production, e-learning, web streaming, pre production elements and post production phases of web technology, web based broadcast technologies and content production, e-magazines, presentation of audio, video, animated and digital images in the web.

Text Book:

Reference Books:
EC275 ADVERTISING AND PUBLIC RELATION

Credits 4:0:0  
Marks 40+60

Unit I: Nature and Scope of Advertising
Definition, nature and scope of advertising, Roles of advertising; Societal communication, Marketing and Economic Functions of advertising, Effects of advertising, Legal and Ethical issues in advertising.

Unit II: Types of Advertising
Target audience, Geographic area, Media and Purpose, Institutional and Promotional Advertising, Web Advertising (home page designing, overall look of the site, web writing content management.

Unit III: Advertising Agency
Environment, Components – Advertiser, Advertising agency and media, Indian advertising, Latest trends in advertising – (India and abroad) Ad Agency – Structure and function structure of small medium and big agencies. Types of agencies – In-House, Independent, Full-service and specialized Multinational accounts and Global advertising

Unit IV: Media Research and Planning
Client Brief, Account planning, Creative strategy and Brief, communication Plan Brand Management, Positioning .Brand personality , Brand image, brand equity, case studies,Media Research, Planning and Budgeting, Media buying, creative Media options and Media vehicles Rural Communication – Alternative media Options, below-the-line activities and low-budget advertising

Unit V: Public Relations
Public relations – evolution and growth, definition and relevance of PR role – Mass media & PR; PR in Government, public and private sectors; PR and corporate Communications writing for PR; PR ethics and regulations.

Text Book:

References:

EC276 ADVERTISING LAB

Credits 0:0:2  
Marks 50+50

12 Experiments will be notified by HOD from time to time
EC277 AUDIO LAB
Credits 0:0:2
Marks 50+50
12 Experiments will be notified by HOD from time to time

EC278 VIDEO LAB
Credits 0:0:2
Marks 50+50
12 Experiments will be notified by HOD from time to time

EC279 GRAPHICS AND ANIMATION LAB
Credits 0:0:2
Marks 50+50
12 Experiments will be notified by HOD from time to time

EC280 TRANSMISSION LINES AND WAVE GUIDES
Credits 4:0:0
Marks 40+60

Unit I: Transmission Line Theory
Different types of transmission lines – Characteristic impedance – The transmission line as a cascade of T-Sections - Propagation Constant.
General Solution of the transmission line – The two standard forms for voltage and current of a line terminated by an impedance – physical significance of the equation and the infinite line – The two standard forms for the input impedance of a transmission line terminated by an impedance – reflection coefficient – wavelength and velocity of propagation.
Waveform distortion – distortion less transmission line – The telephone cable – Inductance loading of telephone cables.
Input impedance of lossless lines – reflection on a line not terminated by characteristic impedance - Transfer impedance – reflection factor and reflection loss – T and [ ] Section equivalent to lines.

Unit II: The Line at Radio Frequencies
Standing waves and standing wave ratio on a line – One eighth wave line – The quarter wave line and impedance matching – the half wave line.
The circle diagram for the dissipationless line – The Smith Chart – Application of the Smith Chart – Conversion from impedance to reflection coefficient and vice-versa. Impedance to Admittance conversion and viceversa – Input impedance of a lossless line terminated by an impedance – single stub matching and double stub matching.

Unit III: Guided Waves
Waves between parallel planes of perfect conductors – Transverse electric and transverse magnetic waves – characteristics of TE and TM Waves – Transverse Electromagnetic waves

**Unit IV: Rectangular Waveguides**

**Unit V : Circular Wave Guides and Resonators**
Bessel functions – Solution of field equations in cylindrical co-ordinates – TM and TE waves in circular guides – wave impedances and characteristic impedance – Dominant mode in circular waveguide – excitation of modes – Microwave cavities, Rectangular cavity resonators, circular cavity resonator, semicircular cavity resonator, Q factor of a cavity resonator for TE101 mode.

**Text Books**
1. J.D.Ryder “Networks, Lines and Fields”, PHI, New Delhi, 2003. (Unit I & II)

**References**

**EC281 ELECTRIC CIRCUIT ANALYSIS AND NETWORKS**

Credits 3:1:0 Marks 40+60

**Unit I : Basic Circuit Concepts**

**Unit II : Sinusoidal Steady State Analysis**
Phasor- sinusoidal steady state response - concepts of impedance and admittance - analysis of simple circuits - power and power factor - series resonance and parallel resonance - bandwidth and Q factor. Solution of three-phase balanced circuits - power measurements by two-wattmeter methods.

**Unit : III : Mesh-Current And Node-Voltage Methods**
Unit IV: Network Theorems And Applications

UNIT V: Transient Analysis & Graph Theory

Text Book

References:

EC282 ANTENNAS AND WAVE PROPAGATION
Credits 3:1:0 Marks 40+60

UNIT I: Radiation Fields of Wire Antennas
Concept of vector potential-modification of time varying retarded case. Fields associated with Hertzian dipole-Radiation power, resistance and gain of current element- Radiation resistance of elementary dipole with linear current distribution- Radiation from half-wave dipole and quarter wave monopole-Assumed current distribution for wire antennas-Use of capacity hat and loading coil for short antennas

UNIT II: Antenna Fundamentals and Antenna Arrays
Definitions: Radiation intensity- Directive gain- Directivity-Power gain-Beam width-Band width. Radiation resistance and gain of half wave dipole and folded dipole-Reciprocity principle-Effective length and effective area. Relation between gain effective length and radiation resistance
Loop Antennas: Radiation from small loop and its radiation resistance- Radiation from loop with circumference equal to wavelength and resultant circular polarization on axis
Helical Antennas: Normal and axial mode of operation
Antenna Arrays: Expression for electric field from two or three element arrays-uniform linear array-method of pattern multiplication-binomial array-image method

UNIT III: Travelling Wave Antennas
Radiation from a traveling wave on a wire
Rhombic Antenna: Analysis and design
**Coupled Antennas:** Self and mutual impedance-2 and 3 element yagi antennas-Log periodic antennas-feeding and transposing of lines- effects of decreasing $\alpha$.

**UNIT IV : Aperture and Lens Antennas**
Radiation from Huygen’s source- Radiation from the open end of a coaxial line- Radiation from a rectangular aperture treated as an array of Huygen’s source-Equivalence of fields of slot and complementary dipole- Relation between dipole and slot impedances.
Feeding of slot antennas-Thin slot in an infinite cylinder-Field on E plane horn-Reduction from circular aperture-Beam width and effective area
Reflector antennas-Lens antennas-Spherical waves and biconical antennas

**UNIT V: Propagation**
**Sky wave propagation:** Structure of ionosphere-Effective dielectric constant of ionized region-Refraction-Refractive index-critical frequency-Skip distance-Effect of earth’s magnetic field-collisions-Max usable frequency-fading-diversity reception
**Space wave propagation:** Reflection of polarized waves-Reflection characteristics of earth-Resultant of direct and reflected wave at the receiver-Duct propagation
**Ground wave propagation:** Attenuation characteristics-calculation of field strength

**Text Book:**

**Reference:**

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**EC353 SOLID STATE DEVICE MODELING AND SIMULATION**

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

**Unit I : Basic Semiconductor Physics**
Quantum Mechanical Concepts, Carrier Concentration, Transport Equation, Bandgap, Mobility and Resistivity, Carrier Generation and Recombination, Avalanche Process, Noise Sources.

**Unit II : Bipolar Device Modeling**
Injection and Transport Model, Continuity Equation, Diode Small Signal and Large Signal (Change Control Model), Transistor Models: Ebber - Molls and Gummel Port Model, Mextram model, SPICE modeling temperature and area effects.
Unit III : MOSFET Modeling
Introduction Interior Layer, MOS Transistor Current, Threshold Voltage, Temperature Short Channel and Narrow Width Effect, Models for Enhancement, Depletion Type MOSFET, CMOS Models in SPICE.

Unit IV : Parameter Measurement
General Methods, Specific Bipolar Measurement, Depletion Capacitance, Series Resistances, Early Effect, Gummel Plots, MOSFET: Long and Short Channel Parameters, Statistical Modeling of Bipolar and MOS Transistors.

Unit V : Optoelectronic Device Modeling
Static and Dynamic Models, Rate Equations, Numerical Technique, Equivalent Circuits, Modeling of LEDs, Laser Diode and Photodetectors.

Reference Books:

EC354 GENETIC ALGORITHMS FOR VLSI DESIGN

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

Unit I
Introduction, GA Technology-Steady State Algorithm-Fitness Scaling-Inversion

Unit II

Unit III

Unit IV
Global routing-FPGA technology mapping-circuit generation-test generation in a GA frame work-test generation procedures.
Unit V

References

EC355 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY IN SYSTEM DESIGN
Credit : 4:0:0 Marks ( 40 + 60)

Unit I : EMI Environment
EMI/EMC concepts and definitions, Sources of EMI, conducted and radiated EMI, Transient EMI, Time domain Vs Frequency domain EMI, Units of measurement parameters, Emission and immunity concepts, ESD.

Unit II : EMI Coupling Principles
Conducted, Radiated and Transient Coupling, Common Impedance Ground Coupling, Radiated Common Mode and Ground Loop Coupling, Radiated Differential Mode Coupling, Near Field Cable to Cable Coupling, Power Mains and Power Supply coupling.

Unit III : EMI/EMC Standards And Measurements

Unit IV : EMI Control Techniques
Shielding, Filtering, Grounding, Bonding, Isolation Transformer, Transient Suppressors, Cable Routing, Signal Control, Component Selection and Mounting.

Unit V : EMC Design of PCBs

References

EC356 MEMS AND NANO TECHNOLOGY
Credit : 4:0:0		Marks ( 40 + 60)

Unit I : Introduction to MEMS and Micro Systems

Unit II : Microsystem Materials

Unit III : Microsystem Fabrication Process

Unit IV : Nanotechnology Basics

Unit V : Applications Of Nanotechnology In Medicines
Nanobiosensors – Electronic Nose – Photo Dynamic Therapy – Molecular Motors – Protein Engineering.

Text Books

References

EC357 RF SYSTEM DESIGN
Credit : 4:0:0		Marks ( 40 + 60)

Unit I : RF Issues
Importance of RF design, Electromagnetic Spectrum, RF behaviour of passive components, Chip components and Circuit Board considerations, Scattering Parameters, Smith Chart and applications.
Unit II : RF Filter Design
Overview, Basic resonator and filter configuration, Special filter realizations, Filter implementations, Coupled filter.

Unit III : Active RF Components & Applications
RF diodes, BJT, RF FETs, High electron mobility transistors; Matching and Biasing Networks – Impedance matching using discrete components, Microstripline matching networks, Amplifier classes of operation and biasing networks.

Unit IV : RF Amplifier Designs
Characteristics, Amplifier power relations, Stability considerations, Constant gain circles, Constant VSWR circles, Low Noise circuits, Broadband, high power and multistage amplifiers.

Unit V : Oscillators, Mixers & Applications
Basic Oscillator model, High frequency oscillator configuration, Basic characteristics of Mixers; Phase Locked Loops; RF directional couplers and hybrid couplers; Detector and demodulator circuits. Microwave integrated circuits.

References:

EC358 ADVANCED EMBEDDED SYSTEM DESIGN
Credit : 4:0:0 Marks (40 + 60)

Unit I : ARM Processor Architecture
CISC & RISC Architecture – Block diagram-Introduction to ARM7/ARM9…. and ARM extensions—Pipelines – Memory - Architecture – Memory interfacing – Bus architecture – AMBA; Examples of embedded ARM cores – Philips ARM7 core – Architecture – Peripheral interfacing

Unit II : ARM Instructions & Programming
Programming in assembly language (ALP) – The ARM instruction set – Introduction to arm thumb – Thumb programmers model – ARM/Thumb inter working-Example and exercises

Unit III : Embedded C Programming for ARM
Support for high-level languages-Review of C-Programming-C Program Elements, Macros and functions.-Use of Pointers- NULL Pointers-Use of Function Calls-Function Queues and
Interrupt Service Routines Queues Pointers-Concepts of EMBEDDED PROGRAMMING in C-“C” Program compilers- Cross compiler

Unit IV : Real Time Operating Systems

Unit V : RTOS Implementation with ARM
Study of Micro C/OS-IT & Embedded LINUX RTOS-RTOS System Level Functions-Task Service Functions-Time Delay Functions-Memory Allocation Related Functions-Semaphore Related Functions-Mailbox Related Functions- Queue Related Functions-Case Studies-Multiple Tasks and their functions-Creating a list of tasks.

Textbooks

Websites :
1. WWW.arm.com

EC359 ASIC DESIGN LAB

Credits 0:0:2 Marks 50+50

1. 6 experiments will be notified by the HOD from time to time
2. Mini Project work using Menter Graphics front end and back end tools
SCHOOL OF
ELECTRICAL SCIENCES
ADDITIONAL SUBJECTS

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<td>EC370</td>
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<td>EC374</td>
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<td>EC375</td>
<td>Global Tracking and Positioning Systems</td>
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EC283 ELECTRON DEVICES

Credit : 4:0:0

Unit I: Electron Ballistics

Charged Particles – Constant electric Field – Two dimensional motions – Electrostatic Deflection in CRT – CRO – Force in magnetic Field – Motion in a magnetic field – Magnetic deflection in CRT – Combined electric and Magnetic Field.

Unit II: Theory of PN Diodes


Unit III: Theory of Junction Transistors

Moll equation – static characteristics of transistors (CE, CB, CC) – comparison of transistor configuration.

**Unit IV: Theory of FET, UJT and SCR**

**Unit V: Special Semiconductor Devices**

**Text Books**

**Reference Books**

**EC284 DIGITAL ELECTRONICS**

**Credit : 3:1:0**

**Unit I : Number Systems & Boolean Algebra**

**Unit II : Combinational Logic Design**

**Unit III :Counters & Registers**

**Unit IV: Synchronous Sequential Logic Design**
Basic models of sequential machines – concept of state table – state diagram – state reduction through partitioning & implementation of synchronous sequential circuits

**Unit V: Digital Logic Families**
LOGIC FAMILIES: RTL, DTL, TTL families, schottky – clamped TTL, Emitter Coupled (ECL), Integrated Injection Logic (IIL), MOS inverters, CMOS inverters, comparison of performance of various logic families.

**Text Book**

**Reference Books**

**EC285 SIGNALS AND SYSTEMS**

**Credit: 3:1:0**

**Unit I: Introduction**
Continuous Time (CT) signals – CT signal operations – Discrete Time(DT) signals – Representation of DT signals by impulses – DT signal operations – CT and DT systems – Properties of the systems – Linear Time Invariant(LTI) and Linear Shift Invariant(LSI) systems – Continuous and Discrete Convolutions – CT system representations by differential equations – DT System representations by difference equations.

**Unit II: Fourier Analysis of Ct Signals and Systems**

**Unit III: Sampling and Laplace Transform**

**Unit IV: Fourier Analysis of DT Signals and Systems**

Unit V: Transform Operations of DT Signals and Systems

Text Books

Reference Books

EC286 RADAR AND NAVIGATIONAL AIDS
Credit: 4:0:0

Unit I: Radar Equation
Radar block diagram and operation - Radar frequencies - Radar range equation - Prediction of range performance - Minimum detectable signal - Radar cross section of targets - cross section fluctuations - Transmitter power - Pulse repetition frequency and range ambiguities - system loss and propagation effects

Unit II: CW and FM CW Radar
Doppler Effect CW radar- Basic principle and operation of FMCW radar - MTI and pulse Doppler line cancellers - Range gated Doppler filter - Non Coherent MTI - Pulse Doppler radar - Tracking radars - sequential lobing - Conical scan and simultaneous lobing monopulse

Unit III: Synthetic Aperture and Air Surveillance Radar
Synthetic aperture radar - resolution; Radar equation, SAR signal processing- Inverse SAR, Air surveillance radar- User's requirements- Characteristics and frequency consideration. ECCM and BIOSTATIC RADAR: Electronic counter - Counter measures- bistatic radar- Description bistatic radar equation - Comparison of monostatic radars.

Unit IV: Radar Signal Detection and Propagation on Waves
Detection Criteria ; Automatic detection : constant false alarm rate receiver. Information available from a radar; Ambiguity diagram; Pulse Compression. Propagation over plane
earth; Anomalous propagation and diffraction. Introduction to clutter, surface clutter, Radar equation

**Unit V: Radio Navigation**
Adcock directional finder- automatic Directional finder- VHF omni directional range-
Hyperbolic systems of navigation - Loren and Decca Navigation system" Tactical air
navigation ILS and GCA as aids to approach and landing

**Text Book**
   2003

**Reference Books**

**EC287 SPEECH PROCESSING**

**Credit: 4:0:0**

**Unit I: Nature of Speech Signal**
Speech production mechanism- Classification of speech- sounds- nature of speech signal-
models of speech production. Speech signal processing : purpose of speech processing-
digital models for speech signal- Digital processing of speech signals- Significance- short
time analysis.

**Unit II: Time Domain Methods for Speech Processing**
Time domain parameters of speech- methods for extracting the parameters- Zero crossing-
Auto correlation functions - pitch estimation.

**Unit III: Frequency Domain Methods for Speech Processing**
Short time Fourier analysis- filter bank analysis- spectrographic analysis- Format extraction-
pitch extraction- Analysis – synthesis systems.

**Unit IV: Linear Predictive Coding of Speech**
Formulation of linear prediction problem in time domain- solution of normal equations-
interpretation of linear prediction in auto correlation and spectral domains.

**Unit V: Homomorphic Speech Analysis**
Central analysis of speech- format and pitch estimation- Applications of speech processing -
Speech recognition- Speech synthesis and speaker verification.

**Text Book**
   perception of speech and music,” John Wiley & Sons, 2000

**Reference Books**

**EC360 DIGITAL SIGNAL PROCESSOR ARCHITECTURES AND APPLICATIONS**

**Credit: 4:0:0**

**Unit I: Introduction to DSP Processors**
Difference between DSP and other Microprocessor Architectures- Their Comparison- Need for Special ASPs- RISC Vs CISC- Overview of Various DSP Architectures

**Unit II: Fixed Point DSP’s**
Architecture of TMS320C5X & C54X Processors- Assembly Instructions- Addressing Modes- Pipelining and Peripherals

**Unit III: Floating Point DSP’s**
Architecture of TMS320C3X- Instruction Set- Addressing Modes- Data Formats- Floating Point Operation- Pipelining and Peripherals

**Unit IV: DSP Interfacing and Development Tools**

**Unit V: Overview of Other DSP’s and Applications**

**Text Book**

**Reference Books**

**EC361 MODELLING OF DIGITAL SYSTEM DESIGN USING HDL**

**Credit: 4:0:0**

**Unit I: Introduction to Advanced Digital System Design**
Minimization of Boolean expression- K-Map- Quine McClusky method- Combinational Circuits- Sequential Circuits- Design of CLC- Multiple output minimization- Design of static hazard free and dynamic hazard free logic circuits- Programmable logic primer : PLA- PAL – PLDs- Programmable Gate Arrays. FPGAs : Xilinx 3000 series and 4000 series- Altera complex programmable logic devices (CPLDs)- Altera flex 10k series CPLDs.

Unit II: Sequential & Asynchronous Circuit Design

Unit III: Symmetric Functions
Elementary symmetric functions - Partially symmetric and totally symmetric functions - Mc Cluskey de-composition method - Synthesis of symmetric function by contact networks.

Unit IV: Introduction to VHDL

Unit V: Introduction to Verilog

Text Books

Reference Books
EC362 ANALYSIS AND DESIGN OF ANALOG INTEGRATED CIRCUITS

Credit: 4:0:0

Unit I: Models for Integrated Circuit Active Devices

Unit II: Circuit Configuration for Linear Ic
Current sources- Analysis of difference amplifiers with active load using BJT and FET- supply and temperature independent biasing techniques- voltage references- Output stages: Emitter follower- source follower and Push pull output stages.

Unit III: Operational Amplifiers
Analysis of operational amplifiers circuit- slew rate model and high frequency analysis- Frequency response of integrated circuits: Single stage and multistage amplifiers- Operational amplifier noise

Unit IV: Analog Multiplier and PLL
Analysis of four quadrant and variable trans conductance multiplier- voltage controlled oscillator- closed loop analysis of PLL- Monolithic PLL design in integrated circuits: Sources of noise- Noise models of Integrated-circuit Components – Circuit Noise Calculations – Equivalent Input Noise Generators – Noise Bandwidth – Noise Figure and Noise Temperature

Unit V: Analog Design with MOS Technology
MOS Current Mirrors – Simple- Cascode- Wilson and Widlar current source – CMOS Class AB output stages – Two stage MOS Operational Amplifiers- with Cascode- MOS Telescopic-Cascode Operational Amplifier – MOS Folded Cascode and MOS Active Cascode Operational Amplifiers

Text Books

Reference Books
EC363 COMPUTER AIDED VLSI DESIGN

Credit: 4:0:0

Unit I: Introduction to Data Structure and Basic Algorithms
Introduction to VLSI Methodologies- A quick tour of VLSI Design Automation Tools -Data structures and Basic Algorithms- Algorithmic graph theory and computational complexity.

Unit II: Placement & Partitioning
Tractable and Intractable problems-Placement and Partitioning- Circuit representation - Placement algorithms – partitioning

Unit III: Floorplanning & Routing
Floorplanning concepts - shape functions and floorplan sizing - Types of local routing problems - Area routing - channel routing - global routing - algorithms for global routing.

Unit IV: Simulation & Synthesis

Unit V: Compaction & FPGAs and MCMs
Layout Compaction - Design rules - problem formulation - Physical Design Automation of FPGAs – MCMs

Text Book

Reference Books

EC364 EMBEDDED SYSTEM DESIGN

Credits: 4: 0: 0

Unit I: Embedded Architecture
Embedded Computers- Characteristics of Embedded Computing Applications- Challenges in Embedded Computing system design- Embedded system design process- Requirements-Specification- Architectural Design- Designing Hardware and Software Components-System Integration- Formalism for System Design- Structural Description- Behavioral Description- Design Example: Model Train Controller

Unit II: Embedded Processor and Computing Platform
ARM processor- processor and memory organization- Data operations- Flow of Control-

Unit III: Networks
Distributed Embedded Architecture- Hardware and Software Architectures- Networks for embedded systems- I2C- CAN Bus- SHARC link ports- Ethernet- Myrinet- Internet-Network-Based design- Communication Analysis- system performance Analysis- Hardware platform design- Allocation and scheduling- Design Example: Elevator Controller.

Unit IV: Real Time Characteristics

Unit V: System Design Techniques

Text Book

Reference Books

EC365 ANALOG VLSI DESIGN
Credit: 4:0:0

Unit I: Introduction to Analog VLSI and Basic CMOS Circuit Techniques
Introduction to Analog VLSI: VLSI Microelectronics- Mixed-Signal VLSI chips- Potential of Analog VLSI. Basic CMOS circuit Techniques: MOS Models- Current Division Technique- Basic Gain Stage- Limitations- Gain-Boosting Technique- Super MOS Transistor

Unit II: Device Modelling
Unit III: Analog Systems

Unit IV: Design Automation and Verification

Unit V: Bicmos Circuit Techniques and Current-Mode Signal Processing

Text Book

Reference Books

EC366 HIGH PERFORMANCE COMMUNICATION NETWORKS
Credits: 4:0:0

Unit I: Basics of Networks
Telephone- computer- Cable television and Wireless network- networking principles- Digitalization: Service integration- network services and layered architecture- traffic characterization and QOS- networks services: network elements and network mechanisms

Unit II: Packet Switched Networks
OSI and IP models: Ethernet (IEEE 802.3); token ring (IEEE 802.5)-FDDI-DQDB- frame relay-; SMDS: Internet working with SMDS

Unit III: Internet and TCP/IP Networks
Overview:internet protocol; TCP and VDP; performance of TCP/IP networks circuit switched networks:SONET;DWDM-Fibre to home-DSL.Intelligent networks-CATV.
Unit IV: ATM and Wireless Networks
Main features-addressing-signalling and routing; ATM header structure-adaptation layer-management and control; BISDN; Internetworking with ATM-Wireless channel-link level design-channel access; Network design and wireless networks-wireless network standard-IEEE 802.11

Unit V: Optical Networks and Switching
Optical links-WDM systems-cross-connects-optical LAN's-optical paths and networks; TDS and SDS: modular switch designs-Packet switching-distributed-shared-input and output buffers.-Optical network standards-IEEE 802 LAN/MAN

Text Book

Reference Books

EC367 ANALYSIS AND DESIGN OF ANALOG INTEGRATED CIRCUITS

Credit: 4: 0: 0

Unit I: Circuit Configuration for Linear IC
Current sources-analysis of difference amplifiers with active load-supply and temperature independent biasing techniques-voltage references.

Unit II: Operational Amplifiers
Analysis of Operational amplifier circuits-slew rate model and high frequency analysis-operational amplifier noise analysis and low noise operational amplifiers.

Unit III: Analog Multiplier and PLL
Analysis of four quadrant and variable transconductance multiplier-voltage controlled oscillator-closed loop analysis of PLL.

Unit IV: MOS Analog ICs
Design of MOS Operational Amplifier-CMOS voltage references-MOS Power amplifier and analog switches.

Unit V: MOS Switched Capacitor Filters
Design techniques for switched capacitor filter-CMOS switched capacitor filters-MOS integrated active RC Filters.
Text Book

Reference Books

EC368 SOFT COMPUTING

Unit I: Artificial Neural Networks

Unit II: Fuzzy Systems

Unit III: Neuro – Fuzzy Modeling

Unit IV: Genetic Algorithms

Unit V: Applications

Text Books

Reference Books
EC369 MODERN DIGITAL COMMUNICATION TECHNIQUES

Credit: 4: 0: 0

Unit I: Coherent and Non-Coherent Communication

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; Hammning; Golay; Cyclic; BCH ; Reed – Solomon codes.

Unit IV: Convolutional Coded Digital Communication

Unit V: Spread Spectrum Signals for Digital Communication

Text Book

Reference Books

EC370 ADVANCED VLSI DESIGN
Credits: 4: 0: 0

Unit I: Overview of VLSI Design Technology

Unit II: VLSI Fabrication Technology

Unit III: MOS and CMOS Circuit Design Process

Unit IV: Subsystem Design

Unit V: Sequential Circuits

Text Books

Reference Books

EC371 APPLIED ELECTRONICS LAB – I
Credits: 0:0:2

10 Experiments will be notified by the HOD from time to time

EC372 APPLIED ELECTRONICS LAB - II
10 Experiments will be notified by the HOD from time to time.

EC374 WAVELET TRANSFORMS AND APPLICATIONS

Credits: 4:0:0

Unit I : Mathematical Preliminaries

Unit II : Multiresolution Analysis
Definition of Multi Resolution Analysis (MRA) – Haar basis - Construction of general orthonormal MRA-Wavelet basis– Continuous time MRA interpretation for the DTWT – Discrete time MRA- Basis functions for the DTWT – PR-QMF filter banks.

Unit III : Continuous Wavelet Transform
Wavelet Transform - definition and properties - concept of scale and its relation with frequency - Continuous Wavelet Transform (CWT) - Scaling function and wavelet functions (Daubechies, Coiflet, Mexican Hat, Sinc, Gaussian, Bi- Orthogonal) - Tiling of time -scale plane for CWT.

Unit IV : Discrete Wavelet Transform

Unit V : Applications

Text Book

Reference Books
EC375 GLOBAL TRACKING AND POSITIONING SYSTEMS

Credits: 4:0:0

Unit I : Introduction
Satellites-Introduction to Tracking and GPS System-Applications of Satellite and GPS for 3D position-Velocity-determination as function of time-Interdisciplinary applications(eg.-Crystal dynamics-gravity field mapping-reference frame-atmospheric occultation)Basic concepts ofGPS.Space segment-Control segment-user segment-History of GPS constellation-GPS measurement characteristics-selective availability(AS)-antispoofing(AS).

Unit II: Orbits and Reference Systems
Basics of Satellite orbits and reference systems-Two-body problem-orbit elements-time system and time transfer using GPS-coordinate systems-GPS Orbit design-orbit determination problem-tracking networks-GPS force and measurement models for orbit determination-orbit broadcast ephemeris-precise GPS ephemeris.Tracking problems

Unit III GPS Measurements
GPS Observable-Measurement types(C/A Code-P-code-L1 and L2 frequencies for navigation-pseudo ranges)-atmospheric delays(tropospheric and ionospheric)-data format(RINEX)-data combination(narrow/wide lane combinations-ionosphere-free combinations-single-double-triple differences)-undifferenced models-carrier phase Vs Intergrated Doppler-integer biases-cycle slips-clock error

Unit IV: Processing Techniques
GPS Observable-Measurement types(C/A Code-P-code-L1 and L2 frequencies for navigation-pseudo ranges)-atmospheric delays(tropospheric and ionospheric)-data format(RINEX)-data combination(narrow/wide lane combinations-ionosphere-free combinations-single-double-triple differences)-undifferenced models-carrier phase Vs Intergrated Doppler-integer biases-cycle slips-clock error

Unit V : GPS Applications

Text Book

Reference Books
## ADDITIONAL SUBJECTS

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EC288 SOLID STATE CIRCUITS

UNIT I : Rectifiers and Filters

UNIT II : Transistor And FET Biasing
Transistor Biasing: Location of the Q point – Fixed bias circuit – Collector to base circuit – Self bias circuit – Graphical DC bias analysis – Design of DC bias circuit.
FET biasing - Self biasing – Voltage feedback biasing.

UNIT III : Amplifiers

UNIT IV : Feedback Amplifiers & DC Amplifiers

UNIT V : Oscillators And Tuned Amplifiers

TEXT BOOKS

REFERENCE BOOKS

EC289 PULSE AND WAVE SHAPING CIRCUITS

Credits: 4 : 0 : 0

Unit I : Linear Wave Shaping Circuits
High pass and low pass RC circuits – response for step, pulse, square wave, ramp and exponential signals as input – High pass circuit as a differentiator – low pass circuit as an...

**UNIT II : Bistable And Schmitt Trigger Circuits**

**UNIT III : Monostable And Astable Circuits**

**UNIT IV : Voltage And Current Time Base Generators**

**UNIT V : Blocking Oscillator Circuits And Sampling Gates**

**TEXT BOOKS**

**REFERENCE BOOKS**

**EC290 INFORMATION THEORY AND CODING**

Credits: 4 : 0 : 0

**UNIT I: INFORMATION ENTROPY FUNDAMENTALS**

**UNIT II:DATA AND VOICE CODING**

UNIT III: ERROR CONTROL CODING

UNIT IV: COMPRESSION TECHNIQUES

UNIT V: AUDIO AND VIDEO CODING

TEXT BOOKS

REFERENCE BOOKS

09EC201 FUNDAMENTALS OF SIGNALS AND SYSTEMS

Credits: 3:0:0
Objective:
It covers the fundamentals of continuous-time and discrete-time signals as well as systems. It covers Fourier analysis of signals and systems.

Outcome:
The concepts studied can be applied to real-time signal processing.

UNIT I
Signals and Systems
Continuous Time (CT) signals – CT signal operations – Representation of CT signals by samples – Sampling Theorem, Discrete Time (DT) signals – Representation of DT signals by impulses – DT signal operations – CT and DT systems – Properties of the systems

UNIT II
Linear Time Invariant Systems
Introduction – Discrete Time LTI systems: Convolution sum – Continuous Time LTI systems: Convolution Integral – Properties of Linear Time-Invariant systems – Causal LTI systems described by differential and difference equations

UNIT III
Fourier analysis of CT Signals and Systems

UNIT IV
Fourier analysis of DT Signals and Systems

UNIT V
Transform Operations of DT Signals and Systems

TEXT BOOKS

REFERENCE BOOK

09EC202 NEURAL NETWORKS

Credits: 3:0:0

Objective
This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward Networks. Also deals with Associate Memories. This subject is very important and useful for doing Project Work.

Outcome
On successful completion of this course, the student should be able to understand the following things:
Basic neuron models: McCulloch-Pitts model, nearest neighbor model etc.
Basic neural network models: multilayer perceptron, nearest neighbor based multilayer perceptron, associative memory, etc.
Basic learning algorithms: the back propagation algorithm, Hebbian algorithm etc.

UNIT I
Introduction to Neural Networks

UNIT II
Essentials of Artificial Neural Networks

UNIT III
Single Layer Feed Forward Neural Networks

UNIT IV
Multilayer Feed forward Neural Networks

UNIT V
Associative Memories

TEXT BOOK

REFERENCE BOOKS
09EC203 MICROPROCESSORS AND INTERFACING

Credits: 3:0:0

Objective:
To impart basic concepts of microprocessor 8 bit (8085), 16 bit (8086), interfacing devices, programmable peripheral devices and applications.

Outcome:
Geared to engineers who work microprocessors, the microprocessor program emphasizes operations, maintenance and troubleshooting.

UNIT I
8085 Microprocessor
Organization of 8085 microprocessor – Instruction set-Addressing modes- Assembly language programming

UNIT II
8086 Microprocessor
Organization of 8086 microprocessor – memory segmentation -Address modes in 8086 – Assembly language programming – minimum mode and maximum mode

UNIT III
Microprocessor Interfacing Techniques
8255 Programmable Peripheral Interface (PPI) - 8251A Programmable communication interface -DMA -8237 Programmable DMA controller.

UNIT IV
Programmable Peripheral Devices
8259A Programmable interrupt controller - 8279 Programmable Keyboard/display interface - 8253 programmable interval timer

UNIT V
Applications

TEXT BOOKS

REFERENCE BOOKS
4. Rafiquzzaman M., "Microprocessor Theory And Applications-Intel And Motorola", PHI, 2002

**09EC204 COMMUNICATION ENGINEERING**

**Credits:** 3:0:0  
**Objective:**  
To introduce the basic concepts of Digital Communication modulation to baseband signals, fundamental concepts in Mobile communication, Satellite Communication and Optical communication.  
**Outcome:**  
It will help to enable the student to become familiar with different types of communications services.

**UNIT I**  
**Introduction**  
Need for wireless transmission and modulation – Concept of baseband and bandwidth – Multichannel Transmission-Modulation of AM signals-Demodulation of AM signals-Modulation of FM signals-  

**UNIT II**  
**Digital Communication**  
Review of Sampling Theorem, PAM and TDMA Principles, Quantization, PCM, DPCM and Delta Modulation-Adaptive Delta Modulation

**UNIT III**  
**Mobile Communication Systems**  
Cellular engineering concepts– Frequency Reuse- Channel Assignment, Co-channel interference and Handoff-GSM Architecture.

**UNIT IV**  
**Elements of Satellite Communication**  
Satellite systems, Orbital description and Orbital mechanics of LEO, MEO and GEO, Placement of a satellite in a GSO, Satellite – description of different Communication Subsystems, Bandwidth allocation.

**UNIT V**  
**Optical Communication**  
Overview of optical communication - Need for optical communication – Comparison with the electrical communication - Snell’s law – Critical angle – Acceptance angle – Numerical Aperture. Types of fibers: Step and Graded index fibers. Wave propagation in multi mode and single mode optical fibers – Attenuation – dispersion – Polarization.

**TEXT BOOK**

REFERENCE BOOKS


09EC205 ELECTRON DEVICES AND CIRCUITS

Credits: 3:0:0

Objective
To learn the operation and characteristics of various semiconductor devices

Outcome
Able to design electronic application circuits.

UNIT I
Theory of Semiconductors

UNIT II
Theory of PN Junction and BJT

UNIT III
Special Semiconductor Devices (Qualitative Treatment Only)

UNIT IV
Design of DC Power Supply

UNIT V
Amplifiers and Feedback Amplifiers
TEXT BOOKS

09EC206 INTRODUCTION TO DIGITAL SIGNAL PROCESSING

Credits: 3:0:0

OBJECTIVES
To study DFT and its computation
To study the design techniques for digital filters
To study the finite word length effects in signal processing
To study the fundamentals of digital signal processors

OUT COME
One can able to apply the concepts (studied in this course) in the field of Digital signal processing.

UNIT I
Introduction to DSP and Fourier Transform
Review of Discrete Time LTI Systems – Linear, circular and sectioned convolutions - DFS, DTFT, DFT – FFT computations using DIT and DIF algorithms

UNIT II
Infinite Impulse Response Digital Filters
Review of classical analog filters-Butterworth, Chebyshev and Elliptic filters–
Transformation of analog filters into equivalent digital filters using impulse invariant method and Bilinear transform method–Realization stuctures of IIR filters-Direct, cascade, parallel forms

UNIT III
Finite Impulse Response Digital Filters

UNIT IV
Finite Word Length Effects
UNIT V
Digital Signal Processors
Introduction to general and special purpose hardware for DSP – Harvard architecture – Dedicated MAC unit - Multiple ALUs, Advanced addressing modes - pipelining-Special instruction-Replication-Hardware digital filter – Overview of Texas Instruments TMS320C5X – Instruction set of TMS320C5X – Simple programs.

TEXT BOOKS

REFERENCE BOOKS
4. Texas Instruments Manual for TMS320C5416 Processor

09EC207 OPTO ELECTRONIC DEVICES

Credits: 3:0:0

Objective
To learn different types of optical emission, detection, modulation and opto electronic integrated circuits and their applications.

Outcome:
To know the basics of solid state physics and understand the nature and characteristics of light.
To understand different methods of luminescence, display devices and laser types and their applications.
To learn the principle of optical detection mechanism in different detection devices.
To understand different light modulation techniques and the concepts and applications of optical switching.
To study the integration process and application of opto electronic integrated circuits in transmitters and receivers.

UNIT I
Elements Of Light And Solid State Physics

UNIT II
Display Devices And Lasers

UNIT III
Optical Detection Devices
Photo detector - Thermal detector - Photo Devices - Photo Conductors - Photo diodes - Detector Performance.

UNIT IV
Optoelectronic Modulator

UNIT V
Optoelectronic Integrated Circuits

TEXT BOOK

REFERENCE BOOKS

09EC208 DIGITAL IMAGE PROCESSING

Credits: 3:0:0
Objective:
To learn the fundamental concepts of Image processing techniques
Outcome:
Can develop simple algorithms for image processing.

UNIT I
Introduction
Fundamental steps and applications of digital image processing – Elements of visual perception – Image sensing and acquisition – Image sampling and quantization - Basic relationship between pixels – 2D DFT and its properties – Computing inverse Fourier transform - Need for padding – Convolution and correlation
UNIT II
**Image Enhancement**
Basic gray level transformations – Histogram Equalization and matching – Arithmetic and logic operations – Spatial averaging – Directional smoothing – Median filtering – Unsharp masking – Gradient and Laplacian operators - Zooming - Smoothing and sharpening frequency domain filters – Homomorphic filtering

UNIT III
**Image Restoration & Color image Processing**
Image degradation/restoration model – Restoration in the presence of noise only spatial filtering – Periodic noise reduction by frequency domain filtering - Inverse and Wiener filtering concept – Color models – Pseudocolor image processing – Color transformations – Smoothing and sharpening

UNIT IV
**Image Compression**

UNIT V
**Image Segmentation**
Detection of discontinuities – Edge linking based on local processing and Hough transform – Thresholding: local, global, Adaptive and multispectral – Region based segmentation

**TEXT BOOK**

**REFERENCE BOOKS**

**09EC209 BASIC VLSI DESIGN**

**Credits: 3 : 0 : 0**

**Objective**
The purpose of this course is to give an exposure to the standard algorithms for VLSI Physical design Automation.

**Outcome**
Introduction to VLSI Design Automation Tools
Placement and Routing Algorithms
Floor Planning Algorithms
Simulation and Logic Synthesis Concepts
High Level Synthesis

**UNIT I**
Overview of VLSI Design Methodology

UNIT II
Layout Design

UNIT III
Design of System

UNIT IV
Tools for Design
Grounds rules for successful design – design styles & philosophy – CAD tools for design & simulation: textual entry layout language – graphical entry layout – design verification – design rule checkers – simulators – tests & testability

UNIT V
CMOS Design Projects & Fast VLSI Circuits

TEXT BOOK

REFERENCE BOOK

09EC210 DIGITAL DESIGN USING VHDL
Credits: 3 : 0 : 0

Objective:
To know about the various flow of VHDL and the programming technologies.

Outcome
Knowledge in VHDL Programming and Programmable devices will be obtained

UNIT I
Programmable Logic Devices
Introduction - Programming Technologies - Programmable Read only Memory (PROM or PLE) - Programmable Logic Array (PLA) - Programmable Array Logic (PAL). System Design using PLD’s: Design of Combinational and Sequential circuits using PLD’s -

UNIT II
Programmed Logic

UNIT III
FPGA And CPLD
Semi custom and full custom IC design- Xilinx XC3000 series, Xilinx XC4000 series -Logic cell Array (LCA)-Configurable Logic block (CLB) - Input and output block (IOB) – Programmable Interconnection Point (PIP) – structure of PLD and Complex PLD – Altera 7000 series – Introduction to ACT2 family.

UNIT IV
Introduction to VHDL

UNIT V
Data Flow, Behavioral and Structural Modeling
Concurrent signal assignment – conditional signal assignment – selected signal assignment – concurrent and sequential statements – Data flow, Behavioral and Structural Modeling - Test bench

TEXT BOOKS

REFERENCE BOOKS

09EC211 MICROCONTROLLERS AND ITS APPLICATIONS
Credits: 3:0:0

Karunya University
Objective:
To learn about the basics of PIC Interfacing and ARM Processor.

Outcome:
On successful completion of the subject, students can able to write the assembly language coding for Various application in Linux Environment.

UNIT 1: Introduction to PIC Microcontroller:
Overview of PIC18 MCU – Architecture - PIC18 Memory Organization- CPU Registers – Pipelining- Instruction Format- Addressing Modes- Instruction Sets.

UNIT 2: PIC Interfacing:

UNIT 3: ARM Processor Fundamentals:

UNIT 4: Introduction to the ARM and Thumb Instruction Set:

UNIT 5: Exception and Interrupt Handling:
Interrupts - Interrupt Handling Schemes - Non-nested Interrupt Handler - Nested Interrupt Handler - Reentrant Interrupt Handler - Prioritized Simple Interrupt Handler - Prioritized Standard Interrupt Handler

TEXT BOOKS

REFERENCE BOOK

09EC212 EMBEDDED SYSTEMS

Credits: 3: 0: 0

Objective
To learn about Real time Embedded system, Programming languages and tools

Outcome
The student can able to do embedded projects

UNIT I
Introduction to Embedded Systems
An Embedded System – Processor in the System – Other hardware units – Software embedded into a System – Exemplary Embedded Systems - Embedded System On Chip and in VLSI circuit

UNIT II
Real Time Systems

UNIT III
Real Time Operating Systems
Task and Task States, tasks and data, semaphores and shared Data Operating system Services- Application of Semaphores -Message queues-Timer Function-Events – Memory management

UNIT IV
Programming Languages and Tools
Language features-Programming environments-Introduction to-assembler-compiler-cross compilers and Integrated Development Environment (IDE). Simulators, Emulators-

UNIT V
Programming Concepts and Embedded Programming in C and C++
Software programming in Assembly Language and in High level language – C Program Elements – Queues – Stacks – lists and ordered lists – Embedded programming in C++

TEXT BOOKS

REFERENCE BOOKS

09EC213 NEURAL NETWORKS AND FUZZY SYSTEMS
Credits: 3:0:0
OBJECTIVE
To learn the fundamentals of soft computing techniques
OUTCOME
Able to solve the simple practical problems in an efficient manner

UNIT I
Fundamentals of Artificial Neural Network

UNIT II
Neural Nets for Pattern Classification & Pattern Association

UNIT III
Neural Nets for Clustering

UNIT IV
Fundamentals of Fuzzy Logic
Fuzzy sets - Fuzzy Relations - Fuzzy Equivalence Relations - Membership functions - Defuzzification methods - Rule based systems.

UNIT V
Fuzzy Logic Applications
Fuzzy classification - Fuzzy Pattern Recognition - Fuzzy Control systems - Fuzzy optimization.

TEXT BOOKS

REFERENCE BOOKS

09EC214 DIGITAL INTEGRATED CIRCUITS
Credits: 3:0:0
Objective
To learn the fundamentals of Digital Design concepts
Outcome
Able to design simple digital application circuits.

UNIT I
Number Systems

UNIT II
Logic Circuits Analysis And Design

UNIT III
Digital ICs
TTL circuits and CMOS circuits - 7400 devices - TTL parameters - AND-OR-invert gate - open collector gates - Three state TTL devices - External drive for TTL loads - positive and negative logic - CMOS Circuits: E-type MOSFET - MOS inverter - 74C00 CMOS characteristics - TTL-CMOS interface - TTL clock.

UNIT IV
Flip flops
RS, JK and D Flip-flops - Schmitt trigger - Types of shift register - synchronous and asynchronous counter.

UNIT V
Memories
Semiconductors Memories: Memory Addressing - ROMs, PROMs, EPROMs, RAMs - DRAMs, memory cells. (In all the five units, trouble-shooting section not included)

TEXT BOOK

REFERENCE BOOK

09EC215 SATELLITE COMMUNICATION
Credits: 3:0:0
Objective:
To introduce the basic concepts of satellite communication.
Outcome:
The students will be equipped to design simple transmitter and receiver circuits.

UNIT I
Orbit and Description
Kepler’s laws - Orbital period and velocity – Azimuth and elevation - Placement of satellite in a geo-stationary orbit – satellite description – transponder subsystem – Telemetry, Command and ranging subsystem – Attitude control and electrical power.

UNIT II
Earth Station

UNIT III
Interference
Basic link analysis – Interference analysis – Carrier to noise plus interference ratio – Terrestrial interference – Cross polarization interference – Adjacent channel and inter symbol interference – Rain induced cross polarization interference.

UNIT IV
Multiple Access Techniques
Frequency Division multiple access (FDMA) – Time division multiple access (TDMA) and code division multiple access (CDMA) – Performance comparison of various multiple access schemes.

UNIT V
Applications and Services
Mobile satellite (MSAT) networks – Low orbital satellites – Domestic satellite systems-the INSAT System-International systems-INTELSAT

TEXT BOOKS

REFERENCE BOOKS

09EC216 DIGITAL INTEGRATED CIRCUITS LAB

Credits: 0:0:2

12 Experiments will be notified by HOD from time to time
1. Study of logic gates
2. Multiplexer and Demultiplexer
3. Encoder and Decoder
4. Adder and Subtractor
5. Design of counter
6. Design of Flip flops
7. Frequency response of Inverting & Non inverting amplifier
8. Measurement of op-amp parameters
9. Design of adder and Subtractor
10. Design of Schmitt trigger using op-amp
11. Design of Integrator & Differentiator
12. Design of Digital to Analog converter
13. Design of Astable multivibrator using op-amp

**09EC217 MICROPROCESSOR AND INTERFACING LAB**

**Credits: 0:0:2**

1. Arithmetic operations of 8085
2. Sorting of n-number
3. Searching of n
4. Block transfer
5. Arithmetic operations of 8086
6. Square wave generation
7. Serial communication
8. Analog to digital Converter
9. Digital to Analog Converter
10. Stepper motor
11. DC motor
12. 7 segment display

**09EC218 BASIC ELECTRONICS**

**Credits: 3:0:0**

**Objective:** To know the basics about semiconductor, integrated circuits and communication system.

**Outcome:** Students will get overview about the basics of electronics.

**UNIT I**

**Introduction to Semiconductor**

Covalent bond – N type & P type semiconductor – conduction in semiconductor – semiconductor devices : diode, transistor, FET, MOSFET, UJT.

**UNIT II**

**Integrated Circuits**

UNIT III
Digital Systems
Number system – Boolean algebra – logic gates – truth table - combinational circuit -4 x 1 multiplexer – 1 x 4 demultiplexer - digital computer principles.

UNIT IV
Communication
Basic block of communication system – need for modulation – Derivation of AM and FM signal - Amplitude and Frequency Modulation (Balanced modulator and varactor diode modulator)- Demodulation(AM diode detector and balanced slope detector.

UNIT V
Communication systems
Block diagram of AM and FM transmitter - Superheterodyne receiver – satellite communication – Fibre optic communication

TEXT BOOK


REFERENCE BOOKS

09EC219 ELECTRONICS AND MICROPROCESSOR LAB

Credits:0:0:1

Any 6 experiments

2. Characteristics of zener diode.
3. Study of Half -Wave and Full-Wave rectifier
4. Study of Bridge Rectifiers.
5. Transistors as a Switch and Amplifier
6. Operational amplifier Configurations: Adder, Integrators, and Current to Voltage
7. Converters.
8. Verifications of truth tables of logic gates AND, OR, NOT, NAND exclusive OR.
10. Sequential logic: Counters, Shift Registers with display devices.
11. Study of Microprocessor Kits.
12. Arithmetic operations on 8085.
14. Display Interface

09EC220 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

Credits: 3: 1: 0

OBJECTIVE
To get knowledge about IC fabrication and applications

OUTCOME
Students will be able to design circuits using ICs

UNIT I
Integrated Circuit Technology

UNIT II
OP-AMP Characteristics And Applications

UNIT III
Comparators And Signal Generators
Comparators - regenerative comparators - input output characteristics - astable multivibrator - Monostable multivibrator - Triangular wave- generators - RC-phaseshiftoscillator -Wein’s bridge oscillator.

Voltage Regulator
Series op amp regulator - IC voltage regulator -723 general purpose regulator - Switching Regulator.

UNIT IV
Active Filters, Timers And Multipliers
Low pass - High pass - Band pass and Band Reject filters – Butterworth - Chebychev filters - first and second order filters-switched capacitor filters.555 Timer functional diagram, monostable and astable operation - multiplier -application.

UNIT V
PLL, ADC And DAC
PLL- basic block diagram and operation - capture range and lock range simple applications of PLL - AM detection - FM detection and FSK demodulation. Weighted resistor DAC, R-2R and inverted R-2R DAC, monolithic DAC - Flash ADC - counter type ADC - successive approximation ADC - dual slope ADC - conversion times of typical ADC.

TEXT BOOK

REFERENCE BOOKS

09EC221 ELECTROMAGNETIC FIELDS

Credits: 3: 1:0

OBJECTIVE
To get knowledge about electric and magnetic fields

OUTCOME
Students can make use of electromagnetic field concepts in wave guide applications.

UNIT I
Static Electromagnetic Fields

UNIT II
Static Magnetic Field

UNIT III
Electric Field In Dielectrics

UNIT IV
Magnetic Field In Ferromagnetic Materials

UNIT V
Time Varying Electric And Magnetic Fields

TEXT BOOKS

REFERENCE BOOKS

09EC222 COMMUNICATION THEORY AND SYSTEMS
Credits: 4:0:0

OBJECTIVE
To get knowledge about various modulation techniques, transmitters, receivers

OUTCOME
Students can design communication circuits

UNIT I
Base Band Signals and Systems
Introduction, Definition of communication - Communication system block diagram – Need for wireless communication – Need for modulation – General definition of modulation – Types of modulation - General concepts about base band signal and bandwidth of signals.

UNIT II
Analog Modulation Techniques

UNIT III
Modulation and Demodulation Techniques
Amplitude Modulation: Introduction – generation of AM signal – low level and high level modulation – square law diode modulation – AM in amplifier circuits – suppressed carrier AM generation (Balanced Modulator, Ring Modulator, Product Modulator)

AM Demodulation: Square law detector, envelope (or) diode detector – distortion in diode detectors – synchronous demodulation.


FM Demodulation: Direct methods frequency demodulation (Travis detector, Balanced slope detector, Foster seeley discriminator, ratio detector, limiters), Indirect methods (Detection using PLL, zero crossing detector)

UNIT IV
AM & FM Transmitters and Receivers


UNIT V
Noise
Noise and Interference-Thermal and Shot noise-Signal to Noise ratio - Noise figure – Noise temperature. Noise in AM and FM: SSB-SC - calculation of output signal to noise ratio. DSBS calculation of output signal to noise ratio-figure of merit-frequency modulation-calculation of output signal to noise ratio-comparison of SNR with respect to AM and FM.

TEXT BOOKS

REFERENCE BOOKS

09EC223 MICROWAVE AND OPTICAL COMMUNICATION ENGINEERING

Credits 4: 0: 0

OBJECTIVE
To get knowledge about Microwave Devices

Karunya University
OUTCOME
Student knows more about Microwave and its propagation

UNIT I
Microwave Passive Devices

UNIT II
Microwave Vacuum Tube Devices

UNIT III
Microwave Solid State Devices and Measurement

UNIT IV
Optical Communication

UNIT V
Optical Transmitters and Receivers
TEXT BOOKS

REFERENCE BOOKS

09EC224 DIGITAL SIGNAL PROCESSING
Credits: 3:1:0

OBJECTIVE
To know more about digital signal processing concepts

OUTCOME
Students can make use of signal processing concepts in TMS processors

UNIT I
Introduction to DSP and Fourier Transform

UNIT II
Finite Impulse Response Digital Filters

UNIT III
Infinite Impulse Response Digital Filters
Realization stuctures of IIR filters-Direct,cascade,parallel forms

UNIT IV
FiniteWord Length Effects

UNIT V
Special Topics in DSP And DSP Processors

TEXT BOOK

REFERENCE BOOKS

09EC225 DIGITAL COMMUNICATION

Credits: 4:0:0

OBJECTIVE
To know more about digital communication concepts

OUTCOME
Students can use digital coding techniques in communication

UNIT I
Sampling And Bandlimited Signalling
Review of Sampling Theorem, PAM and TDMA Principles, Quantization, PCM, DPCM and Delta Modulation – International standard (CCITT, CEPT) Power Spectra of PAM signals -Inter symbol Interference - Ideal Nyquist channel - Raised cosine channels – Correlative coding and precoding.

UNIT II
Digital Modulation

UNIT III
Data Transmission – Detection and Estimation
UNIT IV
Information Theory and Coding
Discrete messages-amount of information-average information-entropy information rate- Shannon’s theorem-capacity of gaussian channel-bandwidth-S/N trade off-coding-parity check bit coding-block codes coding and decoding probability of error with coding- - Convolution codes – Cyclic codes.

UNIT V
Spread Spectrum Systems
Pseudo Noise sequences, generation and correlation properties - direct sequence spread spectrum systems - Frequency Hop systems - processing gain - antijam and multipath performance.

TEXT BOOKS


REFERENCE BOOKS


09EC226 ELECTRONICS AND COMMUNICATION LAB

Credits: 0:0:2

1. Amplitude modulation
2. Diode detection
3. Frequency modulation
4. Pre-emphasis and de-emphasis
5. Pulse amplitude modulation
6. IF amplifier
7. Attenuators
8. Equalizer
9. Pulse duration modulation
10. Study of sampling theorem
11. Monostable multivibrator
12. Astable multivibrator
13. Clippers and clampers

**09EC227 DIGITAL SIGNAL PROCESSING LAB**

Credits: 0:0:2

1. Waveform generation
2. Basic operations on dt-signals
3. Properties of discrete time system
4. Sampling rate conversion
5. Discrete convolution
6. Discrete fourier transform
7. Fast fourier transform
8. Analog butterworth filters
9. Analog chebyshev filters
10. Design of IIR filter
11. Design of FIR filter
   - Time domain response of IIR & FIR system
   - Frequency response of dt- systems

**09EC228 ADVANCED COMMUNICATION LAB**

Credits: 0:0:2

1. Modulation and Demodulation of PAM, PWM, PPM
2. Digital Modulation techniques
3. Pulse code modulation and demodulation
4. Delta modulation and demodulation
5. RF filters
6. RF tuned amplifier
7. Measurement of antenna resonance and VSWR
8. Inverse square law of propagation and verification of reciprocity theorem
9. Determination of characteristics impedance & dielectric constant of transmission line
10. Measurement of VSWR, Reflection coefficient & return loss of transmission line
11. Study of serial communication
12. Modulation using MATLAB
13. Study of GPS

**09EC229 LINEAR INTEGRATED CIRCUITS LAB**

Credits: 0:0:2

List of Experiments:

1. Measurement of op-amp parameters
2. Design of inverting and non-inverting amplifier
3. Design of adder and subtractor using op-amp
4. Design of integrator and differentiator using op-amp
5. Precision rectifiers using op-amp
6. Design of astable multivibrator using op-amp
7. Design of astable multivibrator using 555 Timer
8. Design of active filters using op-amp
9. Design of Weinbridge Oscillator
10. Design of Schmitt Trigger using op-amp
11. Design of Schmitt Trigger using 555 Timer
12. Design of Digital to Analog Converter

09EC230 DIGITAL ELECTRONICS LAB

Credits: 0:0:2

1. Realization of logic gates
2. Half adder & full adder
3. Half subtractor & full subtractor
4. Multiplexer & demultiplexer
5. Encoder & decoder
6. Odd and even parity generator and checker
7. Bed to excess three converter
8. Code conversion
9. Flip flops
10. Shift register
11. Counters
12. Comparator

09EC231 VLSI DESIGN LAB

Credits: 0:0:2

1. Design and simulation of half adder & full adder circuits
2. Design and simulation of JK flip flop
3. Design and simulation of D flip flop
4. Design and simulation of 4*1 multiplexer
5. Design and simulation of 2*4 decoder
6. Design and simulation of priority encoder
7. Design and simulation of shift registers
8. Design and simulation of counters
9. Design and simulation of memory units
10. Design and simulation of sequential logic circuits represented by mealy model
11. Design and testing of parity generators
12. Design and testing of 8-bit ALU
13. Design and testing of magnitude comparator
14. Design and simulation of half adder & full adder circuits using verilog
15. Design and simulation of logic gates using verilog
16. Design and simulation of clock generator/counter circuit using verilog

**09EC232 MICROPROCESSOR AND MICROCONTROLLER LAB**

**Credits: 0:0:2**

**Any 10 experiments.**
1) Programs involving Data Transfer instructions
2) Programs involving Arithmetic and Logical operations
3) Programs on Code conversions
4) Programs on finding largest/smallest number,
5) Programs on ascending/descending order.
6) Stepper motor Interfacing
7) DC Motor Interfacing
8) ADC Interfacing
9) Traffic Light Controller
10) DAC Interfacing
11) Serial Communication
12) Square wave generation.
13) Keyboard Display Interfacing

**09EC233 MICROPROCESSORS AND MICRO CONTROLLERS**

**Credits: 4:0:0**

**Objective**
To learn about the basics of microprocessors and microcontroller with applications.

**Outcome**
On successful completion of the subject, students can able to write the assembly language coding for various applications.

**UNIT I: 8085 Microprocessor**

**UNIT II: 8086 Microprocessor**
Organization of 8086 microprocessor – memory segmentation – Addressing bytes and Words – Address formation –Address modes in 8086 – Assembly language programming – Minimum mode and maximum mode

**UNIT III : Microprocessor Interfacing techniques:**
Programmable parallel ports-8255 PPI -8253 programmable interval timer.
8251A Programmable communication interface -8279 Programmable Keyboard/display interface- - 8259A Programmable interrupt controller-
UNIT IV: Microcontroller 8051
Organization of 8031 and 8051 microcontrollers – I/O ports-External memory –
– Interrupts – Instruction set – Addressing Modes – Assembly language programming,

UNIT V: Applications
Counter and Timers – Serial data input and output – Interrupts – simple applications - LCD,
Keyboard interfacing, ADC, Sensor interfacing and Signal conditioning,

TEXT BOOKS

1. Ramesh.S.Gaonkar “Microprocessor Architecture, Programming & Applications With

REFERENCE BOOKS


09EC234 COMPUTER COMMUNICATION

Credits: 4:0:0

OBJECTIVE:
To introduce the concept, terminologies, and technologies used in modern data communication
and computer networking.

OUTCOME
To introduce the students the functions of different layers.
To introduce IEEE standard employed in computer networking.
To make students to get familiarized with different protocols and network components.

UNIT I
Data Communications
Components – Direction of Data flow – networks – Components and Categories – types of

UNIT II
At Link Layer
LAN: Ethernet IEEE 802.3, IEEE 802.4, and IEEE 802.5 – IEEE 802.11–FDDI, SONET – Bridges.

UNIT III
Network Layer

UNIT IV
Transport Layer

UNIT V
Application Layer
Domain Name Space (DNS) – SMTP, FDP, HTTP, WWW – Security – Cryptography.

TEXT BOOK

REFERENCE BOOKS

09EC235 ELECTRONICS AND MICROPROCESSORS

Credits: 4:0:0

Objective
To learn about various semiconductor devices, transducer And measuring Instruments and microprocessors applications.

Outcome
On successful completion of the subject, students will be able to analyse basic electronic circuits and write simple microprocessor based programs.

UNIT I
**Review Of Semiconductor Devices-Electronics Circuits (Qualitative Study Only)**


**UNIT II**

**Transducer And Measuring Instruments (Qualitative Study Only)**

Classification-working principle of potentiometer, strain gauges, piezoelectric crystals, thermistors, photodiodes, phototransistors- Study of working principle (using block diagram of multimeters, digital voltmeters, signal generators, CRO)

**UNIT III**

**Digital Electronics**

Comparison between analog and digital systems-Number representation-Logic gates-Flip-flops- Registers, Counters, Multiplexers, Decoders, and Encoders-Half and full adders, Half and full subtractor.

**UNIT IV**

**Introduction to Microprocessor**

Block diagram of Microcomputer - Architecture of Intel 8085 - Instruction formats, Addressing methods- types of Instruction - Intel 8085 - Instruction set - Development of simple assembly language programs and examples.

**UNIT V**

**I/O Devices**

Memory and I/O devices and interfacing RAM, ROM, EPROM - Printers-I/O ports-Key boards- Asynchronous and synchronous data transfer schemes-interrupt driven data transfer- DMA data transfer-Simple applications of Microprocessors.

**TEXT BOOKS**


**REFERENCE BOOK**


**09EC236 WORKSHOP PRACTICE ON PCB DESIGN**

Credits: 0:0:2
List of experiments

1. Introduction to ORCAD tool
2. Design of circuit schematic & layout
3. Drilling
4. Etching
5. Soldering
6. Testing using CRO & Multimeter
7. Fitting of PCB board
8. Activity 1
9. Activity 2
10. Activity 3

09EC237 MICROWAVE AND OPTICAL COMMUNICATION LAB

Credits: 0:0:2

Any 10 experiments

1. Frequency And Wavelength Measurement
2. Impedance measurement
3. Mode characteristic of reflex klystron
4. Magic tee
5. Directional coupler
6. Characteristics of Gunn diode
7. Setting up of analog link
8. Setting up of digital link
9. Measurement of Numerical aperture of optical fiber
10. Study of losses in optical fiber
11. Characteristics of LED and PD
12. Time division multiplexing using optical link.

09EC238 ELECTRON DEVICES AND CIRCUITS LAB

Credits: 0:0:2

Any 12 experiments

1. Characteristic of PN diode
2. Characteristic of Zener diode
3. Characteristic of JFET
4. Characteristic of BJJ (CE configuration)
5. Characteristic of UJT
6. Design of HWR and FWR
7. Design of low pass & high pass circuit
8. Design of single state amplifier
9. Design of oscillator
10. Design of voltage regulator
11. Design of single tuned amplifier  
12. Verification of KCL and KVL  
13. Verification of superposition theorems  
14. Verification of thevenin theorem  
15. Design of differential amplifier

**09EC239 SOLID STATE CIRCUITS –I**

**Credits: 4: 0:0**

**Objective:** To know about transistor And FET biasing, amplifiers, oscillators and CMOS logic concepts

**Outcome:** Students can design amplifiers, filters and oscillators

**UNIT I**  
**Rectifier & Filters**  

**UNIT II**  
**Transistor And FET Biasing**  
Transistor Biasing: Location of the Q point – Fixed bias circuit – Collector to base circuit – Self bias circuit – Graphical DC bias analysis – Design of DC bias circuit. FET biasing: Self biasing – Voltage feedback biasing.

**UNIT III**  
**Amplifiers**  

**UNIT IV**  
**MOS Amplifier & Oscillators**  

**UNIT V**  
**CMOS Logic concepts**  
Logic concepts – Inverter characteristic-MOS inverter circuits-CMOS inverter analysis-Static CMOS logic gates-Dynamic logic-Pass transistor logic-Transmission gates

**TEXT BOOKS**  

REFERENCE BOOKS
M.TECH. PROGRAMME
09EC301 ADVANCED RADIATION SYSTEMS

Credits: 4:0:0

Objective:
To learn the fundamental of antenna radiation, different types of antenna and its design methodology.

Outcome:
Able to design any type of antenna

UNIT I
Concepts Of Radiation

UNIT II
Antenna Arrays.

UNIT III
Aperture Antennas

UNIT IV
Horn, Microstrip, Reflector Antennas.

UNIT V
Antenna Polarization.

TEXT BOOK

REFERENCE BOOKS
09EC302 MODERN DIGITAL COMMUNICATION TECHNIQUES

Credits: 4:0:0

OBJECTIVE
To learn the fundamental digital techniques for Communication

OUTCOME
Representation of Signal
Coding theory and Modulation
M ary signaling

UNIT I
Introduction

UNIT II
Modulation Techniques

UNIT III
M' ARY Modulation
M’ARY modulation - M ary PSK, QAM, FSK, - Comparison Power spectra QPSK, MSK, M ary - Bandwidth efficiency.

UNIT IV
Trellis Coded Modulation
Block Interleaving - Convolutional Interleaving - Concept of Turbo code - Turbo Encoder - Feedback Decoder - Trellis coded modulation - TCM Encoding and decoding - TCM example - Reed Solomon code - Performance over Burst Noise - Reed Solomon Encoding and Decoding.

UNIT V
Synchronization
Synchronization Introduction Receiver Synchronization - Frequency and Phase synchronization - Performance in Noise - Non linear loop analysis - Suppressed Carrier loops - Symbol synchronization - Open loop and Closed loop - CPM synchronization - Frame synchronization - Network synchronization - Open loop and closed loop transmitter synchronization.

TEXT BOOKS

3.

REFERENCE BOOKS

09EC303 OPTICAL FIBER COMMUNICATION

Credits: 4:0:0
Objective:
To learn various types of optical fibers, transmitter and receiver section, and fiber amplifiers

Outcome:
Able to establish an efficient optical link.

UNIT I
Fiber Optic Guides
Light wave generation systems, system components, optical fibers, SI, GI fibers, modes, Dispersion in fibers, limitations due to dispersion, Fiber loss, non linear effects. Dispersion shifted and Dispersion flattened fibers

UNIT II
Optical Transmitters And Receivers
Basic concepts, LED's structures spectral distribution, semiconductor lasers, gain coefficients, modes, SLM and STM operation, Transmitter design, Reciever PIN and APD diodes design, noise sensitivity and degradation, Receiver amplifier design.

UNIT III
Light Wave System
Coherent, homodyne and heterodyne keying formats, BER in synchronous- and asynchronous-receivers, sensitivity degradation, system performance, Multichannel, WDM, multiple access networks, WDM components, TDM, Subcarrier and Code division multiplexing.

UNIT IV
Amplifiers
Basic concepts, Semiconductor laser amplifiers, Raman - and Brillouin - fiber amplifiers, Erbium doped – fiber amplifiers, pumping phenomenon, LAN and cascaded in-line amplifiers.

UNIT V
Dispersion Compensation
Limitations, Post-and Pre-compensation techniques, Equalizing filters, fiber based gratings, Broad band compensation, soliton communication system, fiber soliton, Soliton based communication system design, High capacity and WDM soliton system.
TEXT BOOK

REFERENCE BOOKS

09EC304 COMMUNICATION NETWORK SECURITY

Credits: 4:0:0

Objective:
To learn about various network attacks.
To study about security mechanisms such as encryption algorithms and security services to recover the network from attacks.

Outcome:
The student learns to design a better internet security system to detect and correct security violations that involve in the transmission of information.

UNIT I
Conventional Encryption
Introduction, Conventional encryption model, Steganography, Data Encryption Standard, block cipher, Encryption algorithms, confidentiality, Key distribution.

UNIT II
Public Key Encryption And Hashing

UNIT III
IP Security

UNIT IV
Web Security
Web security requirement, secure sockets layer, transport layer security, secure electronic transaction, dual signature
UNIT V
System Security
Intruders, Viruses, Worms, firewall design, Trusted systems, antivirus techniques, digital Immune systems.

TEXT BOOKS:

REFERENCE BOOKS

09EC305 MULTIMEDIA COMPRESSION TECHNIQUES
Credits: 4:0:0

Objective:
To learn about the various compression techniques for audio signals, video signals and text data.

Outcome:
Able to understand the concept of requirement for memory space reduction
Able to develop efficient algorithms for compression

UNIT I
Introduction

UNIT II
Text Compression

UNIT III
Audio Compression

UNIT IV
Image Compression

UNIT V
Video Compression

Karunya University

TEXT BOOK

REFERENCE BOOKS

09EC306 COMMUNICATION LAB-1

Credits: 0:0:2

LAB EXPERIMENTS
Any 12 Experiments
1. STATISTICAL DSP
   (By using Software -MATLAB)
   • Periodogram
   • AR/MA/ARMA
   • Kalman filter
   • Adaptive filters(Noise, Echo chancellor)-LMS /RLS
   • Wavelet
2. Multi Media Compression
   (By using Software- Matlab)
   • Text Compression
   • Audio Compression
   • Image Compression
3. Digital Communication
   (By using Software -Matlab)
   • Cyclic Codes
   • Convolutional Codes
   • Turbo Codes

Image Processing experiments in matlab
Signal Processing Using Processors
09EC307 MOBILE COMMUNICATION NETWORKS

Credits: 4:0:0

Objective:
To learn the fundamental concepts of mobile communication networks

Outcome:
Will be able to design simple communication network in mobile environment

UNIT I
Operation Of Mobile Communication Networks

UNIT II
Propagation Models And Air Protocols
Radio propagation models, error control techniques, handoff, power control, Soft handover, Forward link, Reverse link, common air protocols (AMPS, IS-95, IS-136, GSM, GPRS, EDGE, WCDMA, cdma2000, etc)

UNIT III
Mobile Network Architecture
General Architecture definition, Mobile Terminals (MT, SIM) Radio Section (BTS, BSC) Core Network (MSC, G-MSC, VLR, HLR, AuC) User and Control Plane Protocol Stack, MAP & SS#7, the Key Role of Signaling Interfaces and Network Entities Relation The Physical Channel, The Logical Channels Terminal, Call and Network Management Procedures, Network Planning.

UNIT IV
Wireless Local Area Networks

UNIT V
Security Issues In Wireless Networks

TEXT BOOK


REFERENCE BOOKS

09EC308 ERROR CONTROL CODING

Credits 3:1:0
Objective:
In order to transfer data without error from source to destination, focus must be made on coding. This syllabus is highly intended to emphasize bulk and burst error-correcting codes.
Outcome:
To understand life cyclic redundancy codes and convolution codes
To get a clear concept of different error correcting codes and convolution codes

UNIT I
Vector Algebra
Basics of vector algebra Galois Filed arithmetic in detail, Implementation of Galois Field Arithmetic

UNIT II
Basic Of Cyclic Codes
BCH Codes, Decoding of BCH Codes, implementation of error correction, Non binary BCH and Reed-Solomon Codes, error detection of binary BCH codes

UNIT III
Error Correcting Codes
Burst error correcting codes, decoding of single burst error correcting cyclic codes, Fire code interleaved codes, phased burst error correcting codes, Concatenated codes.

UNIT IV
Convolutional Codes
Convolutional codes, Maximum likelihood decoding of convolutional codes, sequential decoding convolutional codes - stack and fano algorithm Application of Viterbi decoding

UNIT V
Turbo Codes
Turbo codes - Coding - Performance - BCJR algorithm - Applications

TEXT BOOK

REFERENCE BOOKS
09EC309 HIGH PERFORMANCE COMMUNICATION NETWORKS

Credits 4:0:0

Objective
To study ISDN, Frame Relay, ATM and some advanced networks and to understand the module and protocols present in Bluetooth technology.

Outcome
It will be helpful to perform different operations in communication networks.

UNIT I
Packet Switched Networks
OSI and IP models, Ethernet (IEEE 802.3), Token ring (IEEE 802.5), Wireless LAN (IEEE 802.11) FDDI, DQDB, SMDS: Internetworking with SMDS

UNIT II
ISDN And Broadband ISDN
ISDN - overview, interfaces and functions, Layers and services - Signaling System 7 (SS7)- Broadband ISDN architecture and Protocols.

UNIT III
ATM And Frame Relay
ATM: Main features-addressing, signaling and routing, ATM header structure-adaptation layer, management and control, ATM switching and transmission.
Frame Relay: Protocols and services, Congestion control, Internetworking with ATM, Internet and ATM, Frame relay via ATM.

UNIT IV
Advanced Network Architecture
IP forwarding architectures overlay model, Multi Protocol Label Switching (MPLS), integrated services in the Internet, Resource Reservation Protocol (RSVP), Differentiated services

UNIT V
Blue Tooth Technology

TEXT BOOK

REFERENCE BOOKS

09EC310 MICROWAVE INTEGRATED CIRCUITS

Credits: 4:0:0

Objective
To study the different technologies of microwave integrated circuits and to analyze the microstrip line.

Outcome
It will be helpful to design and fabricate different lumped elements and nonreciprocal components.

UNIT I
Technology Of Hybrid MICs

UNIT II
Technology Of Monolithic MICs
Processes involved in fabrication – epitaxial growth of semiconductor layer – growth of dielectric layer – diffusion-ion implantation – electron beam technology.

UNIT III
Analysis Of Microstrip Line

UNIT IV
Coupled Microstrips, Slot Line And Coplanar Veguides
Coupled microstrips – even and odd mode analysis – microstrip directional couplers – branch line couplers – periodic branch line couplers – synchronous branch line couplers.

UNIT V
Lumped Elements And Non-Reciprocal Components


TEXT BOOKS

REFERENCE BOOK
09EC311 SATELLITE COMMUNICATION

Credits: 4:0:0

Objective:
To learn about the science behind the orbiting satellites, various multiplexing schemes and earth station parameters used for satellite communication.

Outcome:
Able to make one global village.

UNIT I
Orbital Parameters
Orbital parameters, Orbital perturbations, Geo stationary orbits, Low Earth and Medium orbits. Frequency selection, Frequency co-ordination and regulatory services, Sun transit outages, Limits of visibility, Attitude and orientation control, Spin stabilisation techniques, Gimbal platform

UNIT II
Link Calculations
Space craft configuration, Payload and supporting subsystems, Satellite uplink -down link power budget, C/No, G/T, Noise temperature, System noise, Propagation actors, Rain and ice effects, Polarization calculations

UNIT III
Access Techniques
Modulation and Multiplexing: Voice, Data, Video, Analog and Digital transmission systems, multiple access techniques: FDMA, TDMA, T1-T2 carrier systems, SPADE, SS- TDMA, CDMA, Assignment Methods, Spread spectrum communication, Compression-Encryption and Decryption techniques

UNIT IV
Earth Station Parameters
Earth station location, propagation effects of ground, High power transmitters-Klystron Crossed field devices, Cassegrania feeds, Measurements on G/T and E_b/No

UNIT V
Satellite Applications
INTELSAT Series, INSAT, VSAT, Remotesensing, Mobile satellite service: GSM. GPS, INMARSAT, Satellite Navigation System, Direct to Home service(DTH), Special services, E-mail, Video conferencing and Internet connectivity

TEXT BOOKS
REFERENCE BOOKS

2. K.Feher, Digital communication satellite / Earth Station Engineering, prentice Hall Inc, New Jersey, 1983

09EC312 COMMUNICATION ENGINEERING LAB-2

Credits: 0:0:2

LAB EXPERIMENTS
Any 12 Experiments
1. HPCN
   (By using Hardware)
   • Wireless LAN (Ad-hoc –Wireless Access Point)
   • Ethernet / token ring
2. MICROWAVE INTEGRATED CIRCUITS
   (By Software SONNET or Microwave Office)
   • Micro STRIPS – (Coupler / circulator / isolators/Phase Shifter)
   • Slot line
   • coplanar
3. Optical Communication
   (By using Hardware)
   • OTDR
   • Splicing KIT
4. Mobile Communication
   (By using Hardware)
   • Mobile KIT
5. Satellite Communication
   (By using Hardware)
   • Satellite KIT
   • GPS/GSM/GPRS

09EC313 ADVANCED DIGITAL SYSTEM DESIGN

Credits 4:0:0

Objective:
Advanced digital system concepts are introduced. Various PLD’s are discussed

Outcome:
Good knowledge to design digital circuit. Architectures of various families of PLD’s enables good understanding of FPGA

UNIT I
Advanced Topics in Boolean Algebra
Shannon’s expansion theorem - Consensus theorem - Octal Designation - Run measure - INHIBIT / INCLUSION / AOI / Driver / Buffer Gates - Gate Expander - Reed Muller Expansion - Synthesis of multiple output combinational logic circuits by product map method - Design of static hazard free and dynamic hazard free logic circuits
UNIT II
Threshold Logic
Linear separability – Unateness - Physical implementation - Dual comparability - Reduced functions - Various theorems in threshold logic - Synthesis of single gate and multigate threshold Network.

UNIT III
Sequential Logic Circuits

UNIT IV
Symmetric Functions
Elementary symmetric functions - partially symmetric and totally symmetric functions - Mc Cluskey de-composition method - Synthesis of symmetric function by contact networks.

UNIT V
Programmable Logic Devices
Anti fuse – static RAM -Basic concepts - Programming techniques - Programmable Logic Element (PLE) - Programmable Logic Array (PLA), Programmable Array Logic (PAL) Structure of Standard PLD’s, Complex PLD’s (CPLD) - Altera Max-7000 Series - Design of combination and sequential circuits using PLD’s. Type of FPGA – Xilinx XC3000 Series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) Input/Output Blocks (I/OB) – Programmable Interconnection Points (PIP) –Xilinx XC4000 families – Design examples.

TEXT BOOKS

REFERENCE BOOKS

09EC314 FPGA DESIGN USING VHDL & VERILOG

Credits 4:0:0
OBJECTIVE:
To know about the various flow of VHDL and verilog programming techniques
OUTCOME:
Knowledge in VHDL Programming and Verilog Programming and implementation of circuits in FPGA will be obtained
UNIT I
Introduction to VHDL & Dataflow modeling
Basic Concurrent Statements – Signal assignment statements – Conditional Signal assignment – Selected signal assignment – Usage of Blocks in Dataflow modeling – Implementations of different digital circuits in Dataflow modeling

UNIT II
Behavioral Modeling & Packages

UNIT III
Structural Modeling & FPGA Implementations

UNIT IV
Introduction to Verilog & Modeling

UNIT V
Structural & Switch Level Modeling
Component Assignments – Switch level modeling – Applications of all dataflow, behavioral and Structural modeling in FPGA – FSM Implementation – Test Benches

TEXT BOOKS

REFERENCE BOOK
09EC315 CMOS VLSI DESIGN

Credits: 4:0:0

OBJECTIVE:
To study about basics in VLSI and various CMOS families and system designing and subsystem designing in CMOS.

OUTCOME:
Knowledge to design CMOS families and Subsystems in transistor and gate level.

Unit I
VLSI Fabrication Technology

UNIT II
Introduction to CMOS Circuits

Unit III
MOS and CMOS Circuit Design Process

Unit IV
Subsystem Design

Unit V
Sequential Circuits
Two phase clocking – Charge storage – Dynamic shift register – precharged bus – General arrangement of a 4 bit arithmetic processor – Design of a 4 bit shifter

TEXT BOOKS
REFERENCE BOOK

09EC316 TESTING OF VLSI CIRCUITS

Credits: 4:0:0

OBJECTIVE:
To know about the various test Generation Algorithms and Fault Simulation Techniques.

OUTCOME:
Testing of various Memory Modules and Combinational logic Circuits.

Unit I
Introduction
Motivation for testing and design for testability – Faults in digital circuits - Modeling of faults - Logical Fault Models - Fault detection - Fault location - Fault dominance

UNIT II
CMOS Testing
Need for testing – Manufacturing test principles – Design Strategies for test – chip level test techniques - System level test techniques- Testability features for board test

UNIT III
Test Generation Algorithms and Fault Simulation Techniques
Serial, Single-fault propagation, Deductive, Parallel and Concurrent Simulation.

UNIT IV
Built In Self Test
Scan-in Scan-out design – Signature analysis - Built-In Self Test - Test pattern generation for BIST - Circular BIST – BIST Architectures - Testable Memory Design - Test algorithms - Test generation for Embedded RAMs

UNIT - V
Fault Diagnosis
Logic Level Diagnosis - Diagnosis by UUT reduction - Fault Diagnosis for Combinational Circuits - Self-checking design - System Level Diagnosis.

TEXT BOOK

REFERENCE BOOKS
09EC317 COMPUTER AIDED DESIGN FOR VLSI CIRCUITS

Credits 4:0:0

OBJECTIVE:
To study the Physical design cycle of VLSI

OUTCOME:
Knowledge of Placement, Routing ,Simulation ,Synthesis and MCMs is obtained

UNIT I
Introduction to VLSI Design

UNIT II
Automation Tools and Algorithms
A quick tour of VLSI Design Automation Tools – Data structures and Basic Algorithms -
Algorithmic graph theory and computational complexity – Tractable and Intractable problems.

UNIT III
Simulation and Synthesis
Simulation – Logic synthesis – Verification – High level synthesis – Compaction.

Unit IV
ASIC Construction, Floorplanning, Placement and Routing

UNIT V
Design Automation

TEXT BOOKS

REFERENCE BOOK
09EC 318 SIMULATION LAB

Credits: 0:0:2

LIST OF EXPERIMENTS

Any 10 experiments

EXPERIMENTS USING TANNER EDA

1. Design & Simulation of CMOS Inverter using Tanner EDA Tools
2. Design & Simulation of NAND & NOR using Tanner EDA Tools
4. Design & Simulation of CMOS Inverter using Tanner EDA Tools
5. Layout Design of CMOS Inverter using Tanner EDA Tools.

EXPERIMENTS USING MENTOR GRAPHICS

6. Simulation & Synthesis of Adders –Front End
7. Pre layout Simulation of adders using design architecture.
8. Simulation of inverter using Design Architecture.
10. Simulation of adders circuit using Design Architecture.
11. a) Design of Schematic Layout of current mirror and BICMOS Logic & generation of Symbol using IC Station in Mentor Graphics.
    b) Digital Simulation of Adders
13. Digital Simulation of Subtractors.
14. Design of Schematic Layout of NAND Gate using SDL Design Methodology and creating the hierarchical schematics for JK Flip flops
15. Design and Simulation of Sequence Detector using HDL Designer
16. Design of RTL using HDL Designer
17. Simulation and Synthesis of Inverter.
09EC319 GENETIC PROGRAMMING AND PARTICLE SWARM OPTIMIZATION

Credits: 4:0:0

Objective
To learn the various concepts and techniques of optimization techniques

Outcome
Will be able to apply these algorithms to obtain optimal solutions in various applications.
Will be able to develop new hybrid algorithms.
Will be able to improve the performance of the existing artificial intelligence technique.

UNIT I
Evolutionary Computation

UNIT II
Genetic Programming Applications

UNIT III
Swarm Intelligence
Foundations, Perspectives and Applications – Canonical Particle Swarm Optimization – Extended Models of PSO for Discrete problems – Applications of Particle Swarm Optimization – Ant Colony Optimization – Ant Colony Algorithms and its Applications.

UNIT IV
Swarm Intelligence – Searchers, Cleaners And Hunters

UNIT V
Swarm Intelligence Applications
Ant Colony Optimization for Fast Modular Exponentiation using Sliding Window Method-Window based methods – Additional chains and additional sequences – Ant Systems and Algorithms – Chain Sequence Minimization using Ant System- Particle Swarm for Fuzzy Models Identification- Fuzzy models - Methodology for Fuzzy models Identification through PSO.
Text Books


Reference Books.


09EC320 ADVANCED DIGITAL IMAGE PROCESSING

Credits: 4:0:0

Objective
To learn the various advanced techniques of image processing with applications

Outcome
Will be used to develop hybrid techniques to solve the segmentation and classification problems
Will be able to apply these techniques for real time applications.
Will be able to form new image processing algorithms.

UNIT I
Image Enhancement

UNIT II
Image Restoration

UNIT III
Colour Image Processing & Wavelets & Multiresolution Processing.

UNIT IV

Image Compression and Morphological Image Processing

UNIT V

Image Segmentation & Description
Detection of Discontinuities - Edge Linking & Boundary Detection – Thresholding - Region Based Segmentation & Segmentation by Morphological Watersheds - Use of Motion in Segmentation - Representations- Boundary Descriptions - Regional Descriptions - Use of Principal Components for Description.

Text Books


Reference Books


09EC321 NEURO-FUZZY MODELLING

Objective
To learn the concepts and techniques of hybrid neuro fuzzy systems

Outcome
Will be able to develop new algorithms for real – time classification problems
Will be able to improve the performance of the existing techniques.
Will be able to design systems for practical applications.

UNIT I
Introduction to Neural Networks

UNIT II
Adaptive Neuro-Fuzzy Inference Systems

UNIT III
Classification and Regression Trees

UNIT IV
Data Clustering Algorithms

UNIT V
Rule base Structure Identification

Text Books

Reference Books
09EC322 PATTERN RECOGNITION

Credits : 4:0:0

Objective
To learn the fundamental pattern recognition techniques for image processing applications

Outcome
Will be able to apply these techniques to solve recognition problems in real-time applications
Will be able to form novel pattern recognition algorithm.
Will be able to analyse the pros and cons of existing algorithms.

UNIT I
Statistical Pattern Recognition

UNIT II
Non Parametric Approaches for Pattern Recognition

UNIT III
Discrete and Binary Classification Problems
Introduction – Linear Discriminant Functions – Fisher’s Linear Discriminant – Discrete and Binary Classification Problems – Techniques to directly obtain Linear Classifiers – Linear Separability – Design of Linear Classifiers-Introduction to Support Vector Machines.

UNIT IV
Neural Networks for Pattern Recognition

UNIT V
Image Analysis

Text Books


Reference Books


09EC323 ARTIFICIAL NEURAL NETWORKS

Credits : 4: 0:0

Objective
To learn the various techniques and methodologies of artificial neural networks

Outcome
Will be able to develop hybrid methodologies for solving engineering applications
Will be able to develop hardware systems for Artificial Intelligence techniques.
Will be able to form new machine learning techniques.

UNIT I
Basic Concepts

UNIT II
Perceptrons

UNIT III
Feedback Networks
Dynamical Systems – Discrete Time Hopfield Networks – Gradient Type Hopfield Network – Solution of Optimisation Problems- Associative Memory – Linear Associator – Recurrent Auto Associative Memory – Bidirectional Associative Memory – Associative Memory of Spatio-temporal patterns.
UNIT IV
Self Organising Networks

UNIT V
ANN Implementation
Neuro computing Hardware Requirements – IC Synaptic Connections – Analog Storage of Adjustable Weights – Digitally Programmable Weights.

Circuits for Neural Networks:
Invertor Based Neuron – Scalar Product & Averaging Circuits – Template Matching Circuit – Analog Multipliers with Weight Storage – Associative Memory Implementations.

Text Books

Reference Books
ELECTRONICS AND COMMUNICATION ENGINEERING
ADDITIONAL SUBJECTS

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<th>Code</th>
<th>Subject Name</th>
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<td>10EC209</td>
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10EC201 ELECTRON DEVICES

Credits: 3:0:0

Objective:
- To know about the internal function of Electron devices
- To know about the advanced semiconductor devices
- To know about the practical applications of devices.

Outcome:
- Able to design practical circuits and to analyse various components

Unit I
Electron Ballistics
Charged Particles – Constant electric Field – Two dimensional motions – Electrostatic Deflection in CRT – CRO – Force in magnetic Field – Motion in a magnetic field – Magnetic deflection in CRT – Combined electric and Magnetic Field.

Unit II
Theory of PN Junction

Unit III
Theory of semiconductor devices
Forward and Reverse characteristics of pn diode– Diode Equation– EberMoll equation – Transistor hybrid model - determination of hybrid parameters, measurement of hybrid parameters, Miller’s theorem.

Unit IV
Special semiconductor diodes
Unit V
Special Semiconductor Devices
Photo diodes –Photo transistors – LED – LCD – optocouplers –Digital electronic display-
plasma display, nano crystal display.

Text Books

1. Jacob Millman, Christos C Halkias, Satyabrata Jit, "Electronic Devices &

Reference Books

3. Charles A Schuler, Roger L Tokheim, “Electronics Principles and Applications”, Tata

10EC202 ELECTRIC CIRCUIT ANALYSIS

Credits: 3:1:0

Objectives:

- To understand the basic concepts of electric circuits
- To study the various techniques which can be used to analyse electric circuits
- To understand the nature of the responses of electric circuits

Outcome:

- Make the students capable of applying the knowledge of circuit theory in other
  engineering subjects

Unit I
Basic Circuit Concepts
Kirchoffs Laws -VI relationships of R, L and C -independent sources - dependent sources –
simple resistive circuits -network reduction, Series and parallel circuits reduction, Star delta
transformation voltage division rule -current division rule -source transformation.

Unit II
Sinusoidal Steady State Analysis
Phasor- sinusoidal steady state response -concepts of impedance and admittance -analysis of
simple circuits- power and power factor -series resonance and parallel resonance – bandwidth
and Q factor. Solution of three-phase balanced circuits, Star connected load and delta connected
load-power measurements by two wattmeter- solution of three phase unbalanced circuits, Star
connected and delta connected load.

Unit III
Mesh-Current And Node-Voltage Methods
Formation of matrix equations and analysis of complex circuits using mesh-Super mesh analysis-nodevoltage analysis-Super node analysis- mutual inductance- coefficient of coupling -ideal transformer.

**Unit IV**

**Network Theorems And Applications**


**Unit V**

**Transient Analysis**

Forced and free response of RL, RC and RLC circuits with D.C. and sinusoidal excitations-

Forced and free response of RL, RC and RLC circuits with D.C. and sinusoidal excitations using Laplace transform technique.

**Text Books**


**Reference Book**


**10EC203 EMBEDDED SYSTEMS**

**Credits:** 3: 0: 0

**Objective**

To learn about Real time Embedded system, Programming languages and tools

**Out Come**

To design Embedded Products based on various Operating Systems.

**UNIT I**

**Introduction to Embedded Systems**


**UNIT II**

**Embedded Linux System**

Definitions -Real Life and Embedded Linux Systems -Design and Implementation Methodology-

Unit III
Real Time Operating Systems
Task and Task States-Tasks and Data- Semaphores and Shared Data Operating system Services-
Application of Semaphores -Message Queues-Timer Function-Events – Memory Management.

Unit IV
Embedded Software Development Process and Tools
Development Process and Hardware-Software-Software Tools-Source Code Engineering Tool-
Host and Target machines –Linking and Locating Software-Integrated Development
Environment (IDE)

Unit V
Programming Concepts and Embedded Programming in C and C++
Software programming in Assembly Language and in High level language – C Program
Elements – Program Elements-Use of Data Structures: Queues – Stacks-Function Pointers-
Function Queues and ISR Queues–Queuing of Functions on Interrupts- Object Oriented
Programming-Embedded programming in C++-Optimization of Codes in Embedded C++.

Text Books

Reference Book

10EC204 DIGITAL COMMUNICATION
Credits: 4:0:0

Objectives:
• To equip the students with the basic concepts of digital modulation techniques.
• To understand the need and basics of error control coding.
• To understand the effect of noise in data reception..

Outcome:
• To make the students understand the recent technologies with the basics of digital
communication and design receivers.

Unit I
Sampling And Bandlimited Signalling
Review of Sampling Theorem, PAM and TDMA Principles, Quantization, PCM, DPCM and
Delta Modulation – International standard (CCIT, CEPT) Power Spectra of PAM signals - Inter
symbol Interference - Ideal Nyquist channel - Raised cosine channels – Correlative coding and
precoding.

Unit II
Digital Modulation

Unit III
Data Transmission – Detection and Estimation

Unit IV
Information Theory and Coding
Discrete messages-amount of information-average information-entropy information rate-Shannon’s theorem-capacity of gaussian channel-bandwidth-S/N trade off-coding-parity check bit coding-block codes coding and decoding probability of error with coding- Convolution codes – Cyclic codes.

Unit V
Spread Spectrum Systems
Pseudo Noise sequences, generation and correlation properties - direct sequence spread spectrum systems - Frequency Hop systems - processing gain - antijam and multipath performance.

Text Books

Reference Books

10EC205 VLSI DESIGN

Credits: 3:0:0

Objective
The purpose of this course is to give an exposure to VLSI Design Process, Layout Design, CMOS logic Design styles and VHDL

Outcome
- Knowledge in VHDL Programming
- To Design various CMOS Design Styles
Unit I
Overview of VLSI Design Methodology

Unit II
Layout Design

Unit III
CMOS Design Styles
Sheet Resistance-Area Capacitances of layers-Standard Unit of Capacitance-Area Capacitance Calculations-CMOS Logic Design styles

Unit IV
Introduction to VHDL

Unit V
Data Flow, Behavioral and Structural Modeling

Text Books

Reference Books

10EC206 ELECTRON DEVICES LAB
Credits: 0:0:2
1. Study of CRO
2. Characteristics of PN Junction diode, Zener diode
3. Characteristics of Photo diode
4. Characteristics of BJT
5. Characteristics of Triac, SCR
6. DC Analysis of Electric Circuits
7. AC Analysis of Electric Circuits
8. Rectifiers
9. Characteristics of UJT, FET

Implementation of the above using PSPICE & Hardware

10EC207 ELECTRONICS AND INTEGRATED CIRCUITS LAB

Credits: 0:0:2

LIC Experiments

1. Design of Basic Operator circuits using op-amp
   a. Adder
   b. Subtractor
   c. Differentiator
   d. Integrator
2. Design of astable multivibrator and Schmitt trigger using 555 Timer
3. Design of active filters using op-amp
4. Design of Weinbridge Oscillator
5. Design of Digital Analog Converter
6. Precision rectifiers using op-amp

ELECTRONICS EXPERIMENTS
7. Half wave & Full wave Rectifiers
8. Voltage Regulator
9. Single stage amplifier
10. Single tuned Amplifier
11. RC Phase shift Oscillator
12. Differential Amplifier

10EC 208 VLSI DESIGN LAB

Credits 0:0:2

VHDL PROGRAMS
1. Design and Simulation Half adder and Full adder
2. Design & Simulation simple ALU
3. Design & Simulation of
   4x1 Multiplexer & Demultiplexer
4. Design & Simulation of Combinational Circuits
   • Magnitude Comparator
   • 3x8 Encoder
5. Design and Simulation of up-down counter
- JK Flip-flop
- RS Flip-flop
- T Flip-flop
- D Flip-flop

7. Design and Simulation of Memory Module

SIMULATION PROGRAMS

8. Design & Simulation of CMOS Inverter/NAND & NOR.
9. Design & Simulation Half adder & Full adder
10. Design & Simulation of Transmission Gate and Multiplexer using TG
11. Design & Simulation of Boolean Expression & Bi CMOS Logic
12. Design & Simulation of different CMOS Design styles.

Required Software Tools:
  Xilinx 9.1, Model Sim, Tanner EDA

10EC209 SEMICONDUCTOR DEVICES

Credits: 4:0:0

Objectives:
- To know about the internal function of Electron devices
- To know about the advanced semiconductor devices
- To know about the practical applications of devices.

Outcome:
- Able to design practical circuits and to analyze various components

Unit I
Electron Ballistics
Charged Particles – Constant electric Field – Two dimensional motions – Electrostatic Deflection in CRT – CRO – Force in magnetic Field – Motion in a magnetic field – Magnetic deflection in CRT – Combined electric and Magnetic Field.

Unit II
PN Diode and its Applications

Unit III
Theory of Junction Transistors
Transistor action– Transistor current components –EberMoll equation – static characteristics of transistors (CE,CB,CC) –Transistor switching times, Maximum voltage rating- Avalanche Multiplication, reach-through

Unit IV
Theory of FET, UJT and SCR

Unit V
Special Semiconductor Devices

Text Books

Reference Books
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
### REVISED AND NEW SUBJECTS

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### 10EC301 STATISTICAL DIGITAL SIGNAL PROCESSING

**Credits:** 3:1:0  

**Objective:**  
To learn the concepts of signal processing and analyze the statistical properties of signals

**Outcome:**  
Will be able to solve the practical signal applications.
Unit I: Discrete Random Signal Processing

Unit II: Spectrum Estimation

Unit III: Linear Estimation And Prediction

Unit IV: Adaptive Filters

Unit V: Multirate Digital Signal Processing
Mathematical description of change of sampling rate-Interpolation and Decimation-continuous time model - Direct digital domain approach - Decimation by an integer factor - Interpolation by an integer factor - Single and multistage realization - Poly phase realization - Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

Text Book

Reference Books

10EC302 NETWORK ROUTING ALGORITHMS
Credits: 4:0:0

Objectives
• To review the routing concept in circuit switching & packet switching networks in general and high speed networks in particular
• To study the routing algorithms of mobile networks in detail

Outcome
• To explore the functionalities of routing algorithms of Wired and Wireless Networks.

Unit I : Multi Access Communication

Unit II : Single User Matched Filter
Distance Vector Routing - Routing Information Protocol - Link State Routing - Open Shortest Path First Protocol - Inter Domain Routing - EGP, BGP and IDRP Protocols - Apple Talk Routing

Unit III : Optimum Multi User Detection
Routing based taxonomy of optical networks, Deflection routing algorithm, Routing in PlaNET - modes, options, packet and call level routing

Unit IV : Non De-Correlating Linear Multi User Detection
Mobility management in Internet - Mobile IP - Routing in cellular networks - hand off and roaming - Introduction to packet radio networks - Routing in small and large sized packet radio networks - Tier and hierarchical routing - Applications and other issues of Mobile Adhoc Networks

Unit V : Decision - Driven Multiuser Detectors

Text Books

Reference Books
2. A.S. Tanenbaum, "Computer Networks", PHI, New Delhi, 2003
10EC303 NETWORK MANAGEMENT

Credits: 4:0:0

Objectives
Understand the fundamental concepts of network management
Exposure to network security aspects

Outcome
Network Management is a course designed to familiarize the student with the design, analysis operation and management of modern data communications networks. The course will provide the student with a working knowledge of the types of communications network management systems and their strengths and weaknesses in solving various information network management problems

Unit I: OSI Network Management
OSI Network management model-Organizational model-Information model, Communication model. Abstract Syntax Notation - Encoding Structure, Macros Functional Model CMIP/CMIS

Unit II: Internet Management (SNMP)
SNMP-organizational model-system overview, The information model, communication model-Functional model. SNMP proxy server, Management information, Protocol remote monitoring

Unit III: Broadband Network Management

Unit IV: Network Management Protocols
HTTP-History and standards development-HTTP Session-Request message-Request methods-Status Codes- persistent connections-Secure HTTP-POP4-SDPS-server implementations-SMTP-mail processing model-protocol review-outgoing mail SMTP server-FTP/IP-IMAP-orginal-imap2-imap4-advantages over POP-disadvantages of IMAP

Unit V: Network Management Applications
Configuration management, Fault management, performance management, Event Corelation Techniques security management, Accounting management, Report Management, Policy Based Management Services Level Management

Text Books
Reference Books

10EC304 GLOBAL POSITIONING SYSTEM

Credits: 4:0:0

Objectives
At the end of this course students will gain knowledge in the topics such as
- Introduction to global positioning
- Types of signals used in the GPS systems and accuracy limits
- Latest versions of GPS and its application

Outcome
The purpose of this course is to develop a strong foundation in the field of Global Positioning Systems. The subject gives the students an in-depth knowledge about working of Global positioning receivers. Students are exposed to various errors occurring in GPS and latest variant DGPS receivers and GPS applications.

Unit I : Introduction
GPS and GLONASS Overview - Satellite Navigation - Time and GPS - User position and velocity calculations - GPS - Satellite Constellation - Operation Segment - User receiving Equipment - Space Segment Phased development

Unit II : Signal Characteristics
GPS signal components - purpose, properties and power level - signal acquisition and tracking - Navigation information extraction - pseudorange estimation - frequency estimation - GPS satellite position calculation

Unit III : GPS Receivers & Data Errors
Receiver Architecture - receiver design options - Antenna design - SA errors - propagation errors - Methods of multipath mitigation - Ephemeris data errors - clock errors

Unit IV : Differential Gps
Introduction - LADGPS - WADGPS, Wide Area Augmentation systems - GEO Uplink subsystem - GEO downlink systems - Geo Orbit determination - Geometric analysis - covariance analysis - GPS /INS Integration Architectures

Unit V : GPS Applications
GPS in surveying, Mapping and Navigation - Precision approach Aircraft landing system - Military and Space application - Intelligent transportation system

Text Book

Reference Book

10EC305 DIGITAL COMMUNICATION RECEIVERS
Credits: 4:0:0

Objectives:
To learn about base band and band pass communication.
To study the different types of receivers used in Additive white Gaussian noise channels and Fading channels.
To study the extraction methods of the signal from AWGN and Fading channel.

Outcome:
The student learns to design a receiver for any given communication channel.

Unit I : Review of Digital Communication Techniques
Base band and band pass communication, signal space representation, linear and nonlinear modulation techniques, and Spectral characteristics of digital modulation.

Unit II : Optimum Receivers for Awgm Channel
Correlation demodulator matched filter, maximum likelihood sequence detector, optimum receiver for CPM signals, M-ary orthogonal signals, envelope detectors for M-ary and correlated binary signals.

Unit III : Receivers For Fading Channels
Characterization of fading multiple channels, statistical models, slow fading, frequency selective fading, diversity technique, RAKE demodulator, coded waveform for fading channel.

Unit IV : Synchronization Techniques
Carrier and signal synchronization, carrier phase estimation-PLL, Decision directed loops, symbol timing estimation, maximum likelihood and non-decision directed timing estimation, joint estimation.

Unit V : Adaptive Equalization
Zero forcing algorithm, LMS algorithm, adaptive decision-feedback equalizer and Equalization of Trellis-coded signals. Kalman algorithm, blind equalizers and stochastic gradient algorithm. Echo cancellation

Text Book:
Reference Books

10EC306 OPTICAL NETWORKS & PHOTONIC SWITCHING

Credits: 4:0:0

Objectives
To learn about
- Various components of optical networks
- First generation and broadcast optical network
- Wavelength routed optical networks also various photonic switches

Outcome
The main purpose of this course is to introduce students the important areas of communication networks, mainly optical networks and photonic switching. This will enable the students to acquire a solid understanding of foundations of optical networks technologies, systems, networks issues as well as economic deployment considerations and also photonic switching

Unit I: Networks
Introduction: first and second generation optical networks: system network evaluation

Unit II: Technology
Propagation of light energy in optical fibers dispersion and non linear effects; components - couplers, isolators, circulators, multiplexers, filters and optical amplifiers; switches and wavelength converters.

Unit III: First Generation Optical Networks
SONET / SDH, MAN layered architecture, broadcast and select networks MAC protocols, test beds, wavelength routing networks

Unit IV: Control and Management
Configuration, performance and fault management, optical safety, service interface; testbeds; access networks - HFC, FTTC, architecture

Unit V: Photonic Packet Switching
OTDM, MUX & DEMUX synchronization; broadcast OTDM networks, switch - ban networks: OTDM testbeds

Text Book
1. Rajiv Ramaswamy, "Optical Networks", Harcourt Asia Private Limited, Singapore, 2001

Reference Books

10EC307 DIGITAL IMAGE PROCESSING

Credits: 3:0:0

Objective:
To study the fundamental concepts, algorithms and techniques of digital image processing

Outcome:
Will be able to develop new techniques for image enhancement, segmentation, compression, etc.

Unit I: Fundamentals of Image Processing
Elements of visual perception - Image sensing and acquisition – Sampling and Quantization – Pixel relationships - Color fundamentals and models – Separable image transforms – DFT, DCT - Walsh, Hadamard, Haar – Karhunen Loeve and SVD

Unit II: Image Enhancement and Restoration

Unit III: Image Segmentation and Feature Analysis
Edge detection – Edge linking and boundary Detection – Intensity and histogram based image segmentation - Region based segmentations – Contour based segmentation - Motion segmentation - Feature analysis and extraction – spatial techniques for shape and texture feature extraction.

Unit IV: Multi Resolution Analysis and Compressions

Unit V: Applications of Image Processing

Text Book

Reference Books

10EC308 WIRELESS SENSOR NETWORKS

Credits: 4:0:0

Objectives:
- To introduce the basic concepts of Sensor Networks.
- To introduce the overview of communication Protocols
- To introduce the Energy management and Security.

Outcome:
Students will be able to understand the concepts of sensor networks, applications and different types of protocols in WSN.

Unit I : Basics Concepts about Sensor Networks

Unit II : Communication Protocols
Time synchronization protocols-Transport Layer protocol-Network layer protocol-Data link protocol-medium access control-The S-MAC protocol-IEEE 802.15.4 standard and Zigbee - Error Control

Unit III : Tracking Technologies
Tracking scenario –Problem formulation –Sensing model-Fundamentals-ToA, TDoA, and AoA-Positioning by signal strength-positioning ang location tracking algorithms-Trilateration-Multilateration-Pattern matching-Nearest neighbor algorithms-probability based algorithms-location tracking-network based tracking

Unit IV : Sensor Network Data Bases
Sensor data base chalanges- Querying the physical environment-High level data base organization-Data aggregation-types of aggregation-Packet level aggregation-total aggregation-Geographic aggregation-selection of the best aggregation points-Problem with high data rate

Unit V : Energy Management And Security
Idle power management - Active power management - Design challenges in energy efficient medium access control - IEEE 802.11 - operation - power saving mode - merits - drawbacks - implications in WSN.
Blue tooth - operation - Merits - implications. Security: Security architecture - Cell based WSNs - Privacy of local information

Text Book:

Reference Books:

10EC309 HIGH SPEED SWITCHING ARCHITECTURE

Credits: 4:0:0

Objective
To understand the types of switch fabrics for high-speed applications. To get a clear idea about the traffic and Queuing systems

Outcome
Speed is one of the demand put forth by the users of communication resources. So focus must be made on the switch architectures suitable for high speed application. This syllabus has been framed based on the above requirements

Unit I: LAN Switching Technology
Switch Forwarding Techniques, Switch Path Control, LAN Switching, Cut through Forwarding, Store and forward, and Virtual LANs

Unit II: Architectures
Switching architectures - Issues and performance analysis - Banyan and knockout switches - Single & Multistage networks - Shuffle switch tandem banyan...

Unit III: Packet Switching Architectures
Architectures of Internet Switches and Routers- Bufferless and buffered Crossbar switches, Multi-stage switching, Optical Packet switching; Switching fabric on a chip; Internally buffered Crossbars.

Unit IV: Signaling Standards and Queueing Concepts
Signaling - SS7 Signaling - Traffic and queueing models - Performance analysis of Input, Output & Multiple shared Queuing.
Unit V : IP Switching
Addressing Model, IP switching types, Flow driven and topology driven solutions, IP over ATM, Address and next hop resolution, Multicasting, IP v6 over ATM

Text Books

Reference Books

10EC310 CMOS VLSI DESIGN

Credits: 4:0:0

Objective:
To study the basic concepts of MOS transistor, circuit design processes, Combinational Logic Circuits, Sequential Logic Circuits, Arithmetic Building Blocks, Memory and Array Structures and BiCMOS Logic Circuits.

Outcome:
To gain knowledge in designing circuits using various design styles.

Unit I : Logic Design with MOSFETS and MOS Transistor Theory

Unit II : Circuit design processes and characterization

Unit III : Designing Combinational Logic and Sequential Logic Circuits

Unit IV : Designing Arithmetic Building Blocks, Memory and Array Structures
Adders – Multipliers – Shifters – Memory Core – Memory Peripheral Circuitry – Programmable Logic Arrays.

**Unit V: BiCMOS Logic Circuits and Chip Input & Output (I/O) Circuits**


**Text Books**

**Reference Books:**

**10EC311 VLSI TECHNOLOGY**

Credits: 4:0:0

**Objective:**
To learn in detail about the fabrication of BJT and MOSFET transistors. All the unit process steps involved in planar process starting from silicon crystal growth to packaging of circuits has to be dealt in depth.

**Outcome:**
Students are expected to design VLSI circuits by keeping technological process constraints in mind.

**Unit I: Introduction**

**Unit II: Oxidation and Diffusion**

**Unit III: Lithography and Etching**

Unit IV: Deposition Techniques
Physical Vapor Deposition – Thermal Evaporation and Sputtering – Metallization – Failure Mechanisms in Metal Interconnects - Silicides and Copper Metallization, Chemical Vapor Deposition Techniques: CVD Techniques for Deposition of Polysilicon, Silicon Dioxide, Silicon Nitride and Metal Films – Comparison of CVD techniques.

Unit V: Integrated Device Fabrication

Text Book

Reference Books

10EC312 VLSI DIGITAL SIGNAL PROCESSING

Credits 3:1:0

Objective
This paper integrates VLSI architecture theory and algorithms, addresses various architectures at the implementation level, and presents several approaches to analysis, estimation, and reduction of power consumption. Explains how to design high-speed, low-area, and low-power VLSI systems for a broad range of DSP applications.

Outcome
The students will be able to apply several optimization techniques to improve implementations of several DSP algorithms, using digital signal processors.
Unit I: Iteration Bound & Pipelining / Parallel Processing.
Introduction to DSP systems- representations of DSP Algorithms- loop bound and iteration bound- algorithms for computing iteration bound- iteration bound for MRDFG- pipelining and parallel processing of FIR filters- pipelining and parallel processing for low power applications.

Unit II: Retiming & Unfolding

Unit III: Systolic Array & Fast Convolution Algorithm
Design Methodology- FIR systolic Arrays- Selection of Scheduling Vector- Cook-Toom Algorithm-Winograd Algorithm- Iterated Convolution – Cyclic Convolution-

Unit IV: Scaling And Round Off Noise
State Variable Description of digital filters- Scaling and roundoff noise computation- Bit level arithmetic architectures- parallel multipliers- bit serial multipliers- Canonic Signed Digit Arithmetic- distributed arithmetic

Unit V: Numerical Strength Reducing Techniques

Text Book

Reference Books

10EC313 TESTING AND TESTABILITY OF ELECTRONICS SYSTEMS

Credits: 3:0:0

Objective:
To know about various Faults, Fault Models, Test Generation Algorithms, Fault Simulation Techniques and Design for Testability.

Outcome:
Testing of various Combinational & Sequential logic Circuits.
Unit I: Introduction

Unit II: Test Generation for Combinational and Sequential Logic Circuits
Introduction - Fault - Table, Boolean difference – Path sensitization, D algorithm –PODEM Test Generation for Sequential Circuits – State Table Verification -Random Testing.

Unit III: Fault Simulation Techniques

Unit IV: Design for Testability
Testability - Ad-hoc design for Testability Techniques - Generic Scan based Designs - Classical Scan based Design – Board-Level and System level DFT Approaches-Boundary Scan Standards.

Unit V: Built-In Self Test

Text Books:

Reference Book:

10EC314 LOW POWER VLSI DESIGN

Credits: 3:0:0

Objective:
To study the concepts on different levels of power estimation and optimization techniques.

Outcome:
Students gain knowledge in designing low power circuits on various levels by applying different optimization techniques.

Unit I: Simulation Power Analysis

**Unit II : Circuit and Logic Level Power Estimation**

**Unit III : Power Estimation**

**Unit IV : Circuit Design Techniques and SRAM Architecture**

**Unit V : Energy Recovery and Low Power Latches and Flip flops**

**Text Books:**

**Reference Books:**

**10EC315 HARDWARE DESCRIPTION LANGUAGES**

Credits: 4:0:0

**Objective:**
To know about the various flow of VHDL and Verilog programming techniques and synthesis

**Outcome:**
Knowledge in VHDL Programming and Verilog Programming
Knowledge in synthesizing circuits using HDL

**Unit I : Introduction To VHDL Data Flow And Structural Modeling**

**Unit II : Behavioral Modeling & Packages**

**Unit III : Introduction to Verilog HDL**

**Unit IV : Modeling With Verilog HDL**

**Unit V : HDL Synthesis**

**Text Books:**

**Reference Books:**
10EC316 SEMICONDUCTOR DEVICES AND MODELING

Credits: 4:0:0

Objective:
To learn the physics behind the semiconductor devices and study the various models. To understand the BJT, MOSFET and other semiconductor devices from the device perspective.

Outcome:
Clear understanding of semiconductor devices which will help the students in learning the advanced semiconductor devices.

Unit I : Semiconductor Physics

Unit II : BJT Device Analysis

Unit III : BJT Models

Unit IV : MOSFET Device Analysis

Unit V : MOSFET models
Level-1 model of MOSFET – Level-2 model of MOSFET: Mobility modeling, Sub-threshold current, Channel length modulation, Short channel effect, Velocity saturation, Narrow width effect, Gate capacitance, Junction capacitances – Level-3 model of MOSFET: Slope discontinuity, Gate capacitances, BSIM model.
Text Book

Reference Books

10EC317 HDL LABORATORY
Credits: 0:0:2
10 Experiments will be notified by the HOD from time to time.

10EC318 ASIC DESIGN LABORATORY
Credits: 0:0:2
10 Experiments will be notified by the HOD from time to time.

10EC319 HIGH SPEED VLSI DESIGN
Credits: 4:0:0
Objective
To learn in detail about Non clocked and Clocked Logic Styles, Latching Strategies and Asynchronous Clocking Techniques.

Outcome
Design of various High speed VLSI Circuits.

Unit I: Non-Clocked and Clocked Logic Styles

Unit II: Circuit Design Margin and Design Variability
Process Induced Variation – Design Induced Variation – Application Induced variation – Noise.
Unit III: Latching Strategies

Unit IV: Interface Techniques

Unit V: Clocking Styles
Clock Jitter and Skew – Clock Generation – Clock Distribution – Single Phase Clocking – Multi-Phase Clocking – Asynchronous Techniques.

Text Book:

Reference Book:

10EC320 MIXED SIGNAL PROCESSING

Credits: 4:0:0

Objective:
To know about the various analog and mixed signal concepts and Behavioral Generic Model of Operational amplifiers.

Outcomes:
Knowledge in Analog and Mixed Signal Extensions to VHDL and VERILOG HDL
Knowledge in Behavioral Generic Model of Operational amplifiers.

Unit I: Introduction

Unit II: Analog and Mixed Signal Extensions To VHDL

Unit III: Analog Extensions to Verilog

Unit IV
Behavioral Generic Model of Operational amplifiers

Unit V: Non-Linear State Space Averaged Modeling of 3-State Digital Phase – Frequency Detector

Text Book:

Reference Books:

10EC321 RF SYSTEM DESIGN
Credits: 4:0:0

Objective:
To know about the RF issues, RF components and applications.

Outcomes:
Knowledge in RF Filter Design and RF Amplifier Design
Knowledge in High frequency Oscillator configuration, Mixers and Phase Locked Loops.

Unit I: RF Issues

Unit II: RF Filter Design
Overview – Basic Resonator and Filter Configuration – Special Filter Realizations – Filter Implementations – Coupled Filter.

Unit III: Active RF Components & Applications

Unit IV: RF Amplifier Designs
Characteristics – Amplifier Power Relations – Stability Considerations – Constant Gain Circles – Constant VSWR Circles – Low Noise Circuits – Broadband – High Power and Multistage
Amplifiers.

**Unit V: Oscillators, Mixers & Applications**
Basic Oscillator Model – High Frequency Oscillator Configuration – Basic Characteristics of Mixers – Phase Locked Loops – RF Directional Couplers and Hybrid Couplers – Detector and Demodulator Circuits – Microwave Integrated Circuits.

**Text Book**

**Reference Books:**

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**10EC322 GENETIC ALGORITHM FOR VLSI DESIGN**

Credits: 4:0:0

**Objective**
To study about Implementation of VLSI Design in GA.

**Outcome**
Design of GA Based Design and Testing.

**Unit I**
Introduction, GA Technology-Steady State Algorithm-Fitness Scaling-Inversion

**Unit II**

**Unit III**

**Unit IV**
Unit V

Text Book:

Reference Books:

10EC323 MEMS AND MICRO SYSTEMS
Credits: 4:0:0

Objective:
To learn about the emerging field of MEMS and Microsystems and understand the concepts involved in realizing various types of Microsensors and actuators using MEMS technology.

Outcome:
Students are expected to learn physical principles involved in micro sensors and design a suitable sensor for a given application.

Unit I : Introduction to MEMS and Microsystems
Introduction to MEMS and Microsystems-Evolution of MEMS- Market survey – Applications of MEMS and various types of MEMS devices – MEMS materials and properties.

Unit II : Microelectronic Technology Applicable to MEMS
Oxidation – Diffusion- Ion-Implantation - Physical Vapor Deposition- Chemical Vapor Deposition-Lithography- Etching, Difference Between Microelectronic Fabrication And MEMS Fabrication, Wafer Bonding, Electroplating, MEMS Packaging, Micromachining.

Unit III: Bulk Micromachining and Surface Micromachining

Unit IV : Scaling and Power in Miniaturized Systems
Scaling of Length, Surface Area and Volume – Scaling and Diffusion – Scaling and Surface Tension – Scaling in Flying and Swimming- Scaling in Electrochemistry- Scaling of Minimal Analytical Sample Size- Scaling In Optics MEMS Batteries And Capacitors- Beam Energy To MEMS- Heat-Powered MEMS- Kinetic Energy Driven MEMS- Combustion Engines In MEMS.

Unit V : MEMS devices

Text Book

Reference Books

10EC324 NANOELECTRONICS

Credits: 4:0:0

Objective:
To Learn About The Various Aspects Of Nanoelectronics. To Understand The Journey From Microelectronics To Nanoelectronics, Various Approaches Of Achieving Nano-Scale Devices.

Outcome:
Students Are Expected To Understand The Physics Behind Nano-Scale Devices And Various Approaches Of Realizing Nanoscale Devices.

Unit I :Introduction to Nanoelectronics

Unit II : Shrink-Down Approaches
CMOS Scaling – Traditional Scaling And Equivalent Scaling – The Nanoscale MOSFET, Vertical MOSFETs – Limits To Traditional Scaling: Technological Limits; Issues In Optical, X-Ray And E- Beam Lithography, Emerging Lithographic Techniques For Nanoscale Fabrication, Device Limits; Leakage Current, Floating Body, Parasitic Signals, Mobility, Equivalent Scaling – High-K Materials – Strained Silicon – FinFETs.

Unit III : Nanoelectronics with Tunneling Devices And Superconducting Device

Unit IV : Molecular Electronics and Single Electron Transistor

Unit V : Nano-Memory Architectures
Single Electron Memory for Terabit Storage – Single Island And Multiple Island Memories – FeRAM – MRAM – NOVORAM.

Text Books

Reference Books

10EC325 ADVANCED SEMICONDUCTOR MEMORIES
Credits: 4:0:0

Objective
This subject deals with the study of recent developments in advanced semiconductor memories like (BSRAM, TSRAM, SDRAM, EDRAM, Floating gate, FRAM, MRAM, Single-electron memory)

Outcome
This subject will help in doing research in advanced memories and its designs

**Unit I : Introduction to Advanced Semiconductor Memories**

**Unit II : High-Performance Dynamic Random Access Memories**

**Unit III : Application-Specific DRAM Architectures And Designs**
Video Rams (VRAM)-Synchronous Graphic RAMS (SGRAMS)-Synchronous Link DRAMS- 3-D Rams-Memory Design Considerations.

**Unit IV : Advanced Non-Volatile Memory Designs And Technologies**

**Unit V : Embedded Memories Designs And Its Applications**
Embedded Memory Developments- Cache Memory Designs-Embedded SRAM/DRAM Designs-DRAM Process With Embedded Logic Architectures-Embedded EEPROM And Flash Memories-Memory Cards And Multimedia Applications.

**Text Book**

**Reference Books**

**10EC326 DESIGNING WITH PLDS AND ASICS**
**CREDITS: 4:0:0**
Objective
To know about different types of PLDs, various families of Xilinx and Physical design of ASICs.

Outcome
Design of Xilinx Series, Application Specific Devices and State Machines

Unit I: Hardware and Mixed Logic Convention:
Gate Hardware – mixed logic as design tools and descriptive convention – Uses of mixed logic in trouble shooting
MSI & LSI Elements Multiplexes – Decoders and demultiplexers – ROM

Unit II: Timing Diagram
Introduction – micro timing diagrams – Hazards – macro timing diagrams - timing simulations - Feedback in combinational circuits

Unit III: PLDs

Unit IV: Designing with Field Programmable Gate Arrays

Unit V: State Charts and Microprogramming

Text Book:

Reference Books:

10EC327 ASIC DESIGN

Credits: 4:0:0

Objective:
To study types of programmable ASICs, ASIC interconnects and Physical design of ASICs.
Outcome:
Knowledge in the complete design flow of ASICs.

Unit I: Introduction to ASICS, CMOS Logic and ASIC Library Design

Unit II: Programmable ASICS, Programmable ASIC Logic Cells And Programmable ASIC I/O Cells

Unit III: Programmable ASIC Interconnect, Programmable ASIC Design Software and Low Level Design Entry

Unit IV: Simulation and ASIC Construction

Unit V: Floorplanning, Placement and Routing
Floor Planning – Placement – Global Routing – Detailed Routing - Circuit Extraction – DRC.

Text Book:

Reference Book

10EC328 DIGITAL ELECTRONICS AND MICROPROCESSORS

Credits: 4:0:0

Objectives:
To understand the concepts of digital circuits
To understand the architecture of microprocessors and methodology of programming

Outcome:
Will be able to design digital circuits and Programming in Microprocessors.
Unit I: Number Systems & Boolean Algebra

Unit II: Combinational Logic Design
half adder, full adder- half subtractor& full subtractor- parallel adder- multiplexers & demultiplexers- implementation of logical functions using multiplexers-encoders & decoders- code converters- parity generator/checker

Unit III: Sequential Logic Design
RS, JK, D&T flip flops- truth table and excitation table of flip flops- shift register- asynchronous & synchronous counters – modulus counters

Unit IV: Microprocessor 8086
Architecture of 8086 – Addressing modes of 8086 – Instruction set - Simple programs

Unit V: Interfacing Techniques
Memory interfacing – I/O interfacing keyboard – Display – Programmable peripheral Interface 8255- Modes of Operation.

Text Books

Reference Books
2. Ramesh S Gaonkar “Microprocessor architecture, Programming and applications with 8085” Penram International, 2006

10EC329 DIGITAL ELECTRONICS AND MICROPROCESSOR LAB
Credits: 0:0:2

10 Experiments will be notified by the HOD from time to time.

10EC330 ELECTRONIC CIRCUITS
Credits: 4:0:0

Objectives:
- The students will be learn the basics of designing a power supply, amplifiers and oscillators
• They will also learn the operation and characters of FET

Outcome:
They will be able to design small circuits such as power supplies, radio circuits etc.

Unit I : Rectifiers and Filters

Unit II : Transistor Biasing and amplifiers

Unit III : Feedback and tuned amplifier

Unit IV : JFET and MOSFET Characteristics
JFET operation - V-I characteristics, transfer characteristics, DC analysis - JFET biasing. Small signal JFET model- Constructional details - Operation of Enhancement and Depletion type MOSFETs , V-I characteristics, Transfer characteristics, analytic expression for drain current, Comparison of PMOS and NMOS devices - MOSFET biasing, MOSFET as a switch, resistor and amplifier, Introduction to CMOS devices.

Unit V : Oscillators and Multivibrators

Text Books

Reference Books

10EC331 ELECTRON DEVICES LAB

Credits: 0:0:2

10 Experiments will be notified by the HOD from time to time.
SCHOOL OF ELECTRICAL SCIENCES
DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING
### ADDITIONAL SUBJECTS

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**10EC401 MEMS AND MICROSENSOR TECHNOLOGY**

**Credit: 4:0:0**

**Objective:**
To learn about the emerging field of MEMS and Microsystems and understand the concepts and technological issues involved in realizing various types of Microsensors and actuators using MEMS technology.

**Outcome:**
Students are expected to learn physical principles involved in micro sensors and design a suitable sensor for a given application.

**Unit-I: Introduction to MEMS and Microsystems**
Introduction to MEMS and Microsystems – Evolution of MEMS – Market survey – Applications of MEMS and various types of MEMS devices.
MEMS materials and properties – Silicon as a substrate material – Crystal structure – Miller Indices – Mechanical properties of silicon – Silicon Compounds – Piezoresistive property in silicon – Piezoelectric property - Polymers

**Unit-II: Microelectronic Technology-I Oxidation, Diffusion and Deposition**
Clean room requirements – Wafer cleaning - Oxidation – Diffusion- Ion-implantation - Physical vapor deposition – Thermal evaporation and sputtering – Metallization –Failure mechanisms in metal interconnects - Chemical vapor deposition techniques: CVD techniques for deposition of polysilicon, silicon dioxide, silicon nitride and metal films – Comparison of CVD techniques.

**Unit-III: Microelectronic Technology-II Lithography and Etching**

**Unit-IV: Bulk Micromachining and Surface Micromachining**
Bulk micromachining: Crystal silicon properties- Wet etching- Isotropic and Anisotropic etching- Issues in wet anisotropic etching- Corner undercutting problem and compensation structures-Real estate consumption issue - Dry etching.
Surface micromachining: Sacrificial layer process, Surface micromachining requirements, Polysilicon surface micromachining, Other compatible materials, Silicon dioxide, Silicon nitride,
Piezoelectric materials, Surface micro machined Systems: Micro motors, Gear trains, Mechanisms - Introduction to LIGA.

**Unit-V: MEMS Devices**

**Text Book**

**Reference Books**

**10EC402 INTEGRATED A/D AND D/A CONVERTERS**

**Credit 4:0:0**

**Objective:**
To learn the various techniques & architectures of D/A & A/D Converters

**Outcome:**
Will be used to develop low power, low voltage, high speed A/D & D/A Converters

**Unit I : Data Converter Fundamentals & Specifications of Converters**
Analog Versus Discrete Time Signals-Converting Analog Signals to Digital Signals-Sample – and –Hold(S/H) Characteristics-Digital data coding-Digital coding schemes-Ideal and Non-ideal converters-DC specifications-Dynamic specifications-Figure of Merit

**Unit II : High Speed A/D Converters & D/A converters**
Design problems in high-speed converters- Full-flash converters-Interpolation-Averaging-Two-step flash converters-Pipeline converter architecture-Folding converter system- High speed D/A converter architecture- Voltage weighting based architecture- High speed segmented converter architecture

**Unit III : High Resolution A/D & D/A converters**
A/D converter-Self-calibrating capacitor A/D converter- Pulse width modulation D/A converters- Integrating D/A converters- Current weighting using ladder networks- Self calibrating D/A converter system- Current calibration principle

Unit IV: Sample-and-hold amplifiers

Unit V: Sigma-delta A/D conversion & Testing of D/A and A/D converters
General form of Sigma-delta A/D converters-General filter architectures-Discussion of basic converter architectures-Multi stage sigma-delta converter (MASH)-Nth order sigma delta architecture- Sigma-delta digital voltmeter- DC testing of D/A converters - Dynamic testing of A/D converters- Testing very high-speed A/D converters

Text Book:

Reference Book:

10EC403 VLSI ARCHITECTURES FOR IMAGE AND VIDEO PROCESSING

Credit: 4:0:0

Objective:
To learn about the image and video compression algorithms and their hardware implementation in VLSI.

Outcome:
Will be able to design practically feasible VLSI chips for image and video algorithms.

Unit I: Fundamentals of Image and Video:

Unit II: Spatio-Temporal Video Sampling and Two-dimensional Motion Estimation
Digital Video Concepts- Sampling Structures for Digital Video – Two- Dimensional Rectangular Sampling - Two- Dimensional Periodic Sampling - Sampling on 3-D Structures -Reconstruction
from Samples - Sampling Structure Conversion-Two-dimensional Motion Estimation-Optical Flow Methods - Block-based Methods - Pixel-based Methods - Bayesian and Mesh Based Methods.

Unit III: VLSI Architecture for DWT & JPEG 2000

Unit IV: Motion Estimation Algorithms and Analysis of Fast Motion Estimation Algorithms.
VLSI Design Methodology for MPEG-4, MPEG – 4 Motion Estimation, Rate/distortion – Optimized Motion Estimation, Fast Motion Estimation Algorithms- Fast Motion Estimation for MPEG -4 - Analysis of PSNR/bit rate and Complexity.

Unit V: Design Space Motion Estimation Architectures and VLSI Implementation.

Text Book

Reference Books
SCHOOL OF ELECTRICAL SCIENCES
## ADDITIONAL SUBJECTS

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11EC201 SOLID STATE CIRCUITS

Credits: 3:1:0

OBJECTIVE
To understand the basic concepts of electronic circuits

OUTCOME
Students will be able to design electronic circuits for various applications

UNIT I
Regulated Power Supplies

UNIT II
Transistor and FET Biasing
Transistor Biasing: Location of the Q point – Fixed bias circuit – Collector to base circuit – Self bias circuit – Graphical DC bias analysis – Design of DC bias circuit- problems . FET biasing - Self biasing – Voltage feedback biasing- Problems

UNIT III
Amplifiers

UNIT IV
Feedback Amplifiers & DC Amplifiers

UNIT V
Oscillators And Tuned Amplifiers

TEXT BOOKS

REFERENCE BOOKS


11EC202 NETWORK ANALYSIS AND SYNTHESIS

Credits 3:1:0

OBJECTIVES
To make the students capable of analyzing any given electrical network
To make the students learn how to synthesize an electrical network from a given impedance/admittance function

OUTCOMES
Students will be able to analyze the various electrical and electronic networks using the techniques they learn
Students will be able to construct a circuit to suit the need

UNIT I
S-Domain Analysis
Network functions for the one port and two port networks – Driving point and transfer functions
– Properties of driving point and transfer functions - Poles and zeros of Network Functions – Significance of poles and zeros -Time domain response from pole zero plots.

UNIT II
Frequency Domain Analysis

UNIT III
Network Topology

UNIT IV
Two Port Networks & Filters
Characterization of two port networks in terms of Z, Y, h, g, T and inverse T parameters – Relations between the network parameters - Network equivalents – Analysis of T, π , ladder and lattice networks - Transfer function of terminated two port networks.
Filters- Design of constant K, m derived and composite filters
UNIT V
Elements of Network Synthesis

TEXT BOOKS


REFERENCE BOOKS


11EC203 SIGNALS AND SYSTEMS

Credit: 3:1:0

OBJECTIVE
To get an in-depth knowledge about signals, systems and the analysis of the same using various transforms

OUTCOME
Students will be able to apply the knowledge obtained to prepare for future developments in the chosen fields

UNIT I
Introduction
Continuous Time (CT) signals – CT signal operations – Discrete Time(DT) signals – Representation of DT signals by impulses – DT signal operations – CT and DT systems – Properties of the systems – Linear Time Invariant(LTI) and Linear Shift Invariant(LSI) Systems

UNIT II
LTI Systems
Continuous and Discrete Convolutions – CT system representations by Differential equations – DT System representations by difference equations. Z transforms – System function algebra and Block Diagram representations – The unilateral Z-transform

UNIT III
Fourier Analysis of CT Signals and Systems

UNIT IV
Sampling and Laplace Transform

UNIT V
Fourier Analysis of DT Signals and Systems

TEXT BOOKS

REFERENCE BOOKS

11EC204 DIGITAL ELECTRONICS

Credits: 3:1:0

OBJECTIVES
To learn about number systems, binary codes basic postulates of Boolean algebra, methods for simplifying Boolean expressions, the formal procedures for the analysis and design of combinational circuits and sequential circuits and the concept of programmable logic devices and logic families.

OUTCOMES
The student will be able to do number conversions and various simplification techniques.
They will be able to design various combinational and sequential circuits and combinational circuit using PLDs

UNIT I
Number Systems & Boolean Algebra

UNIT II
Combinational Logic Design

UNIT III
Flip flops & Synchronous Sequential Logic Design
Level triggering clock and edge triggering clock-RS, JK, D&T flip flops – JK Master–slave flip flop –Excitation tables – Basic models of sequential machines – Concept of State Table – State diagram – State Reduction through Partitioning - Implementation of Synchronous Sequential Circuits- Sequence Detector –Sequence Generator.

UNIT IV
Counters &Registers
Asynchronous Counters- Modulus Counters - Timing Waveforms-Counter Applications.- Synchronous Counters–Synchronous Modulus Counters-Shift Register –Johnson Counter- Ring Counter

UNIT V
Digital Logic Families
Basic structure of PLDS: PAL-PLA-PROM
Implementation of simple combinational circuits using PLDS
LOGIC FAMILIES: TTL families, Schottky Clamped TTL- Emitter Coupled (ECL)- MOS inverter- CMOS Logic Gates -Comparison of performance of various logic families.

TEXT BOOKS

REFERENCE BOOKS

11EC205 DIGITAL COMMUNICATION

Credit: 4:0:0

OBJECTIVE
To learn the fundamental digital modulation techniques and coding schemes for communication

OUTCOME
Knowledge gained will help the student to design an efficient communication system

UNIT I
Fundamental limits on digital communication

UNIT II
Detection and Estimation techniques

UNIT III
Digital Modulation Schemes

UNIT IV
Error control coding
Rationale for Coding- Types of Coding-Linear Block Codes-Syndrome Decoding-Minimum Distance Considerations- Cyclic Codes-Generator Polynomial-Parity Check Polynomial-Encoder Design -Convolution Codes –Maximum Likelihood Decoding of Convolutional Codes-Sequential Decoding of Convolutional Codes.

UNIT V
Spread Spectrum Systems
Modeling - Information Theoretic Limits - Spatial Multiplexing - Space Time Coding - Transit Beam Forming.

TEXT BOOKS


REFERENCE BOOKS


11EC206 COMMUNICATION THEORY AND SYSTEMS

Credits: 4:0:0

OBJECTIVE
To impart the basic concepts of communication systems, transmitter and receiver, analog modulation, demodulation techniques and the effect of noise on signals

OUTCOME
This will enable the student to select the efficient technique to design a communication system

UNIT I
Base Band Signals and Amplitude modulation

UNIT II
Analog Modulation & Demodulation Techniques
UNIT III
AM Transmitters and Receivers

UNIT IV
FM Transmitters and Receivers
FM Transmitter and Receivers: Block diagram of FM transmitter and methods of frequency stabilization – Armstrong FM transmitter system – Pre-emphasis. Block diagram of FM receiver – De-emphasis - Noise and Interference-Thermal and Shot noise-Signal to Noise ratio - Noise figure – Noise temperature - Noise in AM and FM – SSB SC - calculation of output signal to noise ratio - DSBS Calculation of output signal to noise ratio Figure of merit

UNIT V
Multi Access Communication
Digital Communication Techniques- ASK-FSK-PSK. Theory of PM-PDM-PPM-PM obtained from FM-FM obtained from PM- Multiplexing- demultiplexing -SDMA-FDMA-TDMA-CDMA.

TEXT BOOKS

REFERENCE BOOKS

11EC207 C++ AND DATA STRUCTURES

Credits: 3:0:0

OBJECTIVES
To learn the C++ programming language fundamentals: its syntax, properties and styles
To learn object oriented programming concepts
To learn the data structures in c++

OUTCOME
The students will be trained to write their own programs using object oriented programming and data structures.

UNIT I
Objects and Classes
A Simple Class C++ Objects as Physical Objects - C++ Objects as Data Types - Object as function argument Constructors - Copy Constructors, Returning Objects from functions - Structures and Classes - Arrays and Strings.

UNIT II
Operator Overloading
Overloading Unary and Binary Operator - Data Type Conversion and its Pitfalls, Inheritance: Derived Class and Base Class - Derived Class Constructors, Overloading Member Functions-Class Hierarchies - Public and Private Inheritance - Levels of Inheritance - Multiple Inheritance. Pointers: Address and Pointers - Pointers and Arrays - New and Delete Operator - Pointer to Pointer.

UNIT III
Virtual Functions
Virtual Functions- and Polymorphism - Friend Functions Static Functions - this Pointer - Streams and Files: Stream Classes - Stream Errors - Disk File I/O with Streams - File Pointers. Templates and Exception: Function Templates - Class Templates - Exceptions.

UNIT IV
Linked list

UNIT V
Sorting and Searching Techniques
Sorting - Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Heap Sort, Merge Sort. Searching- Linear Search, Binary Search.

TEXT BOOKS

REFERENCE BOOKS
OBJECTIVE
To get knowledge about IC fabrication and applications

OUTCOME
Students will be able to design circuits using ICs

UNIT I
Integrated Circuit Technology

UNIT II
OP-AMP Applications
Rectifiers- Clipper- Clamper- Peak detector- Differentiator and Integrator – Sample & Hold circuit-Log and antilog amplifiers - Multiplier and divider - Instrumentation amplifier, Comparators - Regenerative Comparators - Input output characteristics.

UNIT III
Signal Generators & Voltage Regulator

UNIT IV
Active Filters, Timers And Multipliers

UNIT V
PLL, ADC And DAC
PLL- basic block diagram and operation - capture range and lock range simple applications of PLL - AM detection - FM detection and FSK demodulation. Weighted resistor DAC, R-2R and inverted R- 2R DAC, monolithic DAC - Flash ADC - counter type ADC - successive approximation ADC – dual slope ADC - conversion times of typical ADC.

TEXT BOOKS

REFERENCE BOOKS

11EC209 C++ AND DATA STRUCTURES LABORATORY

Credit: 0:0:2

OBJECTIVE
To learn object oriented programming and data structure programming

OUTCOMES
The students will be able to write the algorithm and flowchart for any object oriented programs
The students will be able to design any object oriented program using data structures

1. Classes and objects
2. Constructors and destructors
3. Operator overloading
4. Data type conversion
5. Inheritance
6. Pointers
7. Virtual functions and polymorphism
8. Friend functions
9. Files
10. Linked list
11. Sorting techniques
12. Searching techniques

11EC210 PULSE AND WAVE SHAPING CIRCUITS

Credits: 4:0:0

OBJECTIVE
To understand the concepts of wave shaping and to design various circuits for any application

OUTCOMES
Will be able design linear and non-linear wave shaping circuits
To apply the fundamental concepts of wave shaping for various switching and signal generating circuits

UNIT I
Linear Wave Shaping Circuits

UNIT II
Karunya University  Department of Electronics and Communication Engineering

**Bistable And Schmitt Trigger Circuits**

**UNIT III**
**Monostable And Astable Circuits**

**UNIT IV**
**Voltage And Current Time Base Generators**

**UNIT V**
**Blocking Oscillator Circuits And Sampling Gates**

**TEXT BOOKS**

**REFERENCE BOOKS**

**11EC211 ANTENNAS AND WAVE PROPAGATION**

**Credits 3:1:0**

**OBJECTIVE**
To understand the applications of the electromagnetic waves in free space

**OUTCOME**
The students will be able to apply the fundamentals to design different types of antennas

**UNIT I**
**Radiation Fields of Wire Antennas**
Concept of Vector Potential-Modification of time varying retarded case. Fields associated with Hertizian dipole-Radiation power, Resistance and Gain of current element- Radiation resistance of elementary dipole with linear current distribution- Radiation from half wave dipole and
quarter wave monopole-Assumed current distribution for wire antennas-Use of Capacitance hat and loading coil for short antennas

UNIT II
Antenna Fundamentals and Antenna Arrays
Definitions: Radiation Intensity-Directive Gain-Directivity-Power gain-Beam width-Band width. Radiation resistance - Gain of half wave dipole - Folded dipole-Reciprocity principle-Effective length and effective area - Relation between gain effective length and radiation resistance
Loop Antennas: Radiation from small loop and its radiation resistance- Radiation from loop with circumference equal to wavelength and resultant circular polarization on axis
Helical Antennas: Normal and axial mode of operation
Antenna Arrays: Expression for electric field from two or three element arrays-Uniform linear array-Method of Pattern multiplication-Binomial array-Image method

UNIT III
Travelling Wave Antennas
Radiation from a Traveling wave on a wire
Rhombic Antenna: Analysis and design
Coupled Antennas: Self and mutual impedance-2 and 3 element Yagi antennas-Log periodic antennas-feeding and transposing of lines- effects of decreasing α.

UNIT IV
Aperture and Lens Antennas
Radiation from Huygen’s source- Radiation from the open end of a coaxial line- Radiation from a rectangular aperture treated as an array of Huygen’s source-Equivalence of fields of Slot and complementary dipole- Relation between dipole and slot impedances. Feeding of slot antennas- Thin slot in an infinite cylinder-Field on E plane horn-Radiation from circular aperture-Beam width and effective area Reflector antennas-Lens antennas-Spherical waves and Biconical antennas

UNIT V
Propagation
Sky wave propagation: Structure of Ionosphere-Effective dielectric constant of ionized region- Refraction-Refractive index-Critical frequency-Skip distance-Effect of earth’s magnetic field- collisions-Max usable frequency-Fading-diversity reception
Space wave propagation: Reflection of polarized waves-Reflection characteristics of earth- Resultant of direct and reflected wave at the receiver-Duct propagation
Ground wave propagation: Attenuation characteristics-Calculation of field strength

TEXT BOOKS

REFERENCE BOOKS
11EC212 TRANSMISSION LINES AND WAVEGUIDES

Credits 4:0:0

OBJECTIVES
To study the fundamental concepts of transmission lines at higher frequencies and also expose the learner to waveguides their types and modes of transmissions

OUTCOME
At the end of the course, the students would be aware of the different parameters and constraints in high frequency transmission of information.

UNIT I
Transmission Line Theory
Different types of transmission lines – Characteristic impedance – The transmission line as a cascade of T-Sections - Propagation Constant - General Solution of the transmission line – The two standard forms for voltage and current of a line terminated by an impedance – physical significance of the equation and the infinite line – The two standard forms for the input impedance of a transmission line terminated by an impedance – reflection coefficient – wavelength and velocity of propagation. Waveform distortion – distortion less transmission line – The telephone cable – Inductance loading of telephone cables - Input impedance of lossless lines – Reflection on a line not terminated by characteristic impedance - Transfer impedance – reflection factor and reflection loss – T and II Section equivalent to lines.

UNIT II
The Line at Radio Frequencies
Standing waves and standing wave ratio on a line – One eighth wave line – The Quarter wave line and impedance matching – the Half wave line. The circle diagram for the dissipationless line – The Smith Chart – Application of the Smith Chart – Conversion from impedance to reflection coefficient and vice-versa - Impedance to Admittance conversion and viceversa – Input impedance of a lossless line terminated by an impedance – Single stub matching and double stub matching.

UNIT III
Guided Waves

UNIT IV
Rectangular Waveguides
UNIT V
Circular Wave Guides and Resonators

TEXT BOOKS
1. J.D. Ryder, “Networks, Lines and Fields”, PHI, New Delhi, 2003. (Unit I & II)

REFERENCE BOOKS

11EC301 CMOS DIGITAL INTEGRATED CIRCUIT DESIGN
CREDITS: 4:0:0
OBJECTIVE
To study the basic concepts of MOS transistors, circuit characterization and performance estimation, CMOS circuit and logic design, Systems design and design methods and CMOS sub system design

OUTCOME
Good understanding of CMOS VLSI design concepts. Ultimately, it is hoped that the course would help to arouse student’s interest in the area of VLSI design.

UNIT I
Introduction to CMOS circuits

UNIT II
Circuit characterization and performance estimation

UNIT III
CMOS circuit and logic design
CMOS Logic Gate Design - Basic Physical Design of Simple Gate - CMOS Logic Structures - Clocking Strategies, I/O Structures - Low Power Design.

UNIT IV
**Systems design and design method**

**UNIT V**
**CMOS sub system design**

**TEXTS BOOK**

**REFERENCE BOOKS**

**11EC302 MODERN DIGITAL COMMUNICATION TECHNIQUES**

**CREDITS: 4:0:0**

**OBJECTIVE**
To understand the various digital communication concepts like coherent and non-coherent- band limited channels- block coded and convolution code and spread spectrum signals.

**OUTCOME**
Understanding of various digital communication techniques. Ultimately it is hoped that the course would help to arouse student’s interest in the area of digital communication.

**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 receivers – 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. Matched filter

**UNIT III**
**Block Coded Digital Communication**
Architecture and performance – Binary block codes; Orthogonal; Biorthogonal; Transorthogonal – Shannon’s channel coding theorem; Channel capacity theorem - Coded BPSK and DPSK demodulators – Linear block codes; Hamming- Cyclic codes- Golay codes- 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 Maximum likelihood- Viterbi algorithm- Sequential decoding; Turbo Coding-BCJR algorithm.

**UNIT V**
**Spread Spectrum Signals for Digital Communication**

**TEXT BOOKS**

**REFERENCE BOOKS**

**11EC303 SOFT COMPUTING**

**CREDITS: 4:0:0**

**OBJECTIVE**
To learn Artificial neural networks- Fuzzy sytems- Neuro Fuzzy modeling and Genetic Algorithm

**OUTCOME**
To understand the concepts of soft computational techniques. The course would help to arouse student’s interest in the application of soft computational techniques to solve various problems.

**UNIT I**
**Artificial Neural Networks**

UNIT II
Unsupervised Networks

UNIT III
Fuzzy Systems

UNIT IV
Neuro-Fuzzy Modeling

UNIT V
Genetic Algorithm

TEXT BOOK

REFERENCE BOOKS

11EC304 DIGITAL IMAGE PROCESSING
CREDITS: 4:0:0

OBJECTIVE:
To study the basics and techniques of digital image processing

OUTCOME:
Students will be able to apply and develop new techniques in the areas of image enhancement-restoration- segmentation- wavelet processing and image morphology.

UNIT I
Fundamentals of Image Processing
Elements of visual perception - Image sensing and acquisition – Sampling and Quantization – Pixel relationships - Color fundamentals and models – Separable image transforms – DFT- DCT - Walsh- Hadamard- Haar – Karhunen Loeve and SVD

UNIT II
Image Enhancement and Restoration

UNIT III
Image Segmentation and Feature Analysis
Edge detection – Edge linking and boundary Detection – Intensity and histogram based image segmentation - Region based segmentations – Contour based segmentation - Motion segmentation - Feature analysis and extraction – spatial techniques for shape and texture feature extraction.

UNIT IV
Multi Resolution- Wavelets and Morphological Processing

UNIT V
Applications of Image Processing

TEXT BOOK

REFERENCE BOOKS

11EC305 APPLIED ELECTRONICS LAB – I

Credits: 0:0:2

(Experiments related to signal processing- communication and digital system design. Using Matlab- Xilinx and ModelSim softwares)

1. Digital Modulation Techniques
2. Spread spectrum estimation
3. Multirate signal processing
4. Power spectrum analysis
5. LMS Algorithm
6. Design of FIR filter
7. Design of combinational circuits in VHDL using packages
8. Design of Counters and shift registers in VHDL using packages
9. Design of ALU in VHDL using packages
10. Design of 4 bit adder using Verilog
11. Design of state diagram using Verilog
12. Design of combinational and sequential circuits using Verilog

11EC306 APPLIED ELECTRONICS LAB - II

Credits: 0:0:2

(Experiments related to image processing and Embedded system. Using Matlab- ARM processor - LINUX platform)

1. Image enhancement in spatial domain
2. Image enhancement in frequency domain
3. Image restoration
4. Edge based segmentation
5. Region based segmentation
6. Wavelet processing
7. Image compression
8. Addition and Subtraction of two Hexadecimal numbers.
9. Multiplication and division of two Hexadecimal numbers.
10. Logical Operations and swapping.
11. ARM-THUMB Interworking.
12. Software Interrupt handler.

11EC307 ANALYSIS AND DESIGN OF ANALOG INTEGRATED CIRCUITS
Credit: 4:0:0
Objective:
To learn about Integrated Circuit Active Devices -opamps-analog multipliers -PLL and Analog Design with MOS Technology.

Outcome:
Students will be able to understand the concepts of active devices and to design various analog circuits.

UNIT I
Analysis of Integrated Circuit Active Devices
Depletion Region Of A PN Junction – Large Signal Behaviour Of Bipolar Transistors- Small Signal Model Of Bipolar Transistor- Large Signal Behaviour Of MOSFET- Small Signal Model Of The MOS Transistors- Short Channel Effects In MOS Transistors – Weak Inversion In MOS Transistors- Substrate Current Flow In MOS Transistor.

UNIT II
Circuit Configuration for Linear IC

UNIT III
Operational Amplifiers
Analysis Of Operational Amplifiers Circuit- Slew Rate Model And High Frequency Analysis- Frequency Response Of Integrated Circuits: Single Stage Amplifier And Multistage Amplifiers Using ZVT And SCT

UNIT IV
Analog Multiplier and PLL
Analysis Of Four Quadrant And Variable Trans Conductance Multiplier- Voltage Controlled Oscillator- Closed Loop Analysis Of PLL- Monolithic PLL Design In Integrated Circuits: Sources Of Noise- Noise Models Of Integrated-Circuit Components – Circuit Noise Calculations – Noise Bandwidth – Noise Figure And Noise Temperature

UNIT V
Analog Design with MOS Technology
MOS Current Mirrors – Simple- Cascode- Current sources: Wilson and Widlar current source – Two stage MOS Operational Amplifiers- with Cascode- MOS Telescopic-Cascode Operational Amplifier – MOS Folded Cascode and MOS Active Cascode Operational Amplifiers

TEXT BOOKS

REFERENCE BOOKS

11EC308 ANALOG VLSI DESIGN

Credit: 4:0:0

Objective:
To learn about Device Modeling- Various types of analog systems- CMOS amplifiers and Comparators.

Outcome:
Students will be able to understand the concepts of analog design and to design various analog systems including data converters- CMOS amplifiers- Comparators and Switched Capacitor Circuits.

UNIT I
Device Modeling

UNIT II
Analog Systems

UNIT III
CMOS Amplifiers

UNIT IV
Comparators

UNIT V
Switched Capacitor Circuits
Switched Capacitor Circuits- Switched Capacitor Amplifiers- Switched Capacitor Integrators- Domain Models of Two-Phase Switched Capacitor Circuits- First-Order Switched Capacitor Circuits- Second-Order Switched Capacitor Circuits- Switched Capacitor Filters.
TEXT BOOK

REFERENCE BOOKS

11EC309 CMOS VLSI DESIGN
Credits: 4:0:0

Objective
To study the basic concepts of MOS transistor- circuit design processes- Combinational Logic Circuits-- Sequential Logic Circuits- Arithmetic Building Blocks- Memory and Array Structures and BiCMOS Logic Circuits.

Outcome
Students are expected to design circuits using different CMOS styles and also to do analysis on CMOS structures.

UNIT I
MOS Transistor Theory

UNIT II
Circuit design processes and characterization

UNIT III
Combinational Logic Design

UNIT IV
Sequential Logic Design

UNIT V
Arithmetic Building Blocks and Memory Design

TEXT BOOKS


REFERENCES BOOKS


11EC310 LOW POWER VLSI DESIGN

Credits 4:0:0
Objective
To study the concepts on different levels of power estimation and optimization techniques.

Outcome
To design chips used for battery-powered systems and high-performance circuits not exceeding power limits.

UNIT I
Simulation Power Analysis
Need For Low Power VLSI Chips- Charging And Discharging Capacitance- Short Circuit Current- Leakage Current- Static Current- Basic Principles of Low Power Design- Gate Level Logic Simulation- Architectural Level Analysis

UNIT II
Circuit and logic level power Estimation
Transistor and Gate Sizing- Equivalent Pin Ordering- Network Reconstructing and Reorganization- Gate Reorganization- Signal Gating- Logic Encoding- State Machine Encoding- Pre-Computation Logic- Power Reduction in Clock Networks- CMOS Floating Node- Low Power Bus- Delay Balancing

UNIT III
Power Estimation
UNIT IV
Circuit Design techniques and SRAM Architecture

UNIT V
Energy recovery and low power latches and Flip Flops

TEXT BOOKS

REFERENCE BOOKS

11EC311 OPTICAL FIBER COMMUNICATION
Credits: 4:0:0

Objective
To learn various types of optical fibers- transmitter and receiver section- and fiber amplifiers

Outcome
Able to establish an efficient optical link.

UNIT I
Fiber Optic Guides
Light wave generation systems- system components- optical fibers- SI- GI fibers- modes- Dispersion in fibers- limitations due to dispersion- Fiber loss- Non linear effects. Dispersion shifted and Dispersion flattened fibers

UNIT II
Optical Transmitters and Receivers
Basic concepts- LED's structures spectral distribution-semiconductor lasers- gain coefficients-modes- Transmitter design- Reciever PIN and APD diodes design- noise sensitivity and degradation.
UNIT III
Light Wave System

UNIT IV
Amplifiers

UNIT V
Dispersion Compensation
Limitations- Post-and Pre-compensation techniques- Equalizing filters- fiber based gratings- Broad band compensation- soliton communication system- fiber soliton- Soliton based communication system design- High capacity and WDM soliton system.

TEXT BOOK

REFERENCE BOOKS

11EC312 MULTIMEDIA COMPRESSION TECHNIQUES
Credits: 4:0:0

Objective
To learn about the various compression techniques for audio signals- video signals and text data.

Outcome
Able to understand the concept of requirement for memory space reduction and motivated to develop efficient algorithms for compression

UNIT I
Introduction

UNIT II
Text Compression

UNIT III
Audio Compression

UNIT IV
Image Compression

UNIT V
Video Compression

TEXT BOOKS

REFERENCE BOOKS

11EC313 MICROWAVE INTEGRATED CIRCUITS

Credits: 4:0:0

Objective
To study the different technologies of microwave integrated circuits and to analyze the microstrip line.

Outcome
It will be helpful to design and fabricate different lumped elements and nonreciprocal components.

UNIT I
Technology of Hybrid Mics & Monolithic Mics

UNIT II
Analysis Of Microstrip Line

UNIT III
Coupled Microstrips- Slot Line and Coplanar Waveguides
Coupled microstrips – even and odd mode analysis – microstrip directional couplers – branch lines couplers – periodic branch line couplers – synchronous branch line couplers.

UNIT IV
Lumped Elements and Non-Reciprocal Components

UNIT V
Microwave Circuit Design
Microwave amplifier Design – Two port power gain- stability -single stage transistor amplifier design- low noise amplifier design- broad band amplifier design. Microwave Oscillator Design-negative resistance oscillator- transistor oscillators design- dielectric resonator oscillator design- oscillator phase noise- Periodic structures- Analysis of infinite- terminated periodic structures – filter design by image parameter method- insertion loss method -Distributed element (transmission line/TEM) filters.

TEXT BOOKS

REFERENCE BOOKS

11EC314 COMMUNICATION LAB-1
Objective
To learn practically about different DSP algorithms- (LMS- RLS- QMF etc) Digital Modulation schemes & antenna design procedures

Objective
Able to understand the DSP algorithms used in communication field
It will be helpful to design different antennas

LAB EXPERIMENTS

Using Matlab(7 experiments)
1. Design and implementation of LMS-RLS and Kalman adaptive filters
   a. to remove noise
   b. estimation of channel
2. Design and implementation of QMF
3. Design and implementation of multistage/multirate system
4. Design and implementation of Digital Modulation Schemes (BPSK-GMSK-QPSK-OFDM)
5. Design and implementation of spread spectrum concepts
6. Implementation of linear, Convolutional and Cyclic codes

Using Hardware (2 experiments)
8. OTDR
9. Connectorization & Splicing

Using FEKO(3 experiments)
10. Design and simulation of Dipole antenna
11. Design and simulation of Horn antenna
12. Study of $\frac{\lambda}{4}$ and $\lambda$ transmission lines

11EC315 COMMUNICATION LAB-II

Credits: 0:0:2

Objective
To learn practically about different microwave components- Routing methods
To Understand Satellite- GSM mobile communication & Software defined radio concepts

Objective
Able to develop different microwave devices and antennas
Able to understand the communication concepts behind satellite communication and Mobile communication
Able to understand network routing procedures

LAB EXPERIMENTS

Using FEKO(3 experiments)
1. S parameter estimation of microwave devices
2. Simulation and implementation of microstrip antennas.
3. Design-implementation and testing of a microstrip coupler.
   Using NS-2 (3 experiments)
4. Creating topology in wireless using CBR and UDP
5. Routing –Unicast and multicast routing
6. Performance analysis in wireless networks
   Using Hardware (2 experiments)
7. MIC characteristics of couplers and filters
8. MIC radiation pattern of antennas
   Using Hardware (4 experiments)
9. Study of CDMA & GPS
10. Satellite Communication
11. GSM Mobile Communication
12. SDR

11EC316 ADVANCED SEMICONDUCTOR MEMORIES

Credits: 4:0:0

Objective
Study of recent developments in advanced semiconductor memories like (BSRAM- TSRAM-

Outcome
Help the students in doing research in advanced memories and its designs.

UNIT I
Static Random Access Memory Technologies:
Basic SRAM Architecture And Cell Structures-SRAM Selection Considerations-High
Performance SRAMS-Advanced SRAM Architectures-Low Voltage SRAM-Bicmos Technology
SRAMS-SOI SRAMS-Specialty SRAMs.

UNIT II
High-Performance Dynamic Random Access Memories:
DRAM Timing Specifications And Operations-DRAM cell capacitor –ESDRAM - Cache
DRAM-Virtual Channel Memory (VCM)DRAM-Multilevel Storage DRAMS.

UNIT III
Application-Specific DRAM Architectures and Designs:
Video RAMS (VRAM)-Synchronous Graphic RAMS (SGRAMS)-Synchronous Link DRAMS-
3-D RAMS-Memory Design Considerations.

UNIT IV
Advanced Non-Volatile Memory Designs and Technologies:
Floating Gate Cell Theory-Flash Memory Architectures-Flash Memory Reliability Issues- Ferroelectric Memories- Magneto Resistive Random Access Memories-Resonant Tunneling Diode-Based Memories-Single-Electron Memories -Phase-Change Non-Volatile Memories

UNIT V
**Embedded Memories Designs And Its Applications:**

**TEXT BOOKS**

**REFERENCE BOOK**

**11EC317 HIGH SPEED SEMICONDUCTOR DEVICES**

**Credits: 4:0:0**

**Objective**
To learn about various high speed devices

**Outcome**
To analyse different materials used in various high speed devices and the factors affecting the performance of high speed devices.

**UNIT I**

**UNIT II**
**Materials for High Speed Devices and Circuits**
such as Carrier Mobility- Velocity Versus Electric Field Characteristics of These Materials. Material and Device Process Technique with These III-V and IV – IV Semiconductors.

UNIT III
MISFET- MESFET and III – V Semiconductor Devices

UNIT IV
High Electron Mobility Transistors (HEMT) & Hetero Junction Bipolar Transistors (HBTS)

UNIT V
High Speed Circuits

TEXT BOOKS

REFERENCE BOOKS

11EC318 NANO CMOS DEVICE ARCHITECTURE

Credits : 4:0:0
Objective
To study the concepts of the nano devices and analyze their characteristics.

Outcome
Successful understanding of the concepts and emerging researchers.

UNIT I
Introduction

UNIT II
Short Channel Effects
Short Channel Effects-Threshold Voltage Roll-off-Drain Induced Barrier Lowering-Punch through-Hot Carrier Degradation Velocity Saturation-Reverse Short Channel Effects-Interconnects.

UNIT III
VLSI Devices

UNIT IV
SOI Devices

UNIT V
Emerging Devices
Resonant Tunneling Diodes-Single-Electron Transistor Logic- other SET and FET Structures-Quantum Dots and Arrays-Carbon Nanotube Transistors (Fets and Sets)- Semiconductor Nanowire (Fets and Sets)- Molecular Sets.

TEXT BOOKS

REFERENCE BOOKS

11EC319 EMBEDDED SYSTEM DESIGN

Credits: 4: 0: 0

Objective
To learn the method of designing a real time systems

Outcome
The course would help to develop a new embedded real system design

UNIT I: Embedded Architecture
Embedded Computers- Characteristics of Embedded Computing Applications- Challenges in Embedded Computing system design- Embedded system design process- Requirements- Specification- Architectural Design- Designing Hardware and Software Components- System Integration- Formalism for System Design- Structural Description- Behavioral Description- Design Example: Model Train Controller

UNIT II Embedded Processor and Computing Platform

UNIT III Networks
Distributed Embedded Architecture- Hardware and Software Architectures- Networks for embedded systems- I2C- CAN Bus- SHARC link ports- Ethernet- Myrinet- Internet- Network Based design- Communication Analysis- system performance Analysis- Hardware platform design- Allocation and scheduling- Design Example: Elevator Controller.

UNIT IV Real Time Characteristics

UNIT V System Design Techniques
TEXT BOOK


REFERENCE BOOKS


11EC320 MEMS AND NANO TECHNOLOGY

Credit: 4:0:0

Objective:
To learn about the emerging fields of MEMS and Nanotechnology and understand the concepts involved in realizing various types of Micro- and nano- devices and their applications.

Outcome:
Students are expected to learn physical principles involved in micro- and nano-sensors and design a suitable sensor for a given application.

UNIT I
Introduction to MEMS and Micro Systems

UNIT II
Microsystem Materials

UNIT III
Microsystem Fabrication Process

UNIT IV
Nanotechnology Basics

UNIT V
Applications of Nanotechnology In Medicines
Nanobiosensors – Electronic Nose – Photo Dynamic Therapy – Molecular Motors – Protein Engineering.
TEXT BOOKS


REFERENCE BOOKS


11EC321 INTEGRATED A/D AND D/A CONVERTERS
Credits: 4:0:0
Objective
To learn the various techniques & architectures of D/A & A/D Converters

Outcome
Will be used to develop low power- low voltage- high speed A/D & D/A Converters

UNIT I
Data Converter Fundamentals & Specifications of Converters
Analog Versus Discrete Time Signals- Converting Analog Signals to Digital Signals-Sample – and –Hold(S/H) Characteristics-Digital data coding-Digital coding schemes-Ideal and Non-ideal converters- DC specifications-Dynamic specifications-Figure of Merit.

UNIT II
High Speed A/D Converters & D/A converters
Design problems in high-speed converters- Full-flash converters- Interpolation- Averaging- Two-step flash converters- Pipeline converter architecture- Folding converter system- High speed D/A converter architecture- Voltage weighting based architecture- High speed segmented converter architecture.

UNIT III
High Resolution A/D & D/A converters

UNIT IV
Sample and hold amplifiers
UNIT V
Sigma-delta A/D conversion & Testing of D/A and A/D converters

TEXT BOOK

REFERENCE BOOKS

11EC322 VLSI ARCHITECTURES FOR IMAGE AND VIDEO PROCESSING

Credits: 4:0:0

Objective
To learn about the image and video compression algorithms and their hardware implementation in VLSI.

Outcome
Will be able to design practically feasible VLSI chips for image and video algorithms.

UNIT I
Fundamentals of Image and Video:

UNIT II
Spatio- Temporal Video Sampling and Two-dimensional Motion Estimation

UNIT III
VLSI Architecture for DWT & JPEG 2000

UNIT IV
Motion Estimation Algorithms and Analysis of Fast Motion Estimation Algorithms.
VLSI Design Methodology for MPEG-4 - MPEG – 4 Motion Estimation - Rate/distortion – Optimized Motion Estimation- Fast Motion Estimation Algorithms- Fast Motion Estimation for MPEG -4 - Analysis of PSNR/bit rate and Complexity.

UNIT V
Design Space Motion Estimation Architectures and VLSI Implementation.

TEXT BOOKS

REFERENCE BOOKS
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<td>12EC340</td>
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<td>Communication Network Security</td>
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<td>Genetic Programming &amp; Particle Swarm Optimization</td>
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<td>Optical Signal Processing</td>
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<td>RF MEMS</td>
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<td>Wavelets and Multi-Resolution Processing</td>
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<td>12EC374</td>
<td>Neural Network for RF and Microwave Design</td>
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12EC101 BASIC ELECTRONICS

Credits: 3:0:0

Course Objective:
- To impart the basic knowledge about the passive components.
- To know about the fundamentals of electronics and some electronic devices.
- To get the knowledge about the various analog communication techniques.

Course Outcome:
- Student get an overview about the basics of electronics.
- Able to get an idea about the communication and some applications in communication.

Unit I
INTRODUCTION TO PASSIVE COMPONENTS AND SEMICONDUCTOR:
Resistors – Types of resistors – colour coding, Capacitors – Types of capacitors, Inductors –
Types of inductors. Covalent bond – N type & P type semiconductor – conduction in
semiconductor.

Unit II
ELECTRONIC DEVICES: PN diode –Application: Half wave rectifier, Zener diode -
Application: Zener Voltage Regulator-Bipolar Junction Transistor - Field Effect Transistors
(JFET, MOSFET) - UJT.

Unit III
DIGITAL ELECTRONICS: Number system – Boolean algebra – logic gates –truth table -
simplification of logic functions using karnaugh map (4 variables), combinational circuit -4 x
1 multiplexer – 1 x 4 demultiplexer

Unit IV
COMMUNICATION SYSTEMS: Basic block of communication system – need for
modulation – types of analog modulation,Derivation of AM and FM signal-Block diagram of
AM and FM transmitter - Superheterodyne receiver.

Unit V
APPLICATION: (Block diagram description only): Principle of Television - Satellite
communication – Radar System - Fibre optic communication- ISDN

Text Book

Reference Books
12EC201 ELECTRON DEVICES

Credits: 4:0:0

Course Objective:
- To understand the mechanisms of current flow in semi-conductors.
- To understand the diode operation and switching characteristics.
- To know about the advanced semiconductor devices and practical applications of devices.

Course Outcome:
- Student will be familiarized with the principle of operation, capabilities and limitation of various electronic devices.
- Able to design practical circuits and to analyze various components.

Unit I

Unit II

Unit III

Unit IV

Unit V

Text Books
Reference Books

12EC202 ELECTRIC CIRCUIT ANALYSIS
Credits: 3:1:0

Course Objectives:
- To understand the basic concepts of electric circuits
- To study the various techniques which can be used to analyse electric circuits
- To understand the nature of the responses of electric circuits

Course Outcome:
- Make the students capable of applying the knowledge of circuit theory in other engineering subjects

Unit I

Unit II
Sinusoidal Steady State Analysis: Phasor- sinusoidal steady state response -concepts of impedance and admittance -analysis of simple circuits- power and power factor -series resonance and parallel resonance – bandwidth and Q factor. Solution of three-phase balanced circuits, Star connected load and delta connected load-power measurements by two wattmeter- solution of three phase unbalanced circuits, Star connected and delta connected load.

Unit III

Unit IV

Unit V
Text Books

Reference Book

12EC203 ELECTROMAGNETIC FIELDS

Credits: 3:1:0

Course Objective:
- To analyze fields and potentials due to static changes
- To evaluate static magnetic fields
- To understand how materials affect electric and magnetic fields
- To understand the relation between the fields under time varying situations
- To understand principles of propagation of uniform plane waves.

Course Outcome:
- The student will be exposed with the concepts, calculations pertaining to electric and magnetic fields
- They will also develop indepth knowledge of understanding the patterns of antennas, microwave devices and Waveguides.

Unit I
INTRODUCTION TO CO-ORDINATE SYSTEMS & VECTOR ALGEBRA:

Unit II
STATIC ELECTRIC FIELD: Coulomb’s Law in Vector Form – Principle of Superposition -Electric Field Intensity – Different cases of existence of electric field - discrete charges – continuous charge distribution - charges distributed uniformly on an infinite and finite line – the axis of a uniformly charged circular disc – an infinite uniformly charged sheet. Electric Scalar Potential – Relationship between potential and Electric field. Potential due to infinite uniformly charged line and electrical dipole - Electric Flux Density – Gauss Law and its applications – Problems on computation of Field Intensity and Flux Density

Unit III
STATIC MAGNETIC FIELD: The Biot-Savart Law in vector form – Magnetic Field intensity due to a finite and infinite wire carrying a current I – Magnetic field intensity on the axis of a circular and rectangular loop carrying a current I – Ampere’scircuital law and simple applications. Magnetic flux density – The Lorentz force equation for a moving charge and applications – Force on a wire carrying a current I placed in a magnetic field – Torque on

Unit IV

Unit V

Text Books

Reference Books

12EC204 MEASUREMENTS AND INSTRUMENTATION

Credits: 3:0:0

Course Objective:
• To make student have a clear knowledge of the instruments, relevant circuits and their working.
• To provide adequate knowledge in electrical instruments and measurements techniques.
• Emphasis is laid on analog and digital techniques used to measure voltage, current, power etc

**Course Outcome:**
• Good understanding of comparison methods of measurements.
• Exposure to various transducers, storage and display devices.

**Unit I**

**Unit II**

**Unit III**

**Unit IV**

**Unit V**

**Text Book**

**Reference Books**

12EC205 DIGITAL ELECTRONICS

Credits: 3:1:0

Course Objectives:
- To learn about number systems, binary codes
- To learn the basic postulates of Boolean algebra, methods for simplifying Boolean expressions
- To study formal procedures for the analysis and design of combinational circuits sequential circuits
- To learn the implementation of digital circuits in programmable logic devices.

Course Outcomes:
- The student will be able to do number conversions and various simplification techniques.
- They will be able to design various combinational and sequential circuits and combinational circuit using PLDs

Unit I

Unit II

Unit III
FLIP FLOPS & SYNCHRONOUS SEQUENTIAL LOGIC DESIGN LATCHES: Level triggering clock and edge triggering clock-Latches- RS, JK, D&T flip flops – JK Master–slave flip flop –Excitation tables – Basic models of sequential machines – Concept of State Table – State diagram – State Reduction through Partitioning - Implementation of Synchronous Sequential Circuits- Sequence Detector –Sequence Generator.

Unit IV
Unit V
DIGITAL LOGIC FAMILIES: Basic structure of PLDS: PAL-PLA-PROM
Implementation of simple combinational circuits using PLDS
LOGIC FAMILIES: TTL families, Schottky Clamped TTL- Emitter Coupled (ECL)- MOS
inverter- CMOS Logic Gates -Comparison of performance of various logic families.

Text Books

Reference Books

12EC206 C++ AND DATA STRUCTURES

Credits: 3:0:0

Course Objective:
• To learn the C++ programming language fundamentals: its syntax, properties and styles
• To learn object oriented programming concepts
• To learn the data structures in C++

Course Outcome:
• The students will be able to write their own programs using object oriented programming and data structures.

Unit I
OBJECTS AND CLASSES: A Simple Class- C++ Objects as Physical Objects - C++ Objects as Data Types - Object as function argument -Constructors - Copy Constructors- Returning Objects from functions - Structures and Classes – Array fundamentals-Initializing arrays-Multidimensional arrays-Array as function arguments-Strings-String variables-String constants-Reading Embedded blanks-Reading multiple lines-Arrays of strings.

Unit II
PRINCIPLES OF OBJECT ORIENTED PROGRAMMING: Overloading Unary and Binary Operator - Data Type Conversion and its Pitfalls- Inheritance: Derived Class and Base Class - Derived Class Constructors-Overloading Member Functions- Class Hierarchies - Public and Private Inheritance - Levels of Inheritance - Multiple Inheritance. Pointers: Address and Pointers - Pointers and Arrays - New and Delete Operator - Pointer to Pointer.

Unit III
ADVANCED OBJECT ORIENTED PROGRAMMING: Virtual Functions and Polymorphism - Friend Functions - Static Functions - this Pointer - Streams and Files: Stream Classes - Stream Errors - Disk File I/O with Streams - File Pointers. Templates and Exception: Function Templates - Class Templates - Exceptions.
Unit IV

Unit V

Text Books

Reference Books

12EC207 SOLID STATE CIRCUITS

Credits: 3:1:0

Course Objective:
- To know about the analysis and design of power supplies.
- To know about the analysis and design of basic transistor Amplifier circuits.
- To understand about the advantages and method of analysis of feedback amplifiers
- To know about the analysis and design of RC and LC oscillators and tuned amplifiers

Course Outcome:
- Students will be able to design simple power supplies and transistor Amplifier circuits.
- Students will be familiarized with the analysis and design of feedback amplifiers, oscillators and tuned amplifiers

Unit I

Unit II
TRANSISTOR AND FET BIASING: Transistor Biasing: Location of the Q point – Fixed bias circuit – Collector to base circuit – Self bias circuit – Graphical DC bias analysis –
Design of DC bias circuit- problems. FET biasing - Self biasing – Voltage feedback biasing- Problems

Unit III

Unit IV

Unit V

Text Books

Reference Books

12EC208 LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

Credits: 3:1:0

Course Objective:
- To get knowledge about IC fabrication
- To learn about IC 741 and its applications
- To learn about IC 555 and its applications

Course Outcome:
- Students will be able to design and analyze circuits using IC 741.
- Students will be able to design and analyze circuits using IC 555

Unit I
Unit II
COMPARATORS AND SIGNAL GENERATORS: Comparators - regenerative comparators - input output characteristics - astable multivibrator -Monostable multivibrator - Triangular wave- generators - RC-phase shift oscillator -Wein’s bridge oscillator.

Voltage Regulator
Series op amp regulator - IC voltage regulator -723 general purpose regulator – Switching Regulator.

Unit III

Unit IV
PLL, ADC AND DAC: PLL- basic block diagram and operation - capture range and lock range simple applications of PLL - AM detection - FM detection and FSK demodulation. Weighted resistor DAC, R-2R and inverted R-2R DAC, monolithic DAC - Flash ADC - counter type ADC - successive approximation ADC - dual slope ADC - conversion times of typical ADC.

Unit V

Text Book

Reference Books

12EC209 NETWORK ANALYSIS AND SYNTHESIS

Credits 3:1:0

Course objectives:
- To make the students capable of analyzing any given electrical network
- To make the students learn how to synthesize an electrical network from a given impedance/admittance function

Course outcomes:
• Students will be able to analyze the various electrical and electronic networks using the techniques they learn
• Students will be able to construct a circuit to suit the need

Unit I
S-DOMAIN ANALYSIS: Network functions for the one port and two port networks – Driving point and transfer functions
– Properties of driving point and transfer functions - Poles and zeros of Network Functions – Significance of poles and zeros - Time domain response from pole zero plots.

Unit II

Unit III

Unit IV
TWO PORT NETWORKS & FILTERS: Characterization of two port networks in terms of Z, Y, h, g, T and inverse T parameters – Relations between the network parameters - Network equivalents – Analysis of T, π, ladder and lattice networks - Transfer function of terminated two port networks. Filters- Design of constant K, m derived and composite filters

Unit V

Text Books

Reference Books

12EC210 COMPUTER ARCHITECTURE

Credits: 3:0:0
**Course Objective:**
- To know about the basic concepts of Computer Organisation.
- Central Processor Organization, Arithmetic operation algorithms, Various Memory Organization
- To study the concepts of parallelism in Processor systems.

**Course Outcome:**
- Good understanding of computer processor, memory and input output organization.
- Knowledge in parallel Processing concepts.

**Unit I**

**Unit II**
**CENTRAL PROCESSOR ORGANIZATION:** General register organization – Stack organization – Instruction formats – Addressing modes – Data transfer and manipulation – Program control – Control memory – Address sequencer – Data path structure - CISC characteristics, RISC Characteristics, RISC pipeline.

**Unit III**
**ARITHMETIC PROCESSING:** Introduction – Addition, Subtraction, Multiplication and Division algorithms – Floating point Arithmetic operations.

**Unit IV**
**MEMORY AND INPUT/OUTPUT ORGANIZATION:** Basic concepts – Memory Hierarchy – Main memory – Auxiliary memory – Associative memory – Cache and Virtual memory concepts – Input – Output interface – Asynchronous Data transfer – Modes of transfer – Direct memory access – I/O processor.

**Unit V**
**INTRODUCTION TO PARALLEL PROCESSING:** Parallelism in Uni-processor systems – Taxonomy of architectures – SISD, SIMD, MISD, MIMD modes of Memory access - shared memory, distributed memory – typical applications.

**Text Books**

**Reference Books**
12EC211 TRANSMISSION LINES AND WAVEGUIDES

Credits: 3:1:0

Course Objective:
- To understand basic terminology in a transmission line and the distortions
- Calculation of various line parameters by conventional and graphical methods.
- To analyze and study the methods of impedance matching.
- To understand principles of Waveguide transmission and resonators.

Course Outcome:
- Student will be familiar with the concepts of transmission lines and theory of waveguides and resonators

Unit I

Unit II

Unit III
IMPEDANCE MATCHING: Impedance Matching - Types of transmission line sections – Half wave line – One eighth wave line – Quarter wave line – Properties of Quarter wave transformer – Baluns — Stub Matching - Single and Double stub matching – Circle Diagram - Smith chart – Impedance and Admittance determination using Smith Chart – Determination of length and location of stub using Smith Chart - Applications of Smith Chart

Unit IV

Unit V
Text Books

Reference Books

12EC212 PULSE AND WAVE SHAPING CIRCUITS

Credits: 4:0:0

Course Objective:
- To understand the concepts of wave shaping.
- To know about the design of various multivibrator circuits.

Course Outcome:
- Students will be able design various linear and non-linear wave shaping circuits.
- Students will be able design various multivibrators, blocking oscillators and time based generators.

Unit I

Unit II

Unit III
Unit IV

Unit V

Text Books

Reference Books

12EC213 COMMUNICATION THEORY

Credits: 4:0:0

Course Objective:
- To study the various analog communication fundamentals
- To study about Amplitude modulation and demodulation, angle modulation and demodulation.
- To learn about Noise performance of various receivers

Course Outcome:
- To provide indepth knowledge of various Amplitude modulation and demodulation systems.
- To provide some depth analysis in noise performance of various receiver.

Unit I

Unit II

Unit III

Unit IV

Unit V
NOISE: Noise and Interference-Thermal and Shot noise-Signal to Noise ratio – Noise-figure – Noise temperature – Noise figure of cascaded stage-Noise in AM and FM – SSB SC calculation of output signal to noise ratio - DSBS Calculation of output signal to noise ratio Figure of merit-SNR calculation of FM.

Text Books

Reference Books

12EC214 SIGNALS AND SYSTEMS

Credits: 3:1:0

Course Objective:
- To impart the basic knowledge about discrete and continuous time signals and systems
- To know about the frequency of continuous time signals and systems using CTFT and Laplace transform.
- To understand the sampling process and frequency analysis of discrete time signals and systems using DTFT and Z transform.
- To study the analysis and synthesis of discrete time systems.
Course Outcome:
- Gain knowledge about signals, systems and the analysis of the same using various transforms.
- Able to apply the knowledge obtained to prepare for future developments in the fields like analog and digital signal processing and communication.

Unit I
Introduction to Signals and Systems: Continuous and Discrete time signals:
Classification of Signals – Periodic and aperiodic – even and odd – energy and power signals – Deterministic and random signals – complex exponential and sinusoidal signals – Unit step, Unit ramp, Unit impulse – Representation of signals in terms of unit impulse – Continuous Time (CT) signals operations – DT signal operations – CT and DT systems: Properties of the systems – Causality and stability of Systems – Linear Time Invariant (LTI) and Linear Shift Invariant (LSI) Systems- Continuous and Discrete Convolutions- Properties of convolution and the interconnection of Systems.

Unit II

Unit III
Discretisation of CT Signals Sampling: Representation of CT signals by samples – Sampling Theorem – Sampling Methods: Impulse, Natural and Flat Top Sampling – Reconstruction of CT signal from its samples – Effect of under sampling – Aliasing Error – discrete time processing of continuous time signals, sampling of band pass signals
MATLAB: Time domain and Frequency domain analysis of Natural sampling, Flat Top sampling and aliasing effect using MATLAB.

Unit IV

Unit V

Text Books

Reference Books

12EC215 MICROPROCESSORS AND INTERFACING TECHNIQUES

Credit: 4:0:0

Course Objective:
- To know about the basic concepts of Computer Organisation.
- To learn about the basics of 8085 and 8086 Microprocessor.
- To introduce the interfacing techniques of peripheral devices.

Course Outcome:
- On successful completion of the subject, students can able to write the assembly language coding using 8085 and 8086 microprocessors.
- Knowledge about memory interfacing, interfacing techniques of peripheral devices.

Unit I

Unit II
8085 MICROPROCESSOR: Organisation of 8085 microprocessor – Addressing modes-Instruction set–Assembly language programming-Timing diagrams – memory interfacing-

Unit III
8086 MICROPROCESSOR: Organisation of 8086 microprocessor – memory segmentation –Address modes in 8086 – Assembly language programming – minimum mode and maximum mode – Bus arbitration in minimum mode and maximum mode.

Unit IV
MICROPROCESSOR INTERFACING TECHNIQUES: Methods of parallel data transfer -Programmable parallel ports-8255 PPI - Input/Output Interface using 8255 -Serial
communication – Asynchronous Synchronous -8251A Programmable communication interface -DMA - Direct memory access - 8237 -Programmable DMA Controller.

Unit V
PROGRAMMABLE PERIPHERAL DEVICES: 8259A Programmable interrupt controller -8279 Programmable Keyboard/display interface - 8253 programmable interval timer -8295 Printer Controller.

Text Books

Reference Books
4. Rafiquzzaman M., "Microprocessor Theory And Applications-Intel And Motorola", PHI, 2002

12EC216 DIGITAL SIGNAL PROCESSING

Credits: 3:1:0

Course Objective:
- To impart the basic knowledge about digital signal processing
- To understand Digital (IIR and FIR) filter design procedures.
- To know about the finite word length effects.
- To study the adaptive filter algorithms and TMS processor.

Course Outcome:
- Gain knowledge about convolution, DTFT, DFT, FFT and digital filter design.
- Able to apply the knowledge obtained to prepare for future developments in the fields digital audio, image and video processing and communication.
- Make use of signal processing concepts in TMS processors

Unit I

Unit II

Unit III

Unit IV

Unit V

Text Book

Reference Books

12EC217 ANTENNAS AND WAVE PROPAGATION

Credits: 3:1:0

Course Objective:
• To understand basic terminology in an antenna
• To analyze fields distribution due to antenna elements
• To design different types of antennas based on its frequency and applications
• To understand principles of different types of propagation of fields
Course Outcome:
- Student will understand the concepts of field distribution, radiation pattern due to an antenna.
- They will be able to design different types of antennas with various frequencies depending on the applications.

Unit I

Unit II
**ANTENNA ARRAYS:** Various forms of antenna arrays - Arrays of point sources - Linear arrays of point sources – Determination of direction of Maxima, direction of Minima and Beam Width for Broadside and Endfire arrays – Collinear - Parasitic arrays - Pattern Multiplication – Binomial arrays – Superdirective arrays - Problems

Unit III

Unit IV
**APERTURE ANTENNAS:** Radiation from Huygen’s Source – Radiation from a rectangular aperture treated as an array of Huygen’s source – Babinet’s Principle – Slot Antennas – Impedance of Slot Antennas – Microstrip Antenna – Horn Antenna – Microwave Antennas - Reflector Antennas – Feed System for Reflectors – Cassegrain Feed – Problems

Unit V
**PROPAGATION:** Sky wave propagation: Structure of ionosphere-Effective dielectric constant of ionized region-Refraction-Refractive index-critical frequency-Skip distance-Effect of earth’s magnetic field-collisions-Max usable frequency-fading-diversity reception
Space wave propagation: Reflection of polarized waves-Reflection characteristics of earth-Resultant of direct and reflected wave at the receiver-Duct propagation
Ground wave propagation: Attenuation characteristics-calculation of field strength

Text Books

Reference Books

12EC218 MICROCONTROLLERS AND APPLICATIONS

Credits 4:0:0

Course Objective:
• To learn about the basics of 8051 microcontrollers.
• To introduce the basics of Motorola 68HC11 and PIC Microcontroller.

Course Outcome:
• On successful completion of the subject, students can able to write the assembly language coding using 8051 microcontrollers.
• Knowledge about Motorola 68HC11 and PIC microcontroller

Unit I
INTEL 8051: Architecture of 8051 -Memory Organization – Register Banks-Bit addressable area – SFR area -Addressing Modes – Instruction Set -Programming examples.

Unit II

Unit III
MOTOROLA 68HC11: 68HC11 features – Different modes of operation and memory map – Functions of I/O ports in single chip and expanded multiplexed mode – Timer system of 68HC11 – Input capture, output compare and pulsed accumulator features of 68HC11.

Unit IV
INTERFACE TECHNIQUES: Serial peripheral interface of 68HC11 - serial communication interface of 68HC11 -Analog to digital conversion features of 68HC11 – Watchdog timer feature.

Unit V

Text Books

References Books

12EC219 DIGITAL COMMUNICATION

Credits: 4:0:0

Course Objective:
- To study pulse modulation and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- To learn baseband pulse transmission, which deals with the transmission of pulse-amplitude, modulated signals in their baseband form.
- To study passband pulse transmission, which deals with digital modulation of data, like ASK, FSK and PSK.
- To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.
- To discuss about the spread spectrum modulation schemes.

Course Outcome:
- Knowledge gained will help the student to design an efficient baseband and passband communication systems.
- Will help the student to understand the coded communication and spread spectrum communication

Unit I

Unit-II
Baseband Pulse Transmission: Matched Filter- Error Rate due to noise – Inter symbol Interference- Ideal Nyquist channel- Raised cosine channels- Pulse Shaping, Nyquist criterion for Distortionless Base band Binary Transmission, Correlative level coding - Base band M-ary PAM transmission -Signalling with duobinary pulses, Adaptive equalization - Eye patterns

Unit III
Passband Data Transmission: Introduction – Pass band Transmission model- Generation, Detection, Signal space diagram, bit error probability and Power spectra of BPSK, QPSK,
FSK and MSK schemes – Differential phase shift keying – Comparison of Digital modulation systems using a single carrier – Carrier and symbol synchronization

Unit IV  

Unit V  

Text Books  

Reference Books  

12EC220 MODERN CONTROL SYSTEMS

Credits: 3:1:0

Course Objective:  
- To teach the fundamental concepts of Control systems and mathematical modeling of the system  
- To study the concept of time response and frequency response of the system  
- To teach the basics of stability analysis of the system

Course Outcome:  
- Students will have the knowledge of mathematical modelling of the system  
- Students will be able to find the response of different order systems for a step input  
- Students will be able to identify the stability of the system

Unit I  
Introduction: Open loop and closed loop systems - transnational and rotational mechanical systems and analogous electrical systems - Basic components of control systems - potentiometer - synchros - tachogenerator - a.c and d.c servo motor – Mathematical
representation – block diagram – signal flow graph and transfer function of electrical systems.

Unit II
Time Response: Time response - step response of first order and second order systems - time domain specifications - type and order of a system - steady state error - static error and generalized error coefficients.

Unit III

Unit IV

Unit V

Text Books

Reference Book

12EC221 ELECTRON DEVICES AND CIRCUITS LAB
Credits: 0:0:2

Course Objective:
• To learn practically about different Electron Devices and its operation.
• They will also learn the basics SPICE software

Course Outcome:
• Students will be able to understand the device characteristics and help them to develop experimental skills.
• Students will be able to do various electronics based projects.

1. Study of CRO
2. Characteristics of PN Junction diode, Zener diode
3. Characteristics of Photo diode
4. Characteristics of BJT
5. Characteristics of Triac
6. Characteristics of SCR
7. Characteristics of UJT
8. Characteristics of FET
9. Verification of Thevenin’s Theorem (Also using PSPICE)
10. Verification of KCL (Also using PSPICE)
11. Verification of KVL (Also using PSPICE)
12. Verification of Superposition Theorem (Also using PSPICE)

**12EC222 DIGITAL ELECTRONICS LAB**

**Credits:** 0:0:2

**Course Objective:**
- To provide hands on experience on the topics studied in Digital Electronics Theory.

**Course Outcome:**
- Students can design, implement and test the practical working module.
- This will enable them to do hardware module of their project.

1. Realization of logic gates using Universal Gates.
2. Half adder & full adder
3. Half subtractor & full subtractor
4. Code conversion
5. Odd and even parity generator and checker
6. Multiplexer & demultiplexer
7. Encoder & decoder
8. Bcd to excess three converter
9. Flip flops
10. Shift register
11. Counters
12. Comparator

**12EC223 C++ AND DATA STRUCTURES LABORATORY**

**Credits:** 0:0:2

**Course Objective:**
- To give hands on training on the fundamentals of object oriented concepts in C++ and data structure programming

**Course Outcome:**
• The students will be able to design and develop their own programs for real world modeling.

1. Classes and objects
2. Constructors and destructors
3. Operator overloading
4. Data type conversion
5. Inheritance
6. Pointers
7. Virtual functions and polymorphism
8. Friend functions
9. Static Functions
10. Linked list
11. Function Template
12. Files

12EC224 ELECTRONICS AND INTEGRATED CIRCUITS LAB

Credits: 0:0:2

Course Objective:
• To learn practically about working of different transistor amplifier circuits and power supply unit.
• Also to learn the use and applications of IC 741 and IC 555.

Course Outcome:
• Students will be able to understand the amplifier characteristics, applications of analog IC’s and help them to develop experimental skills.
• Students will be able to do various electronics based projects and basic PCB fabrication.

Electronics Experiments
1. Half wave & Full wave Rectifiers
2. Voltage Regulator
3. Single stage amplifier
4. Single tuned Amplifier
5. RC Phase shift Oscillator
6. Differential Amplifier

Linear Integrated Circuits Experiments
1. Design of inverting and non-inverting amplifiers
2. Design of Integrator and Differentiator using op amp
3. Design of Astable multivibrator using op amp and 555 IC timer
4. Design of Active filters using op amp
5. Design of Schmitt Trigger using op amp 555 IC timer
6. Design of Digital to analog converter

Any one of these experiments to be implemented in PCB and submitted by end of semester
12EC225 ELECTRONICS AND COMMUNICATION LAB

Credits: 0:0:2

Course Objective:
- To learn practically about working of different multivibrator circuits, wave shaping circuits and modulation and demodulation in communication circuits.

Course Outcome:
- Students will be able to understand the multivibrator characteristics and help them to develop experimental skills.
- Students will understand modulation concepts, basic designing concepts in communication.

1. Clippers And Clampers
2. Schmitt Trigger
3. Astable Multivibrator
4. Monostable Multivibrator
5. Equalizers
6. Attenuators
7. Amplitude Modulation And Demodulation
8. Frequency Modulation
9. Preemphasis and Deemphasis
10. If Amplifier
11. Phase Locked Loop (PLL)
12. Balanced Modulator

12EC226 MICROPROCESSOR LAB

Credits: 0:0:2

Course Objective:
- To learn about microprocessors (8085 & 8086) programming and applications.

Course Outcome:
- Students will develop assembly level programming skills.
- Students will be able to apply interfacing techniques for various applications.

1. Arithmetic operations using 8085
2. Sorting of n-number
3. Searching of n-numbers
4. Block transfer
5. Arithmetic operations using 8086
6. Square wave generation
7. Serial communication
8. Analog to digital Convertor
9. Digital to Analog Converter
10. Stepper motor
11. DC motor
12. 7 segment display

12EC227 DIGITAL SIGNAL PROCESSING LAB

Credits: 0:0:2

Course Objective:
- The course will make extensive use of MATLAB and CCS as an analysis, design, and visualization tool for the techniques of modern digital signal processing that are fundamental to a wide variety of application areas.
- It gives insight to Implementation of fast Fourier transform algorithms and digital filters.

Course Outcome
- Students will be able to apply the knowledge in real-time DSP applications like FIR, IIR filters and FFT.
- Students will gain knowledge on ADSP BS533 and Texas Instrument TMS320C6416/6713 DSK Hardware description of the board, Architecture, Functional Block Diagram, Memory organization, data formats, addressing modes

USING TMS320C 6416/TMS320C 6713/BS533
1. Waveform generation
2. Sampling of input signal and display
3. Implementation of Linear and Circular Convolution
4. Implementation of FFT
5. Implementation of IIR filters
6. Implementation of FIR filters

USING MATLAB/SIMULINK
1. Linear and circular convolution of two sequences
2. Calculation of FFT of a signal
3. Sampling and effect of aliasing
4. Design of IIR filters
5. Design of FIR filters
6. Implementation of Finite word length effects

12EC228 ADVANCED COMMUNICATION LAB

Credits: 0:0:2

Course Objective:
- To know about digital communication concepts and antenna measurements.

Course Outcome:
- Students will understand digital modulation concepts, antenna radiation pattern measurements, RF filters and amplifiers
ANY 12

1. Modulation and Demodulation of PAM, PWM, PPM
2. Digital Modulation techniques (ASK, FSK, PSK, QPSK)
3. Pulse code modulation and demodulation
4. Delta modulation and demodulation
5. RF filters (LPF, HPF, and BPF)
6. RF tuned amplifier/single end diode mixer/double end diode mixer
7. Radiation pattern of parabolic/dipole/yagi uda antenna
8. Inverse square law of propagation and verification of reciprocity theorem
9. Determination of characteristics impedance & dielectric constant of transmission line
10. Measurement of VSWR, Reflection coefficient & return loss of transmission line
11. Study of various wireless topologies
12. Modulation using MATLAB
13. Study of GPS
14. Study on mobile phone communication
15. Study of direct sequence spread spectrum.

12EC229 MICROCONTROLLER LAB

Credits: 0:0:2

Course Objective:

• To learn about microcontroller (8051,68HC11 & PIC controllers) programming and applications.

Course Outcome:

• Students will develop assembly level programming skills.
• Students will be able to apply interfacing techniques for various applications which can be extended to the project level

1. Programs involving Data Transfer instructions
2. Programs involving Arithmetic and Logical operations
3. Programs on Code conversions
4. Programs on ascending/descending order.
5. Stepper motor Interfacing
6. DC Motor Interfacing
7. ADC Interfacing
8. Traffic Light Controller
9. DAC Interfacing
10. Serial Communication
11. Square wave generation.
12. Keyboard Display Interfacing

12EC230 ADHOC NETWORKS

Credits: 3:0:0

Course Objective:
This course covers fundamental principles of ADHOC Networks
To develop a comprehensive understanding of AdHoc network protocols
To understand current and emerging trends in Wireless Networks.

Course Outcome:
This will help the student to design his own wireless network
Students will be able to evaluate the existing network and improve its quality of service

Unit I

Unit II
EFFECTS OF BEACONING & BANDWIDTH EFFICIENT LINK STATE ROUTING:
Motivation- Ad Hoc Wireless Networks-Power Issues- Smart Batteries and Battery Characteristics-Effects of Beaconing on Battery Life- Associativity based Routing- ABR protocol Description-ABR route discovery phase-ABR route deletion phase-Updating routes in wireless networks

Unit III

Unit IV
MULTICASTING IN ADHOC WIRELESS NETWORKS: Multicasting in wired networks-DVMRP-Multicast mesh-CAMP-Group Based-ODMRP-location based-LBM-ABAM-Comparisons of multicast routing protocols.

Unit V
MULTIHOP ADHOC NETWORKS: Real world evaluation of mobile Adhoc networks-Mobile MAN design- integration and experimentation of mobile multi hop ad hoc networks

Text Books

Reference Books
Course Objective:
- To learn about VLSI Design Process, Layout Design, CMOS logic Design styles
- To learn about the sub system design

Course Outcome:
- Students are able to Design various CMOS Design Styles
- Students are able to design different application of digital logic in CMOS

Unit I

Unit II

Unit III
LAYOUT DESIGN RULES: Need for design rules – Mead Conway design rules for the Silicon gate NMOS process CMOS N well / P well design rules – Sheet resistance – Area Capacitance – Wiring Capacitance

Unit IV
LOGIC DESIGN: Switch logic – Gate Logic – Inverter – Two input NAND and NOR gate - Other forms of CMOS logic – Dynamic CMOS logic – Clocked CMOS logic – Precharged domino CMOS logic – Structure Design – Simple combinational logic design examples – Parity generator – Multiplexer – Clocked sequential circuits – 2 Phase clocking – Charge storage – Dynamic Register Element – NMOS and CMOS dynamic shift register

Unit V

Text Books

Reference Books

12EC232 DIGITAL DESIGN USING VHDL

Credits: 3:0:0

Course Objective:
- To learn about the implementation of digital logic in PLDs
- To know about RTL, ABEL
- To learn about different FPGA architectures.
- To learn various VHDL modeling.

Course Outcome:
- Students will be able to write program using RTL, ABEL and VHDL
- They will be able to implement digital logic in PLD

Unit I
PROGRAMMABLE LOGIC DEVICES: Introduction - Programming Technologies - Programmable Read only Memory (PROM or PLE) - Programmable Logic Array (PLA) - Programmable Array Logic (PAL). System Design using PLD’s: Design of Combinational and Sequential circuits using PLD’s.

Unit II

Unit III
FPGA AND CPLD: Semi custom and full custom IC design- Xilinx XC3000 series, Xilinx XC4000 series -Logic cell Array (LCA)-Configurable Logic block (CLB) - Input and output block (IOB) – Programmable Interconnection Point (PIP) – structure of PLD and Complex PLD – Altera 7000 series.

Unit IV

Unit V
DATA FLOW, BEHAVIORAL AND STRUCTURAL MODELING: Concurrent signal assignment – conditional signal assignment – selected signal assignment – concurrent and sequential statements – Data flow, Behavioral and Structural Modeling - Test bench
Text Books

Reference Books

12EC233 COMPUTER COMMUNICATION

Credits: 3:0:0

Course Objective:
- To introduce the concept, terminologies, and technologies used in modern data communication and computer networking.
- To introduce the students the functions of different layers.
- To introduce IEEE standard employed in computer networking.

Course Outcome:
- Students will get familiarized with different protocols and network components.
- They will learn about various IEEE standards.

Unit I

Unit II

Unit III
MEDIUM ACCESS TECHNIQUES: LAN: Ethernet IEEE 802.3, IEEE 802.4, and IEEE 802.5 – IEEE 802.11–FDDI, SONET –Bridges.

Unit IV

Unit V

Text Book

Reference Books

12EC234 MEMS AND NANOELECTRONICS

Credits: 3:0:0

Course Objective:
- To understand the basic concepts of MEMS and Microsystems and the fundamentals of nano electronics.

Course Outcome:
- The students will understand the basic concepts of MEMS and Microsystems the necessity of Micro systems, principle of Microsystems
- They will know the Materials used in Microsystems and the devices in nano electronics.

Unit I

Unit II

Unit III
Unit IV

Unit V

Text Books

Reference Book

12EC235 DIGITAL IMAGE PROCESSING

Credits: 4:0:0

Course Objective:
- To learn the fundamental and various techniques in the field of digital image processing
- Students will learn about various image compression, restoration and enhancement techniques.

Course Outcome:
- Students will develop interest towards digital image processing and take up project work related to this subject.

Unit I

Unit II
Unit III

Unit IV

Unit V
IMAGE ANALYSIS AND COMPUTER VISION: Spatial, Shape and Texture features – Connectivity, Contour following, Edge linking and Heuristic graph searching – Chain codes, Fourier descriptors – Run-length codes, Quad trees – Amplitude thresholding, Region based approaches and Clustering – Decision tree classification

Text Books

Reference Books

12EC236 CELLULAR MOBILE COMMUNICATION

Credits: 3:0:0

Course Objective:
- To learn the fundamental concepts in cellular communication.
- To understand various propagation and signal quality improvement methods for cellular system.
- To learn the different wireless systems and standards.

Course Outcome:
- Able to analyze various generation of cellular system
- Capable to understand traffic and system capacity calculations
- Realize the applications various cellular systems

Unit I
INTRODUCTION TO WIRELESS MOBILE COMMUNICATIONS: History and evolution of mobile radio systems. Types of mobile wireless services/systems- Cellular,

Unit II
**CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS:** Cellular concept and frequency reuse, Multiple Access Schemes, channel assignment and handoff, Interference and system capacity, Trunking and Erlang capacity calculations, Improving coverage and system capacity.

Unit III
**MOBILE RADIO PROPAGATION:** Large scale models-Free space propagation model, Two ray ground reflection model, Durkins model, Factors for small scale fading, Doppler shift, impulse respond models, parameters of mobile multipath channels, types of small scale fading.

Unit IV
**SIGNAL QUALITY IMPROVEMENT METHODS:** Equalization-Linear and non linear, algorithm for adaptive equalization, Diversity, Rake receiver concepts, speech coding- Vocoders, LPC.

Unit V
**WIRELESS SYSTEMS AND STANDARDS:** Wireless networking-CCS, SS7, PCN, Systems and Standards-AMPS, GSM, IS-95, Design issues in personal wireless systems.

**Text Book**

**Reference Books**

**12EC237 SATELLITE COMMUNICATION**

**Credits:** 3:0:0

**Course Objective:**
- To learn the fundamental concept in satellite Communication.
- To understand various satellite orbits and network architecture.
- To learn the working principles of earth station and multiplexing schemes

**Course Outcome:**
- Able to analyze various satellite system
- Capable to understand science behind orbiting satellites
- Realize the applications various satellites

**Unit I**
COMMUNICATION SATELLITE - ORBIT AND DESCRIPTION: Kepler’s laws-Orbital period and velocity – Azimuth and elevation - orbital patterns–Placement of satellite in a geo-stationary orbit – satellite description – transponder subsystem– Telemetry, Command and ranging subsystem – Attitude control and electrical power.

Unit II

Unit III
SATELLITE LINK ANALYSIS AND DESIGN: Basic link analysis – Interference analysis – Carrier to noise plus interference ratio –Terrestrial interference – Cross polarization interference – Adjacent channel and inter symbol interference – Rain Induced attenuation – Path diversity – Up link power control – Rain induced cross polarization interference – Satellite link design – Link without frequency reuse – Link design with frequency reuse.

Unit IV
MULTIPLE ACCESS TECHNIQUES: Frequency Division multiple access (FDMA) – Time division multiple access (TDMA) and code division multiple access (CDMA) – SPADE – Performance comparison of various multiple access schemes.

Unit V
APPLICATIONS AND SERVICES: Very small aperture terminal (VSAT) networks – Technologies & configurations – Mobile satellite (MSAT) networks – Low orbital satellites – Domestic satellite systems-the INSAT System-International systems-INTELSAT / INMARSAT

Text Books

Reference Books

12EC238 BIOMEDICAL INSTRUMENTATION

Credits: 3:0:0

Course Objective:
- To learn about the instrumentations used in biomedical fields
- Also gives the wide knowledge about the study of human functioning system.
- To know about the Clinical measurements of Instrumentation.
Course Outcome:
- Able to analyze the human functioning system in biomedical field.
- Able to get a clear view of surgical equipments
- Awareness of safety hazards in biomedical field

Unit I

Unit II

Unit III
THERAPEUTIC AND SURGICAL EQUIPMENTS: Electro Surgical unit - short wave & microwave diathermy - Laser surgical unit – Anesthesia machine - Pacemakers - Total artificial heart (TAH) - Dialyser - Heart lung machine - Defibrillators - Ventilators - Nerve stimulators - centralized and Bedside patient monitoring system.

Unit IV
BIOCHEMICAL EQUIPMENTS AND ELECTRICAL SAFETY: Flame photometer - spectrophotometer - chromatography- PH, PCO₂ and PO₂ analysis - sterilizers - Electrical safety hazards in hospitals

Unit V
IMAGING SYSTEMS AND TELEMETRY: Computerized tomography (CT) - MRI instrumentation - Ultrasound scanner - X-ray machine - Fluoroscopic techniques - angiography - Echo cardiograph - vector cardiograph - Biotelemetry.

Text Book

Reference Books

12EC239 NEURAL NETWORKS AND FUZZY SYSTEMS

Credits: 3:0:0

Course Objective:
• To learn the concepts and techniques of hybrid neuro fuzzy systems

Course Outcome:
• Will be able to develop new algorithms for real – time classification problems
• Will be able to improve the performance of the existing techniques.
• Will be able to design systems for practical applications.

Unit I

Unit II

Unit III

Unit IV

Unit V
FUZZY LOGIC APPLICATIONS: Fuzzy classification-Fuzzy Pattern Recognition-Fuzzy Control systems-Fuzzy image processing- Fuzzy optimization.

Text Books

Reference Books

12EC240 MICROWAVE & OPTICAL COMMUNICATION LAB

Credits: 0:0:2

Course Objective:
• To learn about the characteristics of microwave and optical devices.
Course Outcome:

- Students will understand about scattering parameter analysis, VSWR, Gain, Bandwidth, Coupling of microwave signals.

A. Microwave Experiments
- 4. Study of Power Distribution in E/H Plane Tee, Magic Tee
- 5. Frequency measurement.
- 6. Impedance measurement by Slotted Line Method.

B. Optical Communication Experiments
- 1. D.C. Characteristics of LED and PIN Photo Diode.
- 2. Optical transmission using Analog Modulation.
- 4. Data transmission through Fiber Optic Link.
- 5. Time Division Multiplexing.
- 6. PI Characteristics of LASER diode.

12EC241 VLSI DESIGN LAB

Credits: 0:0:2

Course Objective:
- To learn the designing and simulation of digital circuits using VHDL program
- To learn the schematic entry of digital circuits using Tanner EDA.

Course Outcome:

- Will be able to design and simulate Digital circuits.
- Will be helpful to do their VLSI based projects.

1. Design and Simulation Half adder and Full adder
2. Design & Simulation simple ALU
3. Design & Simulation of
4. 4x1 Multiplexer & Demultiplexer
5. Design & Simulation of Combinational Circuits
   - Magnitude Comparator
   - 3x8 Encoder
6. Design and Simulation of up-down counter
7. Design & Simulation of flip-flops.
   - JK Flip-flop
   - RS Flip-flop
   - T Flip-flop
   - D Flip-flop
8. Design and Simulation of Memory Module

SIMULATION PROGRAMS
1. Design & Simulation of CMOS Inverter/NAND & NOR.
2. Design & Simulation Half adder & Full adder
3. Design & Simulation of Transmission Gate and Multiplexer using TG
4. Design & Simulation of Boolean Expression & Bi CMOS Logic
5. Design & Simulation of different CMOS Design styles.

**Required Software Tools:**
Xilinx 9.1, Model Sim, Tanner EDA

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**12EC242 DIGITAL SYSTEM DESIGN USING VHDL LAB**

**Credits:** 0:0:2

**Course Objective:**
- To learn the concepts VHDL Program.
- To understand the designing techniques of digital system using VHDL.

**Course Outcome:**
- Can design and verify any digital system using Xilinix 9.1 and modelsim simulator.
- Will be helpful to do their VLSI based projects

1. Design and Simulation Half adder and Full adder
2. Design & Simulation simple ALU
3. Design & Simulation of 4x1 Multiplexer & Demultiplexer
4. Design & Simulation of Combinational Circuits
   - Magnitude Comparator
   - 3x8 Encoder
5. Design and Simulation of up-down counter
   - JK Flip-flop
   - RS Flip-flop
   - T Flip-flop
   - D Flip-flop
7. Design and Simulation of Memory Module
8. Design and simulation of Shift Register
9. Design and simulation of state diagram
10. Design and simulation of BCD to Seven segment display
11. Design and simulation of traffic light controller
12. Design and simulation of vending machine

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**12EC243 MICROWAVE AND OPTICAL COMMUNICATION ENGINEERING**

**Credits:** 4:0:0

**Course Objective:**
- To enable the student to become familiar with optical communication
- Active & passive microwave devices & components.

**Course Outcome:**
- To study optical communication, passive microwave components and their S-Parameters.
- To study Microwave semiconductor devices & applications.
- To study Microwave sources and amplifiers.

Unit I

Unit II

Unit III
**MICROWAVE SOLID STATE DEVICES AND MEASUREMENT:** Microwave diodes – Crystal diode, Schottky diode, Harmonic Mixer; PIN diode – Gunn Diode – Mode of operation - Oscillator Circuit – TRAPAT - IMPATT and BARITT diodes - Mechanism of Operation - Application as Oscillator and Amplifiers - Microwave transistors – Unipolar and Bipolar - Applications. Power measurements – Low and High power measurement, Insertion loss and Attenuation measurement, VSWR - measurement – Low and High VSWR, Impedance measurement - Frequency measurement.

Unit IV

Unit V

**Text Books**
Reference Books

12EC244 MOBILE COMMUNICATION

Credits: 4:0:0

Course Objective:
• To learn the fundamental and emerging trends in Mobile Communication.
• To understand the wireless network/protocol architecture.
• To learn the working principles of Mobile networks

Course Outcome:
• Able to analyze various 3G mobile techniques
• Capable to design wireless protocol architecture
• Able to simulate mobile network structures and routing protocols

Unit I
WIRELESS TRANSMISSION: Frequencies for radio transmission- Signals- Antennas-
Signal Propagation-Multiplexing- Modulation- Spread Spectrum- Cellular Systems-Medium
Access Control: Motivation- SDMA- FDMA- TDMA- CDMA - Comparison

Unit II
TELECOMMUNICATION SYSTEMS: GPRS- GSM- DECT- TETRA-UMTS and IMT-

Unit III
BROADCAST SYSTEMS: Cyclic repetition of data - Digital Audio Broadcasting- Digital
Video Broadcasting Wireless LAN: Infrared VS Radio transmission- Infrastructure and AD-
HOC networks- IEEE 802.11- Hyper LAN- Bluetooth.

Unit IV
WIRELESS ATM: Motivation- Working group- WATM services- reference model-
functions- radio access layer- handover- location management- addressing- quality of service-
access point control protocol - Mobile Network Layer: Mobile IP- Dynamic host
configuration protocol- MANET-Routing Protocols

Unit V
MOBILE TRANSPORT LAYER: Traditional TCP- indirect TCP -snooping TCP - mobile
TCP- fast retransmission/ fast recovery- selective retransmission- transaction oriented TCP -
Support for Mobility: File systems- World Wide Web- Wireless application protocol

Text Books
Reference Books

12EC245 TELEVISION AND VIDEO ENGINEERING
Credits: 3:0:0

Course Objective:
• To impart the knowledge about the fundamentals of television.
• To understand the working of various building blocks of monochrome and colour television.
• To know about the advanced television systems.

Course Outcome:
• Learners will be able to understand the transmission of video signals
• Knowledge about the importance of television standards to effectively work with broadcasting applications.

Unit I

Unit II

Unit III

Unit IV
COLOUR TELEVISION SYSTEMS: NTSC color TV system, PAL-SECAM system color TV system-cancellation of phase errors- PAL-D Colour system PAL coder-PAL-Decoder receiver-chromo signal amplifier-separation of U and V signals, color burst separation-burst phase Discriminator-amplifier ACC-Reference Oscillator-Ident and color killer circuits-U and V demodulators-Colour signal matrixing- Sound in TV.

Unit V
ADVANCED TELEVISION SYSTEMS: Satellite TV technology-Geo Stationary Satellite's Satellite-Electronics-Domestic Broadcast System Cable TV Cable Cable Signal Sources Signal Processing, Distribution & Scrambling-Video Recording VCR Electronics-Video-Home Formats Video disc recording and playback DVD-Players of Teletext signal coding and broadcast Receiver-Digital Television-Transmission and reception-Projection Television Flat Panel display television receivers-LCD and plasma screen receivers- 3DTV EDTV.

Text Books

Reference Books

12EC246 MICROPROCESSOR AND MICROCONTROLLER

Credits: 3:0:0

Course Objective:
- To introduce the architecture and programming of 8085, 8086 microprocessor and 8051 micro controller.
- To introduce the interfacing techniques of peripheral devices.

Course Outcome:
- Learners will be able to write programs using 8085, 8086 microprocessors and 8051 Microcontrollers.
- Knowledge about the interfacing techniques of peripheral devices

Unit I
8085 MICROPROCESSOR: Organization of 8085 microprocessor - Addressing modes-Instruction set – Simple Assembly Language programs.

Unit II

Unit III
MICROPROCESSOR INTERFACING TECHNIQUES: Programmable parallel ports-
8255 PPI - 8251A Programmable communication interface -8279 Programmable
Keyboard/display interface- 8259A Programmable interrupt controller.

Unit IV
MICROCONTROLLER 8051: Organization of 8051 microcontroller - I/O ports - External
memory – Interrupts – Addressing Modes - Instruction set – Simple Assembly language
programs.

Unit V
APPLICATIONS: Counter and Timers of 8051- Serial data input and output of 8051-
Simple applications – Analog to Digital convertor-Stepper motor- DC Motor.

Text Books
1. Ramesh.S.Gaonkar “Microprocessor Architecture, Programming & Applications With

Reference Books

12EC247 MICROPROCESSOR AND MICROCONTROLLER LAB

Credit: 0:0:1

Course Objective:
• To learn about microprocessors and microcontrollers (8085 & 8051) programming
and applications.

Course Outcome:
• Students will develop assembly level programming skills.
• Students will be able to apply interfacing techniques for various applications

(Any 6)
1. Arithmetic operations using 8085
2. Searching of given numbers using 8085
3. Digital to Analog Converter
4. Arithmetic operations using 8051
5. Code conversion using 8051
6. Analog to digital Converter
7. Stepper motor control using 8051
8. DC Motor control using 8051

12EC248 MICRO ELECTRO MECHANICAL SYSTEMS

Credits: 3:0:0

Course Objective:
- To study the fundamentals of fabrication, design and applications of Micro Electro Mechanical Systems (MEMS)
- To introduce the historical background of development of MEMS technology and Micromachining.
- To study the process of surface micromachining.

Course Outcome:
- The students will be able to apply the principles of micro-sensors & micro-actuators in Real Time.

Unit I
MICRO FABRICATION AND BULK MICROMACHINING: Historical background of Micro Electro Mechanical Systems (MEMS) and micromachining – bulk micromachining – isotropic etching and anistropic etching, wafer bonding – high aspect ratio processes (LIGA).

Unit II

Unit III
PHYSICAL MICRO SENSORS: Classification of Physical sensors – Integrated, Intelligent or smart sensors – Sensor principles and examples: Thermal sensors- Electrical sensors- Mechanical sensors-Chemical and Biosensors.

Unit IV

Unit V

Text Books

Reference Books

12EC249 WIRELESS SECURITY

Credits: 3:0:0

Course Objective:
- To examine the various challenges in a wireless network due to active and passive attacks
- To learn various detecting schemes to overcome the security challenges

Course Outcome:
- This helps them to design a wireless network which is free from intrusion and mitigation
- Helps students to design a network with Robust and Ubiquitous security support

Unit I
ATTACKS ON ROUTING PROTOCOLS: Vulnerability of MANET to attack - review of AODV and DSR - type of attack - active and passive - internal and external - behaviour of malicious node - black hole- DoS- Routing table overflow- Impersonation- Energy consumption- Information Disclosure - Misuse type – Misuse goals – Security flaw in AODV -attack on AODV - wormhole and rushing attack

Unit II
INTRUSION DETECTION IN WIRELESS AD HOC NETWORKS: Problem in current IDS techniques - requirements of IDS - classification of IDS – Network and host based – anomaly detection- misuse detection- specification based - intrusion detection in MANETs using distributed IDS and mobile agents - Intrusion resistant routing algorithms.

Unit III

Unit IV
SECURE ROUTING PROTOCOLS: Self organized network layer security in MANETs - on demand secure routing protocol resilient to Byzantine failures – ARIADNE-SEAD.

Unit V
CHALLENGES IN ROUTING SECURITY: Security - Challenges and solutions - Providing Robust and Ubiquitous security support - Denial of service Attack at the MAC layer - Detection and handling of MAC layer Misbehavior.

Text Books

Reference Books

12EC250 FUNDAMENTALS OF NANOSCIENCE

Credits: 3:0:0

Course Objective:
• To make the students understand the importance, relevance and potentialities of this emerging field of study.

Course Outcome:
• Study the basic nano technology and nano science.
• Understand interdisciplinary nature of this field.
• Understand the important role of physics, chemistry, biology.
• Recognize that the rules of nano science are fundamentally different than those we experience.
• Study the basic fabrication strategies of nano science.

Unit I
INTRODUCTION: Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots- nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

Unit II
PREPARATION METHODS: Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

Unit III
PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES: Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma/reactive ion) etching, Etch resists-dip pen lithography

Unit IV
PREPARATION ENVIRONMENTS: Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working Practices, Sample cleaning, Chemical Purification, Chemical and Biological contamination, Safety Issues, Flammable and Toxic Hazards, Biohazards.

Unit V
CHARACTERISATION TECHNIQUES: X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

Text Books

Reference Books

12EC251 BASICS OF MOBILE COMMUNICATION

Credits: 3:0:0

Course Objective:
- To introduce the mobile communication concepts using wireless medium for UG students.
- To introduce the basic concepts of mobile communication systems used under interference parameters
- To understand the concepts of medium to aid propagation in wireless medium.
- To introduce various modulation and mitigation techniques

Course Outcome:
- The students will be able to aware of the concepts of noiseless transmission and enhancement of number of users.

Unit I

Unit II

Unit III

Unit IV

Unit V

Text Books

Reference Books
2. Schiller, “Mobile Communications” Pearson Education Asia Ltd.,2000

12EC252 FUNDAMENTALS OF DIGITAL IMAGE PROCESSING

Credits: 3:0:0

Course Objective:
- To learn the fundamental concepts of Image processing techniques

Course Outcome:
- Can develop simple algorithms for image processing.
- Can use the various techniques involved in Medical applications, etc.

Unit I

Unit II

Unit III
Unit IV
**Image Compression:** Image Compression models – Variable Length Coding: Huffman Coding-Arithmetic coding-LZW Coding-Basics of Image compression standards: JPEG, MPEG.

Unit V
**Morphological Image Processing:** Introduction to Dilation & Erosion – Introduction to Opening & Closing – Basic Morphological Algorithms: Boundary Extraction-Region Filling-Thinning - Thickening

**Text Book**

**Reference Books**

**12EC253 DIGITAL INTEGRATED CIRCUITS**

**Credits:** 3:0:0

**Course Objective**
- To learn the fundamentals of Digital Design concepts

**Course Outcome**
- Able to design simple digital application circuits.

**Unit I**

**Unit II**

**Unit III**
**Digital ICs:** TTL circuits and CMOS circuits - 7400 devices - TTL parameters - AND-OR-invert gate – open collector gates - Three state TTL devices - External drive for TTL loads -
positive and negative logic - CMOS Circuits: E-type MOSFET - MOS inverter - 74C00 CMOS characteristics – TTL/CMOS interface - TTL clock.

Unit IV

Unit V
Memories: Semiconductors Memories: Memory Addressing - ROMs, PROMs, EPROMs, RAMs - DRAMs, memory cells. (In all the five units, trouble-shooting section not included)

Text Book

Reference Book:

12EC254 EMBEDDED SYSTEMS

Credits: 3:0:0

Course Objective:
• To learn about Real time Embedded system, Programming languages and tools

Course Outcome:
• The student will be able to do embedded projects

Unit I

Unit II

Unit III
Real Time Operating Systems: Task and Task States, tasks and data, semaphores and shared Data Operating system Services-Application of Semaphores -Message queues-Timer Function-Events – Memory management

Unit IV
Unit V

Text Books

Reference Books

12EC255 BASIC VLSI DESIGN

Credits: 3:0:0

Course Objective:
- The purpose of this course is to give an exposure to the standard algorithms for VLSI Physical design Automation.

Course Outcome:
- Introduction to VLSI Design Automation Tools
- Students will know various Placement and Routing Algorithms, Floor Planning Algorithms
- Simulation and Logic Synthesis Concepts
- High Level Synthesis

Unit I

Unit II

Unit III

Unit IV
Unit V

Text Book

Reference Book

12EC256 OPTO ELECTRONIC DEVICES

Credits: 3:0:0

Course Objective:
- To learn different types of optical emission, detection, modulation and opto electronic integrated circuits and their applications.

Course Outcome:
- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To learn the principle of optical detection mechanism in different detection devices.
- To understand different light modulation techniques and the concepts and applications of optical switching.
- To study the integration process and application of opto electronic integrated circuits in transmitters and receivers.

Unit I

Unit II

Unit III
Optical Detection Devices: Photo detector - Thermal detector - Photo Devices - Photo Conductors - Photo diodes – Detector Performance.

Unit IV

**Unit V**

**Optoelectronic Integrated Circuits:** Introduction - hybrid and Monolithic Integration - Application of Opto Electronic Integrated Circuits - Integrated transmitters and Receivers - Guided wave devices.

**Text Book**

**Reference Books**

**12EC257 COMMUNICATION ENGINEERING**

**Credits: 3:0:0**

**Course Objective:**
- To introduce the basic concepts of Digital Communication modulation to baseband signals,
- To learn about the fundamental concepts in Mobile communication, Satellite Communication and Optical communication.

**Course Outcome:**
- It will help to enable the student to become familiar with different types of communications services.

**Unit I**


**Unit II**

**Digital Communication:** Review of Sampling Theorem, PAM and TDMA Principles, Quantization, PCM, DPCM and Delta Modulation-Adaptive Delta Modulation

**Unit III**

**Mobile Communication Systems:** Cellular engineering concepts– Frequency Reuse-Channel Assignment, Co-channel interference and Handoff-GSM Architecture.

**Unit IV**

Unit V

Text Book

Reference Books

12EC258 FUNDAMENTALS OF SIGNALS AND SYSTEMS
Credits: 3:0:0

Course Objective:
• It introduces the fundamentals of continuous-time and discrete-time signals as well as systems.
• It also deals with Fourier analysis of signals and systems.

Course Outcome:
• The concepts studied can be applied to real time signal processing.

Unit I
Signals and Systems: Continuous Time (CT) signals – CT signal operations – Representation of CT signals by samples – Sampling Theorem, Discrete Time (DT) signals – Representation of DT signals by impulses – DT signal operations – CT and DT systems – Properties of the systems

Unit II

Unit III

Unit IV

Unit V

Text Books

Reference Book

12EC259 ELECTRON DEVICES LAB

Credits: 0:0:2

Course Objective:
• To learn practically about different Electron Devices and its operation.
• They will also learn the basics SPICE software

Course Outcome:
• Students will be able to understand the device characteristics and help them to develop experimental skills.
• Students will be able to do various electronics based projects.

1. Study of CRO
2. Characteristics of PN Junction diode, Zener diode
3. Characteristics of Photo diode
4. Characteristics of BJT
5. Characteristics of Triac, SCR
6. DC Analysis of Electric Circuits
7. AC Analysis of Electric Circuits
8. Rectifiers
9. Characteristics of UJT, FET
Implementation of the above using PSPICE & Hardware

12EC260 ELECTRONICS AND MICROPROCESSORS
Credits: 4:0:0

Course Objective:
• To learn about various semiconductor devices, transducer and measuring Instruments and microprocessors applications.

Course Outcome:
• On successful completion of the subject, students will be able to analyse basic electronic circuits and write simple microprocessor based programs.

Unit I
Review Of Semiconductor Devices-Electronics Circuits (Qualitative Study Only):

Unit II
Transducer And Measuring Instruments (Qualitative Study Only): Classification- working principle of potentiometer, strain gauges, piezoelectric crystals, thermistors, photodiodes, phototransistors- Study of working principle (using block diagram of multimeters, digital voltmeters, signal generators, CRO)

Unit III
Digital Electronics: Comparison between analog and digital systems-Number representation–Logic gates-Flip-flops- Registers, Counters, Multiplexers, Decoders, and Encoders-Half and full adders, Half and full subtractor.

Unit IV
Introduction to Microprocessor: Block diagram of Microcomputer - Architecture of Intel 8085 - Instruction formats, Addressing methods- types of Instruction - Intel 8085 - Instruction set - Development of simple assembly language programs and examples.

Unit V
I/O Devices: Memory and I/O devices and interfacing RAM, ROM, EPROM - Printers-I/O ports-Key boards- Asynchronous and synchronous data transfer schemes-interrupt driven data transfer- DMA data transfer-Simple applications of Microprocessors.

Text Books

Reference Book

12EC261 ELECTRONICS AND MICROPROCESSOR LAB

Credit: 0:0:1

Course Objective:
• To learn practically about different Electron Devices and its operation, basics of digital circuits and microprocessors.

Course Outcome:
• Students will be able to understand the basics of electronics to do various electronics based projects.

Any 6 experiments
2. Characteristics of zener diode.
3. Study of Half -Wave and Full-Wave rectifier
4. Study of Bridge Rectifiers.
5. Transistors as a Switch and Amplifier
7. Verifications of truth tables of logic gates AND, OR, NOT, NAND exclusive OR.
8. Combination logic realisation: Adder, Subtractor.
9. Sequential logic: Counters, Shift Registers with display devices.
10. Study of Microprocessor Kits.
11. Arithmetic operations on 8085.
13. Display Interface

12EC301 STATISTICAL DIGITAL SIGNAL PROCESSING

Credits: 3:1:0

Course Objective:
• To learn the concepts of signal processing and analyze the statistical properties of signals

Course Outcome:
• Will be able to solve the practical signal applications.

Unit I
Processing by Linear Systems-Simulation of White Noise - Low pass Filtering of White Noise.

**Unit II**


**Unit III**


**Unit IV**


**Unit V**

**Multirate Digital Signal Processing:** Mathematical description of change of sampling rate- Interpolation and Decimation-continuous time model - Direct digital domain approach - Decimation by an integer factor - Interpolation by an integer factor - Single and multistage realization - Poly phase realization - Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

**Text Book**


**Reference Books**


**12EC302 CMOS DIGITAL INTEGRATED CIRCUIT DESIGN**

**Credits:** 4:0:0

**Course objective:**

- To study the basic concepts of MOS transistors,
- Understand circuit characterization and performance estimation
- Know about CMOS circuit and logic design, Systems design and design methods and CMOS subsystem design
Course outcome:
- Good understanding of CMOS VLSI design concepts.
- the course would help to arouse student’s interest in the area of VLSI design.

Unit I

Unit II

Unit III
CMOS circuit and logic design: CMOS Logic Gate Design - Basic Physical Design of Simple Gate - CMOS Logic Structures - Clocking Strategies, I/O Structures - Low Power Design.

Unit IV

Unit V

Texts Book

Reference Books

12EC303 MODERN DIGITAL COMMUNICATION TECHNIQUES

Credits: 4:0:0

Course Objective:
- To understand the various digital communication concepts like coherent and non-coherent- band limited channels
- To analyze block coded and convolution code and spread spectrum signals.
Course Outcome:
- Understanding of various digital communication techniques.
- Understanding spread spectrum signals and its application for digital communication.

Unit I

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. Matched filter

Unit III
Block Coded Digital Communication: Architecture and performance – Binary block codes; Orthogonal; Biorthogonal; Transorthogonal – Shannon’s channel coding theorem; Channel capacity theorem - Coded BPSK and DPSK demodulators – Linear block codes; Hamming-Cyclic codes- Golay codes- Cyclic BCH - Reed –Solomon codes.

Unit IV

Unit V

Text Books

Reference Books
12EC304 MULTIMEDIA COMPRESSION TECHNIQUES

Credits: 4:0:0

Course Objective:
• To learn about the various compression techniques for audio signals, video signals and text data.

Course Outcome:
• Able to understand the concept of requirement for memory space reduction
• Able to develop efficient algorithms for compression

Unit I

Unit II

Unit III

Unit IV

Unit V

Text Book

Reference Books

12EC305 HARDWARE DESCRIPTION LANGUAGES

Credits: 4:0:0

Course Objective:
- To know about the various flow of VHDL and Verilog programming techniques and synthesis

Course Outcome:
- Knowledge in VHDL Programming and Verilog Programming
- Knowledge in synthesizing circuits using HDL

Unit I

Unit II

Unit III

Unit IV

Unit V
Text Books

Reference Books

12EC306 DIGITAL IMAGE PROCESSING

Credits: 4:0:0

Course Objective:
• To study the basics and techniques of digital image processing

Course Outcome:
• Students will be able to apply and develop new techniques in the areas of image enhancement restoration- segmentation- wavelet processing and image morphology.

Unit I

Unit II

Unit III
Image Segmentation and Feature Analysis: Edge detection – Edge linking and boundary Detection – Intensity and histogram based image segmentation - Region based segmentations – Contour based segmentation – Motion segmentation - Feature analysis and extraction – spatial techniques for shape and texture feature extraction.

Unit IV

Unit V

Text Book

Reference Books

12EC307 EMBEDDED SYSTEM DESIGN

Credits: 4: 0: 0

Course Objective:
- To learn the method of designing a real time systems

Course Outcome:
- The course would help to develop a new embedded real system design

Unit I

Unit II

Unit III

Unit IV

Unit V
PBX- System Architecture- Ink jet printer- Hardware Design and Software Design- Personal Digital Assistants- Set-top Boxes.

Text Book

Reference Books

12EC308 HIGH PERFORMANCE NETWORKS

Credits: 4:0:0

Course Objective:
- To study internet protocols, ATM and some advanced networks like optical and wireless network.

Course Outcome:
- It will be helpful to perform different operations in communication networks

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.

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.

Unit III
ATM: Main Features of ATM - Addressing Signaling & Routing - Header Structure – ATM Adaptation layer - Management control - BISDN - Internetworking with ATM

Unit IV
Wireless Networks: Introduction - The wireless channel - Link level design - Channel access - Network design - Wireless Networks - Future and standards

Unit V
Optical Networks: Optical Links - DWDM Systems - Optical Cross Connects – Optical LANs-Optical paths and Networks

Text Book

Reference Books

12EC309 MEMS AND NANO TECHNOLOGY

Credit: 4:0:0

Course Objective:
- To learn about the emerging fields of MEMS and Nanotechnology
- To understand the concepts involved in realizing various types of Micro and nano-devices and their applications.

Course Outcome:
- Students are expected to learn physical principles involved in micro and nano-sensors
- Will be able to design a suitable sensor for a given application.

UNIT I
Introduction to MEMS and Micro Systems

UNIT II
Microsystem Materials

UNIT III
Microsystem Fabrication Process

UNIT IV
Nanotechnology Basics

UNIT V
Applications of Nanotechnology In Medicines
Nanobiosensors – Electronic Nose – Photo Dynamic Therapy – Molecular Motors – Protein Engineering.

Text Books
Reference Books

12EC310 SOFT COMPUTING
Credits: 4:0:0

Course Objective:
• To learn Artificial neural networks- Fuzzy systems- Neuro Fuzzy modeling and Genetic Algorithm

Course Outcome:
• To understand the concepts of soft computational techniques.
• They will be able to apply soft computational techniques to solve various problems.

Unit I

Unit II

Unit III

Unit IV

Unit V
Genetic Algorithm: Fundamentals of genetic algorithm-Mathematical foundations-Genetic modeling-Survival of the fittest - crossover- Inversion and Deletion-mutation-reproduction-
Generational cycle-rank method-rank space method- Other derivative free optimization simulated annealing- Random search- Downhill simplex search- Applications.

Text Book

Reference Books

12EC311 ANALYSIS AND DESIGN OF ANALOG INTEGRATED CIRCUITS

Credits: 4:0:0

Course Objective:
- To learn about Integrated Circuit Active Devices -opamps-analog multipliers -PLL and Analog Design with MOS Technology.

Course Outcome:
- Students will be able to understand the concepts of active devices
- They will be able to design various analog circuits.

Unit I

Unit II

Unit III
Operational Amplifiers: Analysis Of Operational Amplifiers Circuit- Slew Rate Model And High Frequency Analysis- Frequency Response Of Integrated Circuits: Single Stage Amplifier And Multistage Amplifiers Using ZVT And SCT

Unit IV
Analog Multiplier and PLL: Analysis Of Four Quadrant And Variable Trans Conductance Multiplier- Voltage Controlled Oscillator- Closed Loop Analysis Of PLL- Monolithic PLL Design In Integrated Circuits: Sources Of Noise- Noise Models Of Integrated-Circuit Components – Circuit Noise Calculations – Noise Bandwidth – Noise Figure And Noise Temperature
Unit V

Text Books

Reference Books

12EC312 ANALOG VLSI DESIGN

Credits: 4:0:0

Course Objective:
• To learn about Device Modeling- Various types of analog systems- CMOS amplifiers and Comparators.

Course Outcome:
• Students will be able to understand the concepts of analog design
• They will be able to design various analog systems

Unit I
Device Modeling

Unit II
Analog Systems
Unit III
CMOS Amplifiers
Inverters-Differential Amplifiers-Cascode Amplifiers-Current Amplifiers-Output Amplifiers-
High-Gain Amplifier Architectures.

Unit IV
Comparators
Characterization of a Comparator-Two Stage- Open-Loop Comparators-Other Open-Loop
Comparators-Improving the Performance of Open-Loop Comparators –Discrete Time
Comparators- High –Speed Comparators.

Unit V
Switched Capacitor Circuits
Switched Capacitor Circuits- Switched Capacitor Amplifiers- Switched Capacitor
Integrators-z- Domain Models of Two-Phase Switched Capacitor Circuits-First-Order
Switched Capacitor Circuits- Second-Order Switched Capacitor Circuits- Switched Capacitor
Filters.

Text Book

Reference Books
2. Yannis Tsividis, “Mixed Analog – Digital VLSI Device and Technology” World
   scientific publishing Co. Pvt. Ltd., 2002

12EC313 CMOS VLSI DESIGN

Credits: 4:0:0

Course Objective:
• To study the basic concepts of MOS transistor
• To know various circuit design processes and design any Combinational Logic
  Circuits or Sequential Logic Circuits.

Course Outcome:
• Students are expected to design circuits using different CMOS styles and also to do
  analysis on CMOS structures.

Unit I
MOS Transistor Theory: The MOS Structure – The MOS System under External Bias –
Structure and Operation of MOS Transistor (MOSFET) – I_d Versus V_ds Relationships –
MOSFET Scaling and Small-Geometry Effects – MOSFET Capacitances-CMOS Inverter
Characteristics.

Unit II

Unit III

Unit IV

Unit V

Text Books

References Books

12EC314 SEMICONDUCTOR DEVICES AND MODELING

Credits: 4:0:0

Course Objective:
- To learn the physics behind the semiconductor devices
- To study the various device models.
- To understand the BJT, MOSFET and other semiconductor devices from the device perspective.

Course Outcome:
- Clear understanding of semiconductor devices which will help the students in learning the advanced semiconductor devices.

Unit I
Semiconductor Physics

Unit II


Unit III


Unit IV


Unit V

**MOSFET models:** Level-1 model of MOSFET – Level-2 model of MOSFET: Mobility modeling, Sub-threshold current- Channel length modulation- Short channel effect- Velocity saturation- Narrow width Effect- Gate capacitance- Junction capacitances – Level-3 model of MOSFET: Slope discontinuity Gate capacitances, BSIM model.

**Text Book**


**Reference Books**


12EC315 COMPUTER AIDED DESIGN FOR VLSI CIRCUITS

Credits 4:0:0

Course Objective:
• To study the Physical design cycle of VLSI

Course Outcome:
• Knowledge of Placement, Routing ,Simulation ,Synthesis and MCMs is obtained

Unit I

Unit II
Automation Tools and Algorithms

Unit III
Simulation and Synthesis
Simulation – Logic synthesis – Verification – High level synthesis – Compaction.

Unit IV
ASIC Construction, Floorplanning, Placement and Routing

Unit V
Design Automation

Text Books

Reference Book
Course Objective:
- To learn in detail about the fabrication of BJT and MOSFET transistors.

Course Outcome:
- Students are expected to design VLSI circuits by keeping technological process constraints in mind.

Unit I

Unit II

Unit III

Unit IV
Deposition Techniques: Physical Vapor Deposition – Thermal Evaporation and Sputtering – Metallization –Failure Mechanisms in Metal Interconnects - Silicides and Copper Metallization, Chemical Vapor Deposition Techniques: CVD Techniques for Deposition of Polysilicon, Silicon Dioxide, Silicon Nitride and Metal Films – Comparison of CVD techniques.

Unit V

Text Book

Reference Books

12EC317 VLSI DIGITAL SIGNAL PROCESSING

Credits 3:1:0

Course Objective:
- This paper integrates VLSI architecture theory and algorithms,
- It addresses various architectures at the implementation level, and presents several approaches to analysis, estimation, and reduction of power consumption.
- Explains how to design high-speed, low-area, and low-power VLSI systems for a broad range of DSP applications

Course Outcome:
- The students will be able to apply several optimization techniques to improve implementations of several DSP algorithms, using digital signal processors.

Unit I
Iteration Bound & Pipelining / Parallel Processing: Introduction to DSP systems-representations of DSP Algorithms- loop bound and iteration bound- algorithms for computing iteration bound- iteration bound for MRDFG- pipelining and parallel processing of FIR filters- pipelining and parallel processing for low power applications.

Unit II

Unit III
Systolic Array & Fast Convolution Algorithm: Design Methodology- FIR systolic Arrays-Selection of Scheduling Vector- Cook-Toom Algorithm-Winograd Algorithm- Iterated Convolution – Cyclic Convolution.

Unit IV
Scaling And Round Off Noise: State Variable Description of digital filters- Scaling and roundoff noise computation- Bit level arithmetic architectures- parallel multipliers- bit serial multipliers- Canonic Signed Digit Arithmetic- distributed arithmetic

Unit V
Numerical Strength Reducing Techniques: Redundant Arithmetic- Redundant Number Representations- Carry Free Radix-2 Addition and Subtraction-Hybrid Radix 4 Addition- Data Format Conversion- Redundant To Nonredundant Converter- Subexpression Elimination- Multiple Constant Multiplication- Subexpression Sharing In Digital Filters-
Additive and Multiplicative Number Splitting- Synchronous Pipelining and Clocking Styles- Wave Pipelining- Asynchronous Pipelining- Signal Transition Graphs.

Text Book

Reference Books

12EC318 TESTING OF VLSI CIRCUITS

Credits: 4:0:0

Course Objective:
- To know about the various test Generation Algorithms and Fault Simulation Techniques.

Course Outcome:
- Testing of various Memory Modules and Combinational logic Circuits.

Unit I
Introduction: Motivation for testing and design for testability – Faults in digital circuits - Modeling of faults - Logical Fault Models - Fault detection - Fault location - Fault dominance

Unit II

Unit III
Serial, Single-fault propagation, Deductive, Parallel and Concurrent Simulation.

Unit IV
Built In Self Test: Scan-in Scan-out design – Signature analysis - Built-In Self Test - Test pattern generation for BIST - Circular BIST – BIST Architectures - Testable Memory Design - Test algorithms – Test generation for Embedded RAMs

Unit V
Fault Diagnosis: Logic Level Diagnosis - Diagnosis by UUT reduction - Fault Diagnosis for Combinational Circuits - Self-checking design - System Level Diagnosis.

Text Book
Reference Books

12EC319 LOW POWER VLSI DESIGN

Credits 4:0:0

Course Objective:
- To study the concepts on different levels of power estimation and optimization techniques.

Course Outcome:
- To design chips used for battery-powered systems and high-performance circuits not exceeding power limits.

Unit I
Simulation Power Analysis: Need For Low Power VLSI Chips- Charging And Discharging Capacitance- Short Circuit Current- Leakage Current- Static Current- Basic Principles of Low Power Design- Gate Level Logic Simulation- Architectural Level Analysis

Unit II
Circuit and logic level power Estimation: Transistor and Gate Sizing- Equivalent Pin Ordering- Network Reconstructing and Reorganization- Gate Reorganization- Signal Gating- Logic Encoding- State Machine Encoding- Pre-Computation Logic- Power Reduction in Clock Networks- CMOS Floating Node- Low Power Bus- Delay Balancing

Unit III

Unit IV

Unit V
Text Books

Reference Books

12EC320 ADVANCED RADIATION SYSTEMS

Credits: 4:0:0

Course Objective:
- To learn the fundamental of antenna radiation, different types of antenna and its design methodology.

Course Outcome:
- Able to design any type of antenna

Unit I
Concepts of Radiation: Retarded vector potentials – Heuristic approach and Maxwell’s equation approach- The Lorentz gauge condition - Vector potential in Phasor form- Fields radiated by an alternating current element. Total power radiated and radiation resistance- Radiation from Half wave dipole from assumed current distribution- Power radiated in the farfield - Electric vector potential F for a magnetic current source M- Far zone fields due to magnetic source M.

Unit II

Unit III

Unit IV
Unit V

Text Book

Reference Books

12EC321 OPTICAL FIBER COMMUNICATION
Credits: 4:0:0

Course Objective:
- To learn various types of optical fibers- transmitter and receiver section- and fiber amplifiers

Course Outcome:
- Able to establish an efficient optical link.

Unit I
Fiber Optic Guides: Light wave generation systems- system components- optical fibers- SI-GI fibers- modes- Dispersion in fibers- limitations due to dispersion- Fiber loss- Non linear effects. Dispersion shifted and Dispersion flattened fibers.

Unit II
Optical Transmitters and Receivers: Basic concepts- LED's structures spectral distribution- semiconductor lasers- gain coefficients modes- Transmitter design- Receiver PIN and APD diodes design- noise sensitivity and degradation.

Unit III

Unit IV

Unit V
Dispersion Compensation: Limitations- Post-and Pre-compensation techniques- Equalizing filters- fiber based gratings- Broad band compensation- soliton communication system- fiber
soliton- Soliton based communication system design- High capacity and WDM soliton system.

Text Book

Reference Books

12EC322 MULTIMEDIA COMPRESSION TECHNIQUES

Credits: 4:0:0

Course Objective:
- To learn about the various compression techniques for audio signals- video signals and text data.

Course Outcome:
- Able to understand the concept of requirement for memory space reduction and motivated to develop efficient algorithms for compression

Unit I
Introduction

Unit II

Unit III

Unit IV

Unit V


Text Books

Reference Books

12EC323 MOBILE COMMUNICATION NETWORKS

Credits: 4:0:0

Course Objective:
- To learn the fundamental concepts of mobile communication networks

Course Outcome:
- Will be able to design simple communication network in mobile environment

Unit I


Unit II

Propagation Models And Air Protocols: Radio propagation models, error control techniques, handoff, power control, Soft handover, Forward link ,Reverse link , common air protocols (AMPS, IS-95, IS-136, GSM, GPRS, EDGE, WCDMA, cdma2000, etc)

Unit III

Mobile Network Architecture: General Architecture definition, Mobile Terminals (MT, SIM) Radio Section (BTS, BSC) Core Network (MSC, G-MSC, VLR, HLR, AuC)
User and Control Plane Protocol Stack, MAP & SS#7, the Key Role of Signaling Interfaces and Network Entities Relation The Physical Channel, The Logical Channels Terminal, Call and Network Management Procedures, Network Planning.

Unit IV

Unit V

**Text Book**

**Reference Books**

**12EC324 ERROR CONTROL CODING**

**Credits 3:1:0**

**Course Objective:**
- To learn about various error control codes
- To know about the mathematical concepts behind that.

**Course Outcome:**
- To understand life cyclic redundancy codes and convolution codes
- To get a clear concept of different error correcting codes and convolution codes

**Unit I**
**Vector Algebra:** Basics of vector algebra - Galois Filed arithmetic in detail- Implementation of Galois Field Arithmetic.

**Unit II**
**Basic of Cyclic Codes:** BCH Codes, Decoding of BCH Codes- implementation of error correction- Non binary BCH and Reed-Solomon Codes- error detection of binary BCH codes.

**Unit III**
**Error Correcting Codes**
Burst error correcting codes- decoding of single burst error correcting cyclic codes- Fire code interleaved codes- phased burst error correcting codes- Concatenated codes.
Unit IV

**Convolutional Codes:** Covolutional codes- Maximum likelihood decoding of convolutional codes- sequential decoding convolutional codes - stack and fano algorithm- Application of Viterbi decoding.

Unit V

**Turbo Codes:** Turbo codes - Coding - Performance - BCJR algorithm - Applications

Text Book


Reference Books


12EC325 MICROWAVE INTEGRATED CIRCUITS

Credits: 4:0:0

Course Objective:

- To study the different technologies of microwave integrated circuits and to analyze the microstrip line.

Course Outcome:

- It will be helpful to design and fabricate different lumped elements and nonreciprocal components.

Unit I


Unit II


Unit III

**Coupled Microstrips- Slot Line and Coplanar Waveguides:** Coupled microstrips – even and odd mode analysis – microstrip directional couplers – branch lines couplers – periodic branch line couplers – synchronous branch line couplers.

Unit IV

**Lumped Elements and Non-Reciprocal Components:** Design and fabrication using microstrips – flat resistors – flat inductors – interdigital capacitors – sandwich capacitors –

Unit V
Microwave Circuit Design: Microwave amplifier Design – Two port power gain- stability - single stage transistor amplifier design- low noise amplifier design- broad band amplifier design. Microwave Oscillator Design negative resistance oscillator- transistor oscillators design- dielectric resonator oscillator design oscillator phase noise- Periodic structures- Analysis of infinite- terminated periodic structures – filter design by image parameter method- insertion loss method -Distributed element (transmission line/TEM) filters.

Text Books

Reference Books

12EC326 SATELLITE COMMUNICATION

Credits: 4:0:0

Course Objective:
- To learn about the science behind the orbiting satellites, various multiplexing schemes and earth station parameters used for satellite communication.

Course Outcome:
- Able to make one global village.

Unit I
Orbital Parameters: Orbital parameters- Orbital perturbations - Geo stationary orbits- Low Earth and Medium orbits. Frequency selection- Frequency co-ordination and regulatory services- Sun transit outages- Limits of visibility- Attitude and orientation control- Spin stabilisation techniques- Gimbal platform.

Unit II
Link Calculations: Space craft configuration- Payload and supporting subsystems- Satelite uplink -down link power Budget- C/No- G/T- Noise temperature - System noise- Propagation factors- Rain and ice effects- Polarization calculations

Unit III

Unit IV
Earth Station Parameters: Earth station location- propagation effects of ground- High power transmitters-Klystron Crossed field devices- Cassegrania feeds- Measurements on G/T and Eb/No.

Unit V

Text Books

Reference Books

12EC327 APPLIED ELECTRONICS LAB – I

Credits: 0:0:2

Course Objective:

- To provide hands on Training on software related to HDL in Digital System Design
- Use of MATLAB towards communication and signal processing related topics.

Course Outcome:

- To get familiarity in the software.
- Can be applied for project and research.

(Experiments related to signal processing- communication and digital system design. Using Matlab- Xilinx and ModelSim softwares)
1. Digital Modulation Techniques
2. Spread spectrum estimation
3. Multirate signal processing
4. Power spectrum analysis
5. LMS Algorithm
6. Design of FIR filter
7. Design of combinational circuits inVHDL using packages
8. Design of Counters and shift registers inVHDL using packages
9. Design of ALU inVHDL using packages
10. Design of 4 bit adder using Verilog
11. Design of state diagram using Verilog
12. Design of combinational and sequential circuits using Verilog
12EC328 APPLIED ELECTRONICS LAB - II

Credits: 0:0:2

Course Objective:

- To provide hands on Training on image processing tool on MATLAB.
- Use of GNU software for embedded based design.

Course Outcome:

- To get familiarity in the software,which can be applied for project and research.
- Students will be able to apply these software to covert C to assembly language coding

(Experiments related to image processing and Embedded system. Using Matlab- ARM processor
- LINUX platform)
  1. Image enhancement in spatial domain
  2. Image enhancement in frequency domain
  3. Image restoration
  4. Edge based segmentation
  5. Region based segmentation
  6. Wavelet processing
  7. Image compression
  8. Addition and Subtraction of two Hexadecimal numbers.
  9. Multiplication and division of two Hexadecimal numbers.
  10. Logical Operations and swapping.
  11. ARM-THUMB Interworking.
  12. Software Interrupt handler.

12EC329 HDL LABORATORY

Credits 0:0:2

Course Objective:

- To synthesize and simulate various combinational and sequential circuits using
  Xilinx and Model Sim Software.
- To implement the design in Virtex Kits.

Course Outcome:

- Students are able to design various digital circuits using VHDL and Verilog
  language and verify the design.
- Students are also equipped to implement the design in various FPGA Kits like
  Virtex II,Virtex IV kits.

1. Design and Simulation Half adder and Fulladder.
2. Design & Simulation simple ALU
3. Design & Simulation of 4x1 Multiplexer
4. Design & Simulation of Combinational Circuits
   a. Magnitude Comparator
b. 3x8 Encoder

c. Demultiplexer

5. Design and Simulation of up-down counter
   a. JK Flip-flop
   b. RS Flip-flop
   c. T Flip-flop
   d. D Flip-flop
7. Design & Simulation of 32byte Memory Module.

VERILOG PROGRAMS
8. Design and Simulation Half adder and Fulladder
9. Design & Simulation of the following switch level modules:
   a. CMOS Inverter
   b. CMOS NAND Gate

10. Design & Simulation of Combinational Circuits
    a. 8*3 Decoder
    b. 4*1 Multiplexer

11. Design and Simulation of up-down counter
12. Design and Simulation of Clock Generator

12EC330 ASIC DESIGN LABORATORY

Credits: 0:0:2

Course Objective:
• To design digital and analog circuits with aspect ratio for each transistors using Tanner EDA and Mentor Graphics Software.
• To Perform Transient, AC and DC analysis for Analog circuits.
• To verify the backend design by drawing Layout using L-Edit.

Course Outcome:
• Students gain enough skills to choose aspect ratio for each transistor and complete the front end design for digital and analog circuit and this is also useful for their project works.
• After front end verification students are able to perform back end design by drawing Layout.

1. Design and simulation of CMOS logic gates
2. Design and simulation of NMOS inverters and multiplexers.
3. Design and simulation of BICMOS logic gates.
4. Design and simulation of half adders and full adders.
5. Design and simulation of emitter follower and differential amplifier.
6. Design and simulation of switched capacitor circuits.
7. Design and simulation of single stage VCO.
10. Design and simulation of full ASIC Design flow of an inverter.
12. Layout design for CMOS inverter, NAND Gate and nor gate.

Required software tools:
Mentor graphics- design architect, IC station, ELDO simulator, tanner EDA tool-S –edit, S-edit, L-edit.

12EC331 COMMUNICATION LAB-1

Credits: 0:0:2

Course Objective:

- To learn practically about different DSP algorithms- (LMS- RLS- QMF etc) Digital Modulation schemes & antenna design procedures.

Course Outcome:

- Able to understand the DSP algorithms used in communication field.
- It will be helpful to design different antennas.

Using Matlab(7 experiments)
1. Design and implementation of LMS-RLS and Kalman adaptive filters
   a. to remove noise
   b. estimation of channel
2. Design and implementation of QMF
3. Design and implementation of multistage/multirate system
4. Design and implementation of Digital Modulation Schemes (BPSK-GMSK-QPSKOFDM)
5. Design and implementation of spread spectrum concepts
6. Implementation of linear, Convolutional and Cyclic codes

Using Hardware (2 experiments)
8. OTDR
9. Connetcerization & Splicing

Using FEKO(3 experiments)
10. Design and simulation of Dipole antenna
11. Design and simulation of Horn antenna
12. Study of $\lambda/4$ and $\lambda/2$ transmission lines

12EC332 COMMUNICATION LAB-II

Credits: 0:0:2

Course Objective:

- To learn practically about different microwave components- Routing methods.
- To Understand Satellite- GSM mobile communication & Software defined radio concepts.

Course Outcome:

- Able to develop different microwave devices and antennas.
- Able to understand the communication concepts behind satellite communication and Mobile communication.
• Able to understand network routing procedures.

Using FEKO(3 experiments)
1. S parameter estimation of microwave devices
2. Simulation and implementation of microstrip antennas.
3. Design- implementation and testing of a microstrip coupler.

Using NS-2( 3 experiments)
4. Creating topology in wireless using CBR and UDP
5. Routing –Unicast and multicast routing
6. Performance analysis in wireless networks

Using Hardware (2 experiments)
7. MIC characteristics of couplers and filters
8. MIC radiation pattern of antennas

Using Hardware (4 experiments)
9. Study of CDMA & GPS
10. Satellite Communication
11. GSM Mobile Communication
12. SDR

12EC333 C++ AND DATA STRUCTURES
Credits: 3:1:0

Course Objectives:
• To learn the C++ programming language fundamentals: its syntax, properties and styles
• To learn object oriented programming concepts
• To learn the data structures in C++

Course Outcome:
• The students will be trained to write their own programs using object oriented programming and data structures.

Unit I
Objects and Classes: A Simple class- C++ objects as physical objects- C++ Objects and Data types- Object as function argument- constructors- Overloaded Constructors- Copy Constructors- Returning objects from functions- structures and classes- Static class data-const and classes- Array fundamentals-Initializing arrays-Multidimensional arrays-Array as function arguments-Strings-string variables-String constants-Reading Embedded blanks-Reading multiple lines-Arrays of strings.

Unit II
Principles of object oriented programming: Overloading Unary and Binary Operator-Data type conversion and its 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 III
Advanced object oriented programming: Virtual functions and Polymorphism - 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.

Unit IV

Unit V

Text Books

Reference Books

12EC334 HARDWARE-SOFTWARE CO-DESIGN

Credits: 4:0:0

Course Objective:
- To present techniques for the concurrent design, or co-design, of hardware and software.
- Special emphasis will be placed upon methods used for the development of embedded systems that are dedicated to specific applications.

Course Outcome:
- Students will have through knowledge on co-synthesis of Hardware and Software for Embedded Systems.

Unit I
HARDWARE AND SOFTWARE CONCEPTS: Motivation hardware & software co-design- system design consideration- Embedded systems- models of design representation-the virtual machine hierarchy- the performance modeling- Hardware Software development.

Unit II

Unit III
METHODOLOGY FOR CO-DESIGN:Amount of unification- general considerations & basic philosophies- a framework for co-design- Unified representation for Hardware & Software - Benefits of unified representation- modeling concepts-a unified representation.

Unit IV
AN ABSTRACT HARDWARE & SOFTWARE MODEL : Requirements & applications of the models- models of Hardware Software system- an abstract Hardware Software models- Model implementation in ADEPT- generality of the model.

Unit V
PERFORMANCE EVALUATION:Applications of the abstract Hardware & Software model- examples of performance evaluation-object oriented techniques in hardware design- Motivation for object oriented technique- data types- modeling hardware components as classes- designing specialized components- data decomposition- Processor example.

Text Book

Reference Books

12EC335 RISC PROCESSOR ARCHITECTURE AND PROGRAMMING

Credits: 4:0:0

Course Objective:
• To expose the students to the fundamentals of AVR, ARM Architecture and Programming.
• To know about various peripherals of the AVR, ARM processors.

Course Outcome:
• To have thorough knowledge to program RISC Processors.
• To design systems for various applications.

Unit I

Unit II

Unit III

Unit IV

Unit V

Text Books
1. Dhananjay V. Gadre, “Programming and Customizing the AVR Microcontroller”, TMH 2003

Reference Books

12EC336 VLSI FOR WIRELESS COMMUNICATION
Credits: 4:0:0

Course Objective:
- To expose the students to the fundamentals of wireless concept and coding algorithms.
- To impart knowledge on the Transceiver Architecture and OFDM systems.
Course Outcome:
• Students can design VLSI circuits for modern Wireless systems.

Unit I

Unit II

Unit III
TRANSCIEVER ARCHITECTURE AND ISSUES: Receiver Architectures- Superheterodyne receiver- Image rejection receiver--Hartley and Weaver- Zero IF receiver- Low IF receiver- Transmitter architecture- Superheterodyne transmitter- Direct up transmitter- Two-step-up transmitter- Transceiver architectures for modern wireless systems- Case study- LNA- comparison of narrowband and wideband LNA- Wideband LNA design- Narrow band LNA- impedance matching and core amplifier.

Unit IV
OFDM SYSTEM: Principle- propagation characteristics-principle- mathematical model- OFDM baseband signal processing-receiver design- Automatic gain control and DC offset compensation- codesign of Automatic gain control and timing synchronization- codesign of filtering and timing synchronization- Transmit chain setup.

Unit V
ANALOG IMPAIRMENT AND ISSUES: Receiver sensitivity and noise figure- DC offsets- LO leakage- Receiver interferers and intermodulation distortion- Image rejection- Quadrature balance and relation to Image rejection- relation to EVM, Peak to average power ratio- Local oscillator pulling in PLL- effect of phase noise in PLL- Effect of phase noise on OFDM systems- Effect of frequency errors on OFDM systems.

Text Book

Reference Books
12EC337 ANALYSIS AND DESIGN OF MULTIGATE TRANSISTORS

Credits: 4:0:0

Course Objective:
- To impart knowledge on FinFETs and multi-gate transistors in terms of electrostatic integrity and short channel control
- To give knowledge on thin-fin formation techniques and source/drain resistance reduction techniques.
- To discuss radiation effects in advanced single and multi-gate SOI MOSFETs.

Course Outcome:
- Able to design circuits in nanometer range using these multigate devices.

Unit I

Unit II

Unit III
PHYSICS OF THE MULTIGATE MOS SYSTEM: Device electrostatic- double gate MOS system- gate voltage effects-semiconductor thickness effect- asymmetry effects-oxide thickness effect-electron tunnel current-two-dimensional confinement- Silicon multiple gate nanowires.

Unit IV
MOBILITY IN MULTIGATE MOSFETS: Introduction -double gate MOSFETS & FinFETS-. Radiation effects in advanced single & multiple SOI MOSFETS- history of radiation effects in SOI -Total ionizing dose effects - single event effects.

Unit V

Text Book

Reference Book
12EC338 VLSI CIRCUITS FOR BIO-MEDICAL APPLICATIONS

Credits: 4:0:0

Course Objective:
- To give the essential knowledge and techniques for designing VLSI systems for biomedical applications.

Course Outcome:
- Able to design VLSI systems for biomedical applications.

Unit I
INTRODUCTION: Neuro chemical sensing- Neuro potential sensing-Telemetry system-Architecture and VLSI Design-Multimodal electrical and chemical sensing-Prothesis exterior body Unit and wireless link- Body Implantable Unit.

Unit II
CMOS CIRCUITS FOR IMPLANTABLE DEVICES: Inductive link to deliver power to implants-High data rate transmission through inductive links- Energy and bandwidth issues in multi channel-Bio potential recording-Fundamentals of Piezo electric transduction and power delivery-Sub microwatt Piezo powered VLSI circuits-Design and calibration of a complete floating gate sensor array.

Unit III
CMOS CIRCUITS FOR WIRELESS MEDICAL APPLICATIONS: Spectrum regulations for medical use-integrated receiver architecture-Integrated transmit architectures-Radio architecture selection-low noise amplifiers-Mixers-Polyphase filter-Power amplifiers-Phase locked loop-Power dissipation model for RF link with error-correcting codes-encoder implementations and power savings for error correcting codes.

Unit IV

Unit V
NEURO MIMETIC INTEGRATED CIRCUITS: Neuron model for different computation levels of SNNS- Hardware based SNN-Criteria for design strategies of neuro mimetic Ics- Neuro mimetic ASICs.

Text Book

Reference Books

12EC339 EMBEDDED SYSTEMS LABORATORY

Credits: 0:0:2

Course Objective:
- To learn practically about different softwares like (ARM, Microvision 4, Keil C) used for Embedded Systems Design.

Course Outcome:
- Students will be able to design and implement their project and research works using these softwares

1. Arithmetic operation on AVR microcontroller.
2. Square wave generation using AVR timers.
3. Serial communication using AVR serial interrupts.
4. Interfacing LCD display Unit to AVR microcontroller.
5. Interfacing Stepper motor to AVR micro controller.
6. Interfacing DC motor to AVR micro controller.
7. Arithmetic operation on ARM microcontroller.
8. Matrix multiplication on ARM microcontroller.
10. Programs using ADC/DAC of ARM microcontroller
11. Simulate an I2C master or slave device.
12. Program and verify I2C-based memory devices.

12EC340 ADVANCED SEMICONDUCTOR MEMORIES

Credits: 4:0:0

Course Objective:

Course Outcome:
- Help the students in doing research in advanced memories and its designs.

Unit I
**Static Random Access Memory Technologies:** Basic SRAM Architecture And Cell Structures-SRAM Selection Considerations-High Performance SRAMS-Advanced SRAM Architectures Low Voltage SRAM-Bicmos Technology SRAMS-SOI SRAMS-Specialty SRAMs.

Unit II
**High-Performance Dynamic Random Access Memories:** DRAM Timing Specifications And Operations-DRAM cell capacitor –ESDRAM – Cache DRAM-Virtual Channel Memory (VCM)DRAM-Multilevel Storage DRAMS.

Unit III
Application-Specific DRAM Architectures and Designs: Video RAMS (VRAM)-Synchronous Graphic RAMS (SGRAMS)-Synchronous Link DRAMS- 3-D RAMS-Memory Design Considerations.

Unit IV

Unit V

Text Books

Reference Book

12EC341 HIGH SPEED SEMICONDUCTOR DEVICES

Credits: 4:0:0

Course Objective:
- To learn about various high speed devices

Course Outcome:
- To analyse different materials used in various high speed devices and the factors affecting the performance of high speed devices.

Unit I
Silicon Based MOSFET and BJT Circuits for High Speed Operation - Important Parameters of High Speed Performance of Devices: Transit Time of Charge Carriers- Junction Capacitances- ON-Resistances and Their Dependence on The Device Geometry and Size-Carrier Mobility- Doping Concentration and Temperature - Contact Resistance and Interconnection/Interlayer Capacitances in the Integrated Electronic Circuits- Emitter Coupled Logic (ECL) and CMOS Logic Circuits with Scaled Down Devices- Silicon on Insulator (SOI) Wafer Preparation Methods - SOI Based Devices - SOICMOS Circuits for High Speed Low Power Applications.

Unit II

Unit III

Unit IV

Unit V

Text Books

Reference Books

12EC342 NANO CMOS DEVICE ARCHITECTURE

Credits: 4:0:0

Course Objective:
• To study the concepts of the nano devices and analyze their characteristics.
Course Outcome:
- Successful understanding of the concepts and emerging researchers.

Unit I

Unit II
Short Channel Effects: Short Channel Effects-Threshold Voltage Roll-off-Drain Induced Barrier Lowering-Punch through-Hot Carrier Degradation Velocity Saturation-Reverse Short Channel Effects- Interconnects.

Unit III

Unit IV
SOI Devices: Partially Depleted SOI MOSFETs- Fully Depleted SOI MOSFETs -Fully Depleted Collector Mode- Partially Depleted Collector Mode-Accumulation Collector Mode –An Analytic Drain Current Model for Symmetric DG MOSFETS-The Scale Length of Double –Gate MOSFETS- Fabrication Requirements and Challenges of DG MOSFETS-Multiple Gate MOSFETS.

Unit V

Text Books

Reference Books

12EC343 EMBEDDED SYSTEM DESIGN

Credits: 4: 0: 0

Course Objective:
- To learn the method of designing a real time systems
Course Outcome:
- The course would help to develop a new embedded real system design

Unit I

Unit II

Unit III

Unit IV

Unit V

Text Book

Reference Books

12EC344 SMART ANTENNAS

Credits: 4:0:0

Course Objective:
- To introduce the Smart antenna concepts
• To discuss its various array signal processing techniques and methodologies.

**Course Outcome:**
• Students able to gain Good knowledge about smart antenna and its various processing techniques.

**Unit I**
**Introduction:** Antenna gain- Phased array antenna- power pattern- beam steering- degree of freedom- optimal antenna- adaptive antennas- smart antenna -key benefits of smart antenna technology- wide band smart antennas- Digital radio receiver techniques and software radio for smart antennas.

**Unit II**
**Narrow and Broad Band Processing:** Signal model conventional beamformer- null steering beamformer- optimal beamformer- Optimization using reference signal- beam space processing. Tapped delay line structure- Partitioned realization- Derivative constrained processor- Digital beam forming- Broad band processing using DFT method.

**Unit III**
**Adaptive Processing:** Sample matrix inversion algorithm- unconstrained LMS algorithm- normalized LMS algorithm- Constrained LMS algorithm- Perturbation algorithms- Neural network approach- Adaptive beam space processing- Implementation issues.

**Unit IV**

**Unit V**
**Diversity Combining:** Spatial diversity selection combiner- switched diversity combiner-equal gain combiner- maximum ratio combiner- optical combiner.

**Text Books**
1. Lal Chand Godara, "Smart Antennas" CRC press, 2004
2. A. Balanis, "Antenna Theory: Analysis and Design", John Wiley and Sons, 2005

**Reference Books**

**12EC345 INTEGRATED A/D AND D/A CONVERTERS**

**Credits:** 4:0:0

**Course Objective:**
• To learn the various techniques& architectures of D/A & A/D Converters

**Course Outcome:**
• Will be used to develop low power- low voltage- high speed A/D & D/A Converters
Unit I

Data Converter Fundamentals & Specifications of Converters: Analog Versus Discrete Time Signals-Converting Analog Signals to Digital Signals-Sample – and –Hold(S/H) Characteristics-Digital data coding-Digital coding schemes-Ideal and Non-ideal converters-DC specifications-Dynamic specifications-Figure of Merit.

Unit II

High Speed A/D Converters & D/A converters: Design problems in high-speed converters- Full-flash converters-Interpolation-Averaging- Two step flash converters-Pipeline converter architecture-Folding converter system- High speed D/A converter architecture- Voltage weighting based architecture- High speed segmented converter architecture.

Unit III


Unit IV


Unit V


Text Book


Reference Books


12EC346 VLSI ARCHITECTURES FOR IMAGE AND VIDEO PROCESSING

Credits: 4:0:0
Course Objective:
- To learn about the image and video compression algorithms and their hardware implementation in VLSI.

Course Outcome:
- Will be able to design practically feasible VLSI chips for image and video algorithms.

Unit I

Unit II

Unit III

Unit IV
**Motion Estimation Algorithms and Analysis of Fast Motion Estimation Algorithms:** VLSI Design Methodology for MPEG-4 - MPEG – 4 Motion Estimation - Rate/distortion – Optimized Motion Estimation- Fast Motion Estimation Algorithms- Fast Motion Estimation for MPEG -4 - Analysis of PSNR/bit rate and Complexity.

Unit V

Text Books
Reference Books

12EC347 NETWORK ROUTING ALGORITHMS

Credits: 4:0:0

Course Objective:
- To review the routing concept in circuit switching & packet switching networks in general and high speed networks in particular
- To study the routing algorithms of mobile networks in detail

Course Outcome:
- To explore the functionalities of routing algorithms of Wired and Wireless Networks

Unit I

Unit II

Unit III

Unit IV
Non De-Correlating Linear Multi User Detection: Mobility management in Internet - Mobile IP - Routing in cellular networks - hand off and roaming - Introduction to packet radio networks - Routing in small and large sized packet radio networks - Tier and hierarchical routing - Applications and other issues of Mobile Adhoc Networks

Unit V
Decision - Driven Multiuser Detectors: Table driven and On-demand routing protocols- Desitination Sequenced Distance Vector protocol- Clusterhead Gateway Switch Routing protocol- Wireless Routing Protocol - Adhoc Ondemand Distance Vector protocol- Dynamic

Text Books

Reference Books

12EC348 NETWORK MANAGEMENT

Credits: 4:0:0

Course Objective:
• Understand the fundamental concepts of network management
• Exposure to network security aspects

Course Outcome:
• Network Management is a course designed to familiarize the student with the design, analysis operation and management of modern data communications networks.
• The course will provide the student with a working knowledge of the types of communications network management systems and their strengths and weaknesses in solving various information network management problems

Unit I

Unit II
Internet Management (SNMP): SNMP-organizational model-system overview- The information model-communication model- Functional model- SNMP proxy server-Management information- Protocol remote monitoring

Unit III
Unit IV
Network Management Protocols: HTTP-History and standards development-HTTP Session-Request message-Request methods- Status Codes- persistent connections-Secure HTTP-POP4-SDPS-server implementations-SMTP mail processing model-protocol review-outgoing mail SMTP server-FTP/IP-IMAP-original imap2- imap4-advantages over POP-disadvantages of IMAP

Unit V

Text Books

Reference Books

12EC349 GLOBAL POSITIONING SYSTEM
Credits: 4:0:0

Course Objective:
- Introduction to global positioning
- Types of signals used in the GPS systems and accuracy limits
- Latest versions of GPS and its application

Course Outcome:
- The purpose of this course is to develop a strong foundation in the field of Global Positioning Systems.
- The subject gives the students an in-depth knowledge about working of Global positioning receivers.
- Students are exposed to various errors occurring in GPS and latest variant DGPS receivers and GPS applications.

Unit I

Unit II
Signal Characteristics: GPS signal components - purpose, properties and power level - signal acquisition and tracking - Navigation information extraction - pseudorange estimation - frequency estimation – GPS satellite position calculation

Unit III
GPS Receivers & Data Errors: Receiver Architecture - receiver design options - Antenna design - SA errors - propagation errors - Methods of multipath mitigation - Ephemeris data errors - clock errors.

Unit IV

Unit V
GPS Applications: GPS in surveying, Mapping and Navigation - Precision approach Aircraft landing system - Military and Space application - Intelligent transportation system

Text Book

Reference Book

12EC350 DIGITAL COMMUNICATION RECEIVERS
Credits: 4:0:0

Course Objective:
- To learn about base band and band pass communication.
- To study the different types of receivers used in Additive white Gaussian noise channels and Fading channels.
- To study the extraction methods of the signal from AWGN and Fading channel.

Course Outcome:
- The student learns to design a receiver for any given communication channel.

Unit I

Unit II
Optimum Receivers for AWGN Channel: Correlation demodulator matched filter - maximum likelihood sequence detector - optimum receiver for CPM signals - M-ary orthogonal signals - envelope detectors for M-ary and correlated binary signals.

Unit III
Receivers For Fading Channels: Characterization of fading multiple channels - statistical models - slow fading - frequency selective fading - diversity technique - RAKE demodulator - coded waveform for fading channel.

Unit IV
Synchronization Techniques: Carrier and signal synchronization - carrier phase estimation-PLL - Decision directed loops - symbol timing estimation - maximum likelihood and non-decision directed timing estimation - joint estimation.

Unit V

Echo cancellation

Text Book

Reference Books

12EC351 OPTICAL NETWORKS & PHOTONIC SWITCHING

Credits: 4:0:0

Course Objective:
- Various components of optical networks
- First generation and broadcast optical network
- Wavelength routed optical networks also various photonic switches

Course Outcome:
- The main purpose of this course is to introduce students the important areas of communication networks, mainly optical networks and photonic switching.
- This will enable the students to acquire a solid understanding of foundations of optical networks technologies, systems, networks issues as well as economic deployment considerations and also photonic switching

Unit I

Unit II
Technology: Propagation of light energy in optical fibers dispersion and non linear effects; components - couplers - isolators - circulators - multiplexers - filters and optical amplifiers; switches and wavelength converters.
Unit III
First Generation Optical Networks: SONET / SDH - MAN layered architecture - broadcast and select networks MAC protocols - test beds - wavelength routing networks

Unit IV
Control and Management: Configuration - performance and fault management - optical safety - service interface; testbeds; access networks - HFC - FTTC - architecture

Unit V

Text Book
1. Rajiv Ramaswamy, "Optical Networks", Harcourt Asia Private Limited, Singapore, 2001

Reference Books

12EC352 WIRELESS SENSOR NETWORKS

Credits: 4:0:0

Course Objective:
- To introduce the basic concepts of Sensor Networks.
- To introduce the overview of communication Protocols
- To introduce the Energy management and Security.

Course Outcome:
- Students will be able to understand the concepts of sensor networks, applications and different types of protocols in WSN.

Unit I

Unit II
Communication Protocols: Time synchronization protocols-Transport Layer protocol-Network layer protocol-Data link protocol-medium access control-The S-MAC protocol-IEEE 802.15.4 standard and Zigbee - Error Control

Unit III
Tracking Technologies: Tracking scenario –Problem formulation –Sensing model-Fundamentals-ToA, TDoA, and AoA Positioning by signal strength-positioning ang location
tracking algorithms-Trilateration-Multilateration-Pattern matching-Nearest neighbor algorithms - probability based algorithms location tracking-network based tracking

Unit IV
Sensor Network Data Bases: Sensor data base chalanges- Queying the physical environment-High level data base organization-Data aggregation-types of aggregation-Packet level aggregation-total aggregation-Geographic aggregation-selection of the best aggregation points-Problem with high data rate.

Unit V

Text Book

Reference Books

12EC353 HIGH SPEED SWITCHING ARCHITECTURE

Credits: 4:0:0

Course Objective:
- To understand the types of switch fabrics for high-speed applications.
- To get a clear idea about the traffic and Queuing systems

Course Outcome:
- Students will be able to design switch architectures suitable for high speed application.

Unit I
LAN Switching Technology: Switch Forwarding Techniques - Switch Path Control - LAN Switching - Cut through Forwarding - Store and forward - and Virtual LANs

Unit II

Unit III
Packet Switching Architectures: Architectures of Internet Switches and Routers- Bufferless and buffered Crossbar switches - Multi-stage switching - Optical Packet switching; Switching fabric on a chip; internally buffered Crossbars.

Unit IV
Signaling Standards and Queuing Concepts: Signaling - SS7 Signaling - Traffic and queuing models - Performance analysis of Input – Output & Multiple shared Queuing.

Unit V
IP Switching: Addressing Model - IP switching types - Flow driven and topology driven solutions - IP over ATM - Address and next hop resolution - Multicasting - IP v6 over ATM

Text Books

Reference Books

12EC354 HIGH SPEED VLSI DESIGN
Credits: 4:0:0

Course Objective:
- To learn in detail about Non clocked and Clocked Logic Styles, Latching Strategies and Asynchronous Clocking Techniques.

Course Outcome:
- Design of various High speed VLSI Circuits.

Unit I

Unit II
Circuit Design Margin and Design Variability: Process Induced Variation – Design Induced Variation – Application Induced variation – Noise.
Unit III

Unit IV

Unit V
**Clocking Styles:** Clock Jitter and Skew – Clock Generation – Clock Distribution – Single Phase Clocking – Multi-Phase Clocking – Asynchronous Techniques.

**Text Book**

**Reference Book**

**12EC355 MIXED SIGNAL PROCESSING**

Credits: 4:0:0

**Course Objective:**
- To know about the various analog and mixed signal concepts and Behavioral Generic Model of Operational amplifiers.

**Course Outcome:**
- Knowledge in Analog and Mixed Signal Extensions to VHDL and VERILOG HDL
- Knowledge in Behavioral Generic Model of Operational amplifiers.

**Unit I**

**Unit II**

**Unit III**
**Analog Extensions to Verilog:** Introduction – Equation Construction – Solution – Waveform Filter Functions – Simulator – Control Analysis – Multi Disciplinary Model.

**Unit IV**
Unit V
Non-Linear State Space Averaged Modeling of 3-State Digital Phase – Frequency

Text Book

Reference Books

12EC356 RF SYSTEM DESIGN

Credits: 4:0:0

Course Objective:
- To know about the RF issues, RF components and applications.

Course Outcome:
- Knowledge in RF Filter Design and RF Amplifier Design
- Knowledge in High frequency Oscillator configuration, Mixers and Phase Locked Loops.

Unit I

Unit II
RF Filter Design: Overview – Basic Resonator and Filter Configuration – Special Filter Realizations – Filter Implementations – Coupled Filter.

Unit III

Unit IV

Unit V

Text Book

Reference Books

12EC357 GENETIC ALGORITHM FOR VLSI DESIGN
Credits: 4:0:0

Course Objective:
- To study about Implementation of VLSI Design in GA.

Course Outcome:
- Design of GA Based Design and Testing.

Unit I

Unit II

Unit III

Unit IV

Unit V

Text Book

Reference Books

12EC358 MEMS AND MICRO SYSTEMS

Credits: 4:0:0

Course Objective:
- To learn about the emerging field of MEMS and Microsystems
- To understand the concepts involved in realizing various types of Microsensors and actuators using MEMS technology.

Course Outcome:
- Students are expected to learn physical principles involved in micro sensors and design a suitable sensor for a given application.

Unit I

Unit II
Microelectronic Technology Applicable to MEMS: Oxidation – Diffusion- Ion-Implantation - Physical Vapor Deposition- Chemical Vapor Deposition-Lithography- Etching- Difference Between Microelectronic Fabrication And MEMS Fabrication - Wafer Bonding - Electroplating - MEMS Packaging - Micromachining.

Unit III

Unit IV
Scaling and Power in Miniaturized Systems: Scaling of Length - Surface Area and Volume – Scaling and Diffusion – Scaling and Surface Tension – Scaling in Flying and Swimming- Scaling in Electrochemistry- Scaling of Minimal Analytical Sample Size-
Scaling in Optics MEMS Batteries And Capacitors- Beam Energy to MEMS- Heat-Powered MEMS- Kinetic Energy Driven MEMS- Combustion Engines in MEMS.

Unit V

Text Book

Reference Books

12EC359 NANOELECTRONICS

Credits: 4:0:0

Course Objective:
- To learn about the various aspects of nanoelectronics.
- To understand the journey from microelectronics to nanoelectronics, various approaches of achieving nano-scale devices.

Course Outcome:
- Students are expected to understand the physics behind nano-scale devices and various approaches of realizing nanoscale devices.

Unit I

Unit II
Shrink-Down Approaches: CMOS Scaling – Traditional Scaling And Equivalent Scaling – The Nanoscale MOSFET- Vertical MOSFETs –Limits To Traditional Scaling: Technological Limits; Issues In Optical, XRay and E- Beam Lithography- Emerging Lithographic Techniques for Nanoscale Fabrication - Device Limits ; Leakage Current- Floating Body-
Parasitic Signals-Mobility- Equivalent Scaling- High-K Materials – Strained Silicon – FinFETs.

Unit III: Nanoelectronics with Tunneling Devices And Superconducting Device

Unit IV

Unit V

Text Books

Reference Books

12EC360 ADVANCED SEMICONDUCTOR MEMORIES
Credits: 4:0:0

Course Objective:
- This subject deals with the study of recent developments in advanced semiconductor memories like (BSRAM, TSRAM, SDRAM, EDRAM, Floating gate, FRAM, MRAM, Single-electron memory)

Course Outcome:
- This subject will help in doing research in advanced memories and its designs

Unit I
Introduction to Advanced Semiconductor Memories: Semiconductor Memories Overview- Advanced Semiconductor Memories Development- Future Memory Direction-

Unit II

Unit II
Application-Specific DRAM Architectures And Designs: Video RAMs (VRAM)-Synchronous Graphic RAMS (SGRAMS)-Synchronous Link DRAMS-3D RAMs-Memory Design Considerations.

Unit IV

Unit V

Text Book

Reference Books

12EC361 DESIGNING WITH PLD AND ASICs

Credits: 4:0:0

Course Objective:
- To know about different types of PLDs ,various families of Xilinx and Physical design of ASICs.

Course Outcome:
- Design of Xilinx Series, Application Specific Devices and State Machines
Unit I
**Hardware and Mixed Logic Convention:** Gate Hardware – mixed logic as design tools and descriptive convention – Uses of mixed logic in trouble shooting. **MSI & LSI Elements**

Multiplexes – Decoders and demultiplexers – ROM

Unit II
**Timing Diagram:** Introduction – micro timing diagrams – Hazards – macro timing diagrams - timing simulations - Feedback in combinational circuits

Unit III
**PLDs:** Introduction – Programmable Logic – Programmable Logic – Programmable Logic Device - Simple PLDs – CPLD – FPGA – PREP Benchmarks – Future Direction of Programmable Logic

Unit IV

Unit V
**State Charts and Microprogramming:** State Machine Charts – Derivation of SM Charts – Realization of SM Charts – Implementation of the Dice Game – Microprogramming - Linked State Machines.

**Text Book**

**Reference Books**

**12EC362 ASIC DESIGN**

**Credits:** 4:0:0

**Course Objective:**
- To study types of programmable ASICs , ASIC interconnects and Physical design of ASICs.

**Course Outcome:**
- Knowledge in the complete design flow of ASICs.

Unit I

Unit II

Unit III

Unit IV

Unit V

Text Book

Reference Book

12EC363 COMMUNICATION NETWORK SECURITY

Credits: 4:0:0

Course Objective:
- To learn about various network attacks.
- To study about security mechanisms such as encryption algorithms and security services to recover the network from attacks.

Course Outcome:
- The student learns to design a better internet security system to detect and correct security violations that involve in the transmission of information.

Unit I
Unit II
**Public Key Encryption And Hashing:** Principles of public key cryptosystems - RSA algorithm - Diffie-Hellman Key Exchange - Elliptic curve cryptology - message authentication and Hash functions - Hash and Mac algorithms - Digital signatures.

Unit III

Unit IV
**Web Security:** Web security requirement - secure sockets layer - transport layer security - secure electronic Transaction - dual signature

Unit V
**System Security:** Intruders - Viruses - Worms - firewall design - Trusted systems - antivirus techniques – digital Immune systems.

**Text Book**

**Reference Book**

**12EC364 ADVANCED DIGITAL SYSTEM DESIGN**

**Credits 4:0:0**

**Course Objective:**
- Advanced digital system concepts are introduced. Various PLD’s are discussed

**Course Outcome:**
- Good knowledge to design digital circuit. Architectures of various families of PLD’s enables good understanding of FPGA

**Unit I**
**Advanced Topics in Boolean Algebra:** Shannon’s expansion theorem - Consensus theorem - Octal Designation - Run measure - INHIBIT / INCLUSION / AOI / Driver / Buffer Gates - Gate Expander - Reed Muller Expansion - Synthesis of multiple output combinational logic circuits by product map method - Design of static hazard free and dynamic hazard free logic circuits.

**Unit II**
**Threshold Logic:** Linear seperability – Unateness - Physical implementation - Dual comparability – Reduced functions - Various theorems in threshold logic - Synthesis of single gate and multigate threshold Network.
Unit III
**Sequential Logic Circuits:** Mealy machine - Moore machine - Trivial / Reversible / Isomorphic sequential machines – State diagrams - State table minimization - Incompletely specified sequential machines – State assignments – Design - of synchronous and asynchronous sequential logic circuits working in the Fundamental mode and pulse mode - Essential hazards Unger’s theorem.

Unit IV
**Symmetric Functions:** Elementary symmetric functions - partially symmetric and totally symmetric functions – Mc Cluskey de-composition method - Synthesis of symmetric function by contact networks.

Unit V
**Programmable Logic Devices:** Anti fuse – static RAM -Basic concepts - Programming techniques - Programmable Logic Element (PLE) - Programmable Logic Array (PLA), Programmable Array Logic (PAL) Structure of Standard PLD’s, Complex PLD’s (CPLD) - Altera Max-7000 Series - Design of combination and sequential circuits using PLD’s. Type of FPGA – Xilinx XC3000 Series – Logic Cell Array (LCA) – Configurable Logic Blocks (CLB) Input/Output Blocks (I/OB) – Programmable Interconnection Points (PIP) –Xilinx XC4000 families – Design examples.

Text Books

Reference Books

**12EC365 FPGA DESIGN USING VHDL & VERILOG**

**Credits 4:0:0**

**Course Objective:**
- To know about the various flow of VHDL and verilog programming techniques

**Course Outcome:**
- Knowledge in VHDL Programming and Verilog Programming and implementation of circuits in FPGA will be obtained

**Unit I**
statements – Conditional Signal assignment – Selected signal assignment – Usage of Blocks in Dataflow modeling – Implementations of different digital circuits in Dataflow modeling

Unit II

Unit III

Unit IV

Unit V
Structural & Switch Level Modeling: Component Assignments – Switch level modeling – Applications of all dataflow, behavioral and Structural modeling in FPGA – FSM Implementation – Test Benches.

Text Books

Reference Book

12EC366 GENETIC PROGRAMMING AND PARTICLE SWARM OPTIMIZATION

Credits: 4:0:0

Course Objective:
- To learn the various concepts and techniques of optimization techniques
Course Outcome:

- Will be able to apply these algorithms to obtain optimal solutions in various applications.
- Will be able to develop new hybrid algorithms.
- Will be able to improve the performance of the existing artificial intelligence technique.

Unit I


Unit II


Unit III

Swarm Intelligence: Foundations, Perspectives and Applications – Canonical Particle Swarm Optimization – Extended Models of PSO for Discrete problems – Applications of Particle Swarm Optimization – Ant Colony Optimization – Ant Colony Algorithms and its Applications.

Unit IV


Unit V


Text Books

Reference Books

12EC367 ADVANCED DIGITAL IMAGE PROCESSING

Credits: 4:0:0

Course Objective:
• To learn the various advanced techniques of image processing with applications

Course Outcome:
• Will be used to develop hybrid techniques to solve the segmentation and classification problems
• Will be able to apply these techniques for real time applications.
• Will be able to form new image processing algorithms.

Unit I

Unit II

Unit III

Unit IV

Unit V
**Image Segmentation & Description:** Detection of Discontinuities - Edge Linking & Boundary Detection – Thresholding – Region Based Segmentation & Segmentation by Morphological Watersheds - Use of Motion in Segmentation - Representations- Boundary Descriptions - Regional Descriptions - Use of Principal Components for Description.

**Text Books**

**Reference Books**

**12EC368 NEURO-FUZZY MODELLING**

**Credits:** 4:0:0

**Course Objective:**
- To learn the concepts and techniques of hybrid neuro fuzzy systems

**Course Outcome:**
- Will be able to develop new algorithms for real – time classification problems
- Will be able to improve the performance of the existing techniques.
- Will be able to design systems for practical applications.

**Unit I**

**Unit II**

**Unit III**
Unit IV

Unit V

Text Books

Reference Books

12EC369 PATTERN RECOGNITION
Credits: 4:0:0
Course Objective:
• To learn the fundamental pattern recognition techniques for image processing applications

Course Outcome:
• Will be able to apply these techniques to solve recognition problems in real-time applications
• Will be able to form novel pattern recognition algorithm.
• Will be able to analyse the pros and cons of existing algorithms.

Unit I

Unit II

Unit III
**Discrete and Binary Classification Problems:** Introduction – Linear Discriminant Functions – Fisher’s Linear Discriminant – Discrete and Binary Classification Problems – Techniques to directly obtain Linear Classifiers – Linear Separability – Design of Linear Classifiers – Introduction to Support Vector Machines.

Unit IV
**Neural Networks for Pattern Recognition:** Introduction – Neural Network Structures for Pattern Recognition Applications – Neural Network Based Pattern Associator – Black Box Structure – Properties – Unsupervised Learning in Neural Pattern Recognition – Self Organizing Networks – Adaptive Resonance Theory Networks – Pattern Associator for Character Classification.

Unit V

**Text Books**

**Reference Books**

**12EC370 ARTIFICIAL NEURAL NETWORKS**

Credits: 4:0:0

**Course Objective:**
- To learn the various techniques and methodologies of artificial neural networks

**Course Outcome:**
- Will be able to develop hybrid methodologies for solving engineering applications
- Will be able to develop hardware systems for Artificial Intelligence techniques.
- Will be able to form new machine learning techniques.

**Unit I**

Unit II

Unit III
Feedback Networks: Dynamical Systems – Discrete Time Hopfield Networks – Gradient Type Hopfield Network – Solution of Optimisation Problems – Associative Memory – Linear Associator – Recurrent Auto Associative Memory – Bidirectional Associative Memory – Associative Memory of Spatiotemporal patterns.

Unit IV

Unit V

Text Books

Reference Books

12EC371 OPTICAL SIGNAL PROCESSING

Credits: 4:0:0

Course Objective:
• To provide fundamentals of geometrical and physical optics
• To discuss on propagation in anisotropic media; noise and stochastic processes; and two-dimensional signal processing

**Course Outcome:**

• The students can understand in a better manner about the concepts of the modern optical signal processing.

**Unit I**

**Basic signal parameters:** Characterization- Sample function- geometrical optics- basic laws- Refraction by prisms- lens formula- imaging condition- optical invariants- physical optics- Transforms: Fresnel- Fourier- Inverse Fourier and Extended Fourier.

**Unit II**

**Spectral Analysis:** Spatial light modulation- spatial light modulators- detection process- system performance process- dynamic range- raster format- spectral analysis

**Unit III**

**Spatial Filtering and Filtering System:** Types of spatial filters- optical signal processing and filter generation- read out module- orientation and sequential search- applications of optical spatial filter

**Unit IV**

**Acousto-Optic devices and power spectrum analysis:** Acousto-optic cells- spatial light modulators- Raman – Nath and Bragg mode- basic spectrum analyzer- aperture weighting- dynamic range and SNR- photo detector- geometric considerations- radiometer

**Unit V**

**Homodyne and Heterodyne Spectrum Analysers:** Overlapping of waves- photo detector size- and optimum photo detector size for 1D and 2D structure- Optical radio- spatial and temporal frequencies- Distributed and local oscillator - Dynamic range comparison of heterodyne and power spectrum analyzers.

**Text Books**


**Reference Books**


**12EC372 RF MEMS**

**Credits:** 4:0:0

**Course Objective:**
• To know about various electronic components of which moving sub-millimeter-sized parts provide RF functionality

Course Outcome:
• To identify the main characteristics of each MEMs.

Unit I

Unit II

Unit III:

Unit IV

Unit V

Text Book

Reference Books
12EC373 WAVELETS AND MULTI-RESOLUTION PROCESSING

Credits: 4:0:0

Course Objective:
- This course provides students with a practical understanding of wavelet transforms and their properties.

Course Outcome:
- Students can identify problems for which wavelet transform techniques are well-suited.
- They will understand how to implement wavelet transforms efficiently.
- They will be able to choose or design appropriate wavelets for a given application.

Unit I

Unit II
Multi Resolution Analysis: Definition of Multi Resolution Analysis (MRA) – Haar basis - Construction of general orthonormal MRA-Wavelet basis for MRA – Continuous time MRA interpretation for the DTWT – Discrete time MRA- Basis functions for the DTWT – PRQMF filter banks

Unit III
Continuous Wavelet Transform: Wavelet Transform - definition and properties - concept of scale and its relation with frequency - Continuous Wavelet Transform (CWT) - Scaling function and wavelet functions (Daubechies, Coiflet, Mexican Hat, Sinc, Gaussian, Bi-Orthogonal) - Tiling of time-scale plane for CWT.

Unit IV

Unit V

Text Books

Reference Books

12EC374 NEURAL NETWORK FOR RF AND MICROWAVE DESIGN

Credits: 4:0:0

Course Objective:
• To focus new, unconventional alternatives for conquering RF and microwave design and modeling problems using neural networks.

Course Outcome:
• The students will able to create models with neural networks
• Will learn, how quick model evaluation can be done, plus other opportunities presented by neural networks for conquering the toughest RF and microwave CAD problems.

Unit I

Unit II

Unit III

Unit IV
Unit V


**Text Book**

**Reference Book**
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12EC375 SEMICONDUCTOR MEMORY DESIGN AND TESTING

Credits: 4:0:0

Objective:
To learn the concepts behind designing the semiconductor memories and to test the memories for any defect. To understand the reliability and radiation effects on semiconductor memories.

Outcome:
Students will be able to design a semiconductor memory and perform testing and will be able to provide solutions for reliability and radiation issues in semiconductor memories.

Unit I
STATIC RANDOM ACCESS MEMORY TECHNOLOGIES: Static Random Access Memories (SRAM) - SRAM cell structures - MOS SRAM Architecture - MOS SRAM cell and peripheral Circuit Operation - Bipolar SRAM Technologies - Silicon on insulator (SOI) Technology - Advanced SRAM Architectures and Technologies - Application Specific SRAMs.

Unit II
DYNAMIC RANDOM ACCESS MEMORY TECHNOLOGIES: Dynamic Random Access Memories (DRAM) - DRAM Technology Development - CMOS DRAM - DRAM cell theory and advanced cell structures - BiCMOS DRAM - soft error failures in DRAM - Advanced DRAM Design and Architecture - Application Specific DRAM.

Unit III
NON-VOLATILE MEMORIES: Masked Read only Memories (ROM) - High Density ROMs - Programmable ROM - Bipolar ROMs - CMOS PROMs - Erasable(UV) Programmable ROM(EPROM) - Floating Gate EPROM Cell - One time Programmable EPROM (OTPEPROM) - Electrically Erasable PROMS - EEPROM Technology and Architecture - Non volatile SRAM - Flash Memories (EPROM or EEPROM) - Advanced Flash Memory Architecture.

Unit IV

Unit V
SEMICONDUCTOR MEMORY RELIABILITY AND RADIATION EFFECTS AND ADVANCED MEMORY TECHNOLOGIES: General Reliability Issues - RAM Failure Modes and Mechanism - Nonvolatile Memory Reliability - Reliability Modeling and Failure Rate Prediction-Design for Reliability - Radiation Effects-Single Event Phenomenon (SEP) - Radiation Hardening Techniques -
Ferroelectric Random Access Memories (FRAMs) - Gallium Arsenide (GaAs) FRAMs - Analog Memories - Magnetoresistive Random Access Memories (MRAMs).

Text Book

Reference Books
13EC101 BASIC ELECTRONICS ENGINEERING

Credits: 3:0:0

Objective:
- To impart the basic knowledge about the passive components.
- To know about the fundamentals of electronics and some electronic devices.
- To get the knowledge about the various analog communication techniques.

Outcome:
- Student get an overview about the basics of electronics.
- Able to get an idea about the communication and some applications in communication.

Unit I

Unit II
ELECTRONIC DEVICES: PN diode –Application: Half wave rectifier, Zener diode - Application: Zener Voltage Regulator-Bipolar Junction Transistor - Field Effect Transistors (JFET, MOSFET) - UJT.

Unit III
DIGITAL ELECTRONICS: Number system – Boolean algebra – logic gates –truth table - simplification of logic functions using karnaugh map (4 variables), combinational circuit -4 x 1 multiplexer – 1 x 4 demultiplexer

Unit IV
COMMUNICATION SYSTEMS: Basic block of communication system – need for modulation – types of analog modulation,Derivation of AM and FM signal-Block diagram of AM and FM transmitter - Superheterodyne receiver.

Unit V
APPLICATION: (Block diagram description only): Principle of Television - Satellite communication – Radar System - Fibre optic communication- ISDN

Text Book

Reference Books