



# **SYLLABUS**

## **SEMESTER – III**

**(CHOICE BASED CREDIT SYSTEM)**

**(Vetted in BOS, Sep -2017)**

**For**

**B. Tech Electronics and Communication Engineering**

**Four Years Programme**

**(For Batches 2017 onwards)**



## SEMESTER-III

| <b>Course Code</b> | <b>Course Title</b>                      | <b>L – P</b>      | <b>Credit</b> |
|--------------------|--|-------------------|---------------|
| ECE-311 T          | Analog Electronics-I                     | 4 – 0             | 4             |
| ECE-312 T          | Network Analysis                         | 4 – 0             | 4             |
| ECE-313 T          | Digital Electronics and Logic Design     | 4 – 0             | 4             |
| ECE-314 T          | Signals & Systems                        | 4 – 0             | 4             |
| MTH-313 T          | Laplace, Fourier and Complex Analysis    | 4 – 0             | 4             |
| XXX-Gxx T          | Elective-I (Generic) *                   | x – 0             | X             |
| ECE-315 P          | Analog Electronics-I Lab                 | 0 – 2             | 1             |
| ELE-313 P          | Basic Electrical Engineering Lab         | 0 – 2             | 1             |
| ECE-316 P          | Digital Electronics and Logic Design Lab | 0 – 2             | 1             |
|                    | <b>Total Credits</b>                     | <b>(20+x) – 6</b> | <b>(23+x)</b> |

\* Subject to be selected from Discipline Centric Electives (subject from parent or sister departments)

\*\* Subject to be selected from the list of open electives (subject from a non-related discipline)



**ANALOG ELECTRONICS-I (ECE- 311 T)**  
**(Credits 4: L-4, P-0)**

**UNIT-I**

**Diode Circuits:** Diode as a circuit element, Load Line Concept, Rectifiers: Half Wave Rectifier, Full Wave Rectifier (CT and bridge type), Derivation of rectifier specifications, Analysis and design of filters with rectifiers, Diode Clipping and Clamping Circuits, Comparators, Peak Detector, Sampling Gate, Voltage Multiplier Circuits, Basic operation of Zener Diode, Avalanche Breakdown, Zener Breakdown, Zener Diode as a Voltage Regulator, Schottky Diode, Tunnel Diode.

**UNIT-II**

**Transistors (BJT):** Current Components of Transistor, Types, Transistor as an Amplifier, Operation and Characteristics, Ebers-Moll model, Analysis and Design of CE, CB and CC Configurations, Input-Output Characteristics and Graphical Analysis of Basic Amplifier Circuits, Maximum Voltage Rating, Early-Effect.

**UNIT-III**

**Transistor Biasing:** Operating Point, Load Lines, Need for Bias Stabilization, Biasing Configurations: Fixed Bias, Collector-to-Base Bias, Bias Circuit with Emitter Resistor, Voltage Divider Biasing, Emitter Bias, Bias Stability, Stability Factor, Bias Compensation Techniques, Thermal Runaway, Thermal Stability.

**UNIT-IV**

**Transistor at Low Frequency:** Two port devices and hybrid model, Transistor hybrid model, h-parameters, Analysis of a transistor amplifier circuit using h-parameters, Miller's Theorem, Cascading transistor amplifiers, High input resistance transistor circuit. **Transistor at High Frequency:** Hybrid Pi ( $\pi$ ) Common Emitter Transistor model, Hybrid  $\pi$  Capacitances, Common Emitter Short Circuit Current Gain, Validity of Hybrid  $\pi$  Model.

**UNIT-V**

**JFET's:** JFET Operation, JFET Volt-Ampere Characteristics, Small-Signal Model, Analysis and design of Common Source, Common Drain and Common Gate Configuration, Low Frequency and High Frequency response of Common Source and Common Drain Amplifiers, FET Biasing, h-Parameter Model, FET as a Voltage Variable Resistor(VVR), **MOSFET's:** Types, Operation and Characteristics, VMOS.

**TEXT BOOKS:**

1. Electronic Circuits by D. Schelling and C. Belove
2. Integrated Electronics by Millman & Halkias.
3. Electronic circuits by G. Grob.
4. Electronic Devices and Circuit Theory by Boylestead and Nashelsky. 1994
5. Microelectronic Circuits Adel S. Sedra and Kenneth C. Smith.



**NETWORK ANALYSIS (ECE-312 T)**  
**(Credits 4: L-4, P-0)**

**UNIT-I**

**Development of the circuit concept:** Charge and energy, capacitance, inductance, resistance parameters, reference direction for current and voltage, active element convention, the dot convention for coupled circuits, Kirchhoff's laws, the number of network equation, source transformation, example of the formulation of network equation loop variables analysis, node variables analysis, duality, Dependent sources. Network graph theory: concept of network graph, tree, co-tree, and loops, Incidence matrix, tie-set, cut-set matrix, fundamental tie-set and cut-set matrix, Formulation of equilibrium equations in matrix form, solution of resistive networks.

**UNIT-II**

**Initial conditions in networks:** Evaluating initial conditions in networks, First order differential equation: Differential equations as applied in solving networks. Laplace Transformation properties, Solution of Network problems with Laplace transformation, Wave form analysis and synthesis: The unit step, ramp and impulse functions and their Laplace transforms. Initial and final value of  $f(t)$  from  $f(s)$ , Convolution integral, convolution as summation. Transients – steady state and transient response – DC response & sinusoidal response of R,L,C circuits – application of Laplace transform in transient analysis.

**UNIT-III**

**Network theorems and impedance functions:** Complex frequency, transform impedance and transform circuits, series and parallel combinations of elements. Network Functions: poles and zeros, network functions for one port and two port networks (ladder and general networks). Poles and zeros of network functions, Restriction on pole and zero locations for driving point and transfer functions. Time domain response from pole zero plot.

**UNIT-IV**

**Two port parameters:** Relationship of two port parameters. Admittance, impedance, transmission and hybrid parameters, Relationship between parameter sets, condition for symmetry & reciprocity – interconnections of two port networks – open circuit and short circuit impedances – input & output impedances - image impedances – attenuation & phase constants – characteristic impedance – T- $\pi$  transformation.

**UNIT-IV**

**Filter fundamentals:** Symmetrical two port reactive networks as filters – classification – characteristics of filter networks, pass and stop band, constant K & m derived filters, behavior of characteristics impedance over pass and stop bands, design of filters.

**TEXT BOOKS:**

1. Valkenberg, Network Analysis, Prentice-Hall of India
2. K.S. Suresh Kumar, Electric Circuits & Networks, Pearson Education
3. Roy Choudhury, Networks & Systems, New Age International publishers
4. Gopal. G. Bhise, Engineering Network Analysis and Filter Design, Umesh Publications

**REFERENCE BOOKS:**

1. William H Hayt & Jack E Kemmerly, Engineering Circuit Analysis, Tata McGraw-Hill
2. A. Chakrabarti, Circuit Theory (Analysis & Synthesis), Dhanpat Rai & Co.
3. B.C. Kuo, Network analysis & synthesis – Wiley-India
4. Edminister, Electric Circuits – Schaum's Outline Series, McGraw-Hill
5. Richard C. Dorf & J.A. Svoboda, Introduction to electric circuits, Wiley-India
6. Huelsman L.P., Basic Circuit Theory, Prentice Hall of India
7. K.M. Soni, Circuits & Systems, Katson Books



**DIGITAL ELECTRONICS AND LOGIC DESIGN (ECE -313 T)**  
**(Credits 4: L-4, P-0)**

**UNIT-I**

**Number Systems and Codes:** Binary, octal, and hexa- decimal number systems, binary arithmetic, binary code, excess-3 code, gray code, error detection and correction codes. Boolean algebra: Postulates and theorems, logic functions, minimization of Boolean functions using algebraic, Karnaugh map and Quine – McClausky methods, realization using logic gates.

**UNIT-II**

**Combinational Circuits:** Introduction to combinational circuits, realization of basic combinational functions like Adder, Subtractor, Encoder/Decoder, Multiplexer, Comparators, delays and hazards in combinational circuits, Code converters – Implementation using MUX and ROM

**UNIT-III**

**Sequential Circuits:** Flip-Flops: SR, JK, T, D, Master/Slave FF, triggering of FF, Analysis of clocked sequential circuits-their design, state minimization, state assignment, circuit implementation, Registers: shift registers, inter-conversion of shift registers, Counters.

**UNIT-IV**

**Programmable Logic Devices (PLD's):** Programmable Array Logic, Programmable Logic Array – GAL, RISC, CISC – basic concepts.

**UNIT-V**

**Logic Families:** RTL, DCTL, I<sup>2</sup>L, DTL, HTL, TTL, ECL, NMOS and CMOS logic gates, circuit diagram and analysis, characteristics and specifications, tri-state gates, totem-pole configuration.

**TEXT BOOKS:**

1. Morris Mano, "Digital logic and Computer Design ", Prentice-Hall of India.

**REFERENCE BOOKS:**

1. Floyd T.L., "Digital Fundamentals ", Charles E. Merrill Publishing Company
2. Jain R.P., "Modern Digital Electronics ", Tata McGraw Hill.
3. Ronald J. Tocci, "Digital Systems, Principles and Applications", Prentice-Hall of India.



**SIGNALS AND SYSTEMS (ECE - 314 T)**  
**(Credits 4: L-4, P-0)**

**UNIT-I**

**Classification of signals and systems:** Introduction to signals and systems, Continuous time and discrete time signals, Classification of CT and DT signals - periodic and non-periodic, Even and Odd, Power and Energy, Invertible and Non-invertible, Deterministic and Random. Elementary signals - exponential, sine, step, impulse and its properties, ramp, rectangular, sine, triangular, signum. Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration (Accumulator for DT), time scaling, time shifting and folding. System: definition, classification – Linear and Non-Linear, Time Variant and Time Invariant, Causal and Non-causal, Stable and Unstable (BIBO stability), Static and Dynamic.

**UNIT- II**

**Analysis of continuous time signals:** Definition and necessity of CT and DT Fourier series and Fourier transforms, Fourier series representation of continuous time and discrete time periodic signals -properties of continuous time and discrete time Fourier series. Continuous time Fourier Transform (CTFT), amplitude and phase spectra of CT signals, Properties of CTFT, convolution and multiplication property of CTFT, systems characterized by Linear Constant Coefficient Differential Equations, Limitations of FT and need of LT and ZT. Laplace Transform – ROC and pole zero concept. Properties of Laplace Transform, inverse Laplace transform, relation between Laplace transform and Fourier transform

**UNIT-III**

**Linear time invariant –continuous time systems:** Differential equation and Block diagram representation of LTI systems, Impulse response and properties of LTI systems, Convolution integral, properties of convolution, frequency response, State variable equations and matrix representation of systems, Analysis and characterization of LTI systems using Fourier and Laplace transform, Computation of impulse response, transfer function, causality and stability using Laplace transform.

**UNIT-IV**

**Analysis of discrete time signals and systems:** Sampling of CT signals and aliasing, DTFT and properties, z-transform definition – region of convergence – Properties of z-transform, inverse z-transform, Poles and Zeros -, Relationship between z-transform and Laplace transform. LTI-DT systems -Characterization using difference equation, Block diagram representation, Properties of convolution and the interconnection of LTI Systems – Analysis of LTI systems in Z- domain- response, causality and stability.

**UNIT-V**

**Systems with finite and infinite duration impulse response:** Systems with finite duration (FIR) and infinite duration (IIR) impulse response – recursive and non-recursive discrete time system, realization structures – direct form – I, direct form – II, Transpose, cascade and parallel forms

**TEXT BOOK:**

1. Alan V. Oppenheim, Alan S. Willsky with S. Hamid Nawab, Signals & Systems, 2nd edition., Pearson Education, 1997
2. Signals and systems by Simon Haykins and Barry Van Veen

**REFERENCE BOOKS:**

1. John G. Proakis & Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, 3rd edn, PHI, 2000.
2. M.J. Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.
3. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999
4. K. Lindner, "Signals and Systems", McGraw Hill International, 1999.
5. Moman .H. Hays," Digital Signal Processing ", Schaum's outlines, Tata McGraw-Hill Co Ltd., 2004.
6. Ashok Amhardar, "Analog and Digital Signal Processing", 2nd Edition Thomson 2002.



**LAPLACE, FOURIER AND COMPLEX ANALYSIS (MTH-313 T)**  
**(Credits 4: L-4, P-0)**

**UNIT-I**

Laplace transform, Shifting theorem, Laplace transforms of different functions, Heaviside's unit function, Dirac Delta function and its Laplace transforms, Heaviside's expansion theorem.

**UNIT-II**

Inverse Laplace transforms, Initial and final value theorems, convolution theorem and applications, use of Laplace transforms in the solution of linear differential equations.

**UNIT-III**

Bessel's functions, Recurrence relations, modified Bessel's function of first kind, Legendre polynomials, Rodrigue formula, Recurrence relations.

**UNIT-IV**

Definition of Fourier transform, Fourier Sine and Cosine transform Fourier integral formula.

**UNIT-V**

Introduction to complex variables, analytic functions, harmonic conjugate, conformal transformation of some simple functions.

**TEXT BOOKS:**

1. Laplace Transforms by Spiegel (Schaum Series).
2. The use of Integral Transforms by Iam.N.Snedden, Tata McGraw Hill.
3. Integral Transforms by Loknath Debnath, C.R.C. Press, New York.
4. Complex variables and applications by R.V. Churchill, McGraw Hill International Book Company.
5. Advance Engineering Mathematics by R.K.Jain & S.R.K. Iyengen-Norosa-2001.
6. Higher Engineering mathematics, BS Grewal, Khanna Publishers, Delhi



**ANALOG ELECTRONICS-I LAB (ECE – 315 P)**  
**(Credits 1: L-0, P-2)**

**LIST OF EXPERIMENTS:**

**Note:** To get familiar with the working knowledge of the following instruments: CRO, Multimeter, function generator, Regulated power supply, Active and Passive Components, Breadboard.

1. Study of V-I characteristics of diode
2. To study and draw the characteristics of half wave and full wave rectifiers
3. To study and draw the characteristics of rectifier filter circuits.
4. To assemble and observe the performance of clipper and clamping circuits
5. To obtain Zener diode characteristics and use zener diode as voltage regulator
6. To obtain the characteristic of transistor configurations (CE, CB, CC)
7. To plot the V-I characteristics of BJT and determine  $h_{fe}$ ,  $h_{re}$ ,  $h_{ie}$ ,  $h_{oe}$
8. To plot the gain- frequency response of CE amplifier.
9. To plot the gain- frequency response of emitter follower amplifier
10. Design a two stage RC coupled amplifier and determine the effect of cascading on gain and bandwidth

**RECOMMENDED BOOKS:**

1. Basic Electronics (A text-lab manual), Zbar, Malvino & Miller, Tata Mcgraw Hill





**BASIC ELECTRICAL ENGINEERING LAB (ELE- 313 P)**  
**(Credits 1: L-0, P-2)**

**LIST OF EXPERIMENTS:**

1. To study the color coding of resistors, Connection of Ammeters, voltmeters, Wattmeter's and Millimeters in DC and AC circuits and selection of their ranges, Use of LCRQ meter.
2. To study the series and parallel operation of resistors and verifying their effective values by LCRQ meter.
  - b) Repeat the same for inductors.
  - c) Repeat the same for capacitors.
3. To verify the KVL and KCL in D.C. circuits.
4. To verify the star delta transformation of networks.
5. To verify the superposition theorem.
6. To verify the maximum power transfer theorem.
7. To verify Norton's Theorem.
8. To verify Superposition Theorem.
9. To measure electric power in single phase AC circuits with resistive load, RL load and RLC load.
10. To measure the power and power factor in three phase AC circuits.
- 11 To study the series resonance.
12. To study the parallel resonance.



**DIGITAL ELECTRONICS AND LOGIC DESIGN LAB (ECE- 316 P)**  
**(Credits 1: L-0, P-2)**

**LIST OF EXPERIMENTS:**

1. To realize the truth table of the logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR)
2. To realize Half Adder and verify its truth table.
3. To realize Full Adder and verify its truth table.
4. To realize Half subtractor and verify its truth table.
5. To realize Full subtractor and verify its truth table.
6. To design multiplexer using 2-input NAND gates.
7. To design demultiplexer using 2-input NAND gates.
8. To realize Flip-Flops.
9. To realize Ripple Counters.



# ELECTIVES



**List of Electives offered in parent branch, ECE, Sem III to VIII – Department Centric Electives (DC). These subjects may be offered to sister branches (SOT) and external to SOT also)**

| Course Code  | Subject                                  | L – P | Credits | Preferred semester                | Prerequisite              |
|--------------|--|-------|---------|-----------------------------------|---------------------------|
| ECE-E 01 T/P | Image Processing                         | 3 – 2 | 4       | 7 <sup>th</sup> – 8 <sup>th</sup> | Nil                       |
| ECE-E 02 T/P | Radar Systems                            | 3 – 2 | 4       | 7 <sup>th</sup> – 8 <sup>th</sup> | ECE-413T<br>&<br>ECE-611T |
| ECE- E03 T/P | Artificial Neural Networks & Fuzzy Logic | 3 – 2 | 4       | 8 <sup>th</sup>                   | Nil                       |
| ECE- E04 T   | Electronic Devices & Circuits            | 4 – 0 | 4       | 5 <sup>th</sup>                   | ECE-311T<br>ECE-411T      |
| ECE- E05 T   | TV & Video Engineering                   | 4 – 0 | 4       | 5 <sup>th</sup>                   | ECE-311T<br>ECE-413T      |
| ECE- E06 T   | Medical Electronics                      | 3 – 0 | 3       | 6 <sup>th</sup>                   | ECE-311T<br>ECE-511T      |
| ECE- E07 T   | Nano Electronics                         | 4 – 0 | 4       | 6 <sup>th</sup>                   | ECE-314T                  |
| ECE- E08 T   | Advance Computer Architecture            | 4 – 0 | 3       | 5 <sup>th</sup>                   | ECE-313T<br>ECE-412T      |
| ECE- E09 T   | VLSI Technology                          | 3 – 0 | 3       | 5 <sup>th</sup>                   | ECE-311T<br>ECE-411T      |
| ECE- E10 T   | System Design                            | 3 – 0 | 3       | 8 <sup>th</sup>                   | ECE-313T<br>ECE-813T      |
| ECE- E11 T   | Sci Lab                                  | 0 – 3 | 2       | 4 <sup>th</sup>                   | Nil                       |
| ECE- E12 T   | Mobile Communication                     | 3 – 0 | 3       | 7 <sup>th</sup>                   | ECE-611T<br>ECE-712T      |
| ECE- E32 T   | Cyber Laws                               | 3 – 0 | 3       | 5 <sup>th</sup>                   | Nil                       |
| ECE- E33 T   | Network Security                         | 3 – 0 | 3       | 5 <sup>th</sup><br>onwards        | ECE-412 T                 |
| ECE- E34 T   | Mobile Ad hoc Networks                   | 3 – 0 | 3       | 6 <sup>th</sup>                   | ECE 413 T                 |
| ECE- E35 T   | Multi Input Multi Output                 | 3 – 0 | 3       |                                   |                           |
| ECE- E36 T   | Satellite Communication                  | 3 – 0 | 3       | 5 <sup>th</sup><br>onwards        | Nil                       |



## DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

|                   |                    |       |   |                            |     |
|-------------------|--------------------|-------|---|----------------------------|-----|
| <b>ECE- E37 T</b> | Cadence Lab        | 0 – 2 | 2 | 5 <sup>th</sup><br>onwards | Nil |
| <b>ECE- E38 T</b> | Lab View           | 0 – 2 | 2 | 5 <sup>th</sup><br>onwards | Nil |
| <b>ECE- E39 T</b> | CMOS Analog Design | 3 – 0 | 3 |                            |     |



# SYLLABUS



**IMAGE PROCESSING (ECE- E01 T/P)**  
**(Credit 4: L – 3; P- 2)**

**UNIT-I**

**Digital Image Fundamentals and Transforms:** Elements of visual perception – Image sampling and quantization Basic relationship between pixels – Basic geometric transformations-Introduction to Fourier Transform and DFT – Properties of 2D Fourier Transform – FFT – Separable Image Transforms -Walsh – Hadamard – Discrete Cosine Transform, Haar.

**UNIT –II**

**Image Enhancement Techniques:** Spatial Domain methods: Basic grey level transformation – Histogram equalization – Image subtraction – Image averaging –Spatial filtering: Smoothing, sharpening filters – Laplacian filters – Frequency domain filters: Smoothing – Sharpening filters – Homomorphic filtering.

**UNIT- III**

**Image Restoration:** Model of Image Degradation/restoration process – Noise models – Inverse filtering -Least mean square filtering – Constrained least mean square filtering – Blind image restoration – Pseudo inverse –Singular value decomposition.

**UNIT –IV**

**Image Compression:** Lossless compression: LZW coding – Bit plane coding- predictive coding- DPCM. Lossy Compression: Transform coding – Wavelet coding – Basics of Image compressionstandards: JPEG, MPEG, Basics of Vector quantization.

**UNIT- V**

**Image Segmentation and Representation:** Edge detection – Thresholding - Region Based segmentation – Boundary representation: chain codes- Polygonal approximation – Boundary segments– boundary descriptors: Simple descriptors-Fourier descriptors - Regional descriptors – Simple descriptors- Texture

**LIST OF EXPERIMENTS TO BE DONE:**

- 1) Introduction to MATLAB Software and its toolboxes.
- 2) To perform the block operation on an image using im2col and col2im commands.
- 3) Converting RGB Image into gray scale image & extracting the color Spaces
- 4) To draw the Histogram and enhance contrast of grayscale as well as colored image using Histogram Equalization.
- 5) To detect the edges of the Gray scale images using various edge detectors
- 6) To find out the Discrete Wavelet Transform of images.
- 7) To perform the thresholding an image using image processing toolbox.

**REFERENCE BOOKS:**

- 1) William K Pratt, Digital Image Processing John Willey (2001)
- 2) Image Processing Analysis and Machine Vision – Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Larniy (1999).
- 3) A.K. Jain, PHI, New Delhi (1995)-Fundamentals of Digital Image Processing.
- 4) Chanda Dutta Magundar – Digital Image Processing and Applications, Prentice Hall of India, 2000.
- 5) Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing - Pearson Education2003.



**RADAR SYSTEMS (ECE- E02 T/P)**  
**(Credit 4: L – 3; P- 2)**

**UNIT-I**

**Simple Pulse Radar:** Radar equation, range performances and minimum detectable signal, receiver noise SNR; integration of radar pulses; integration efficiency and loss; radar cross section of targets with examples of simple targets; PRF & range ambiguity, Radar system losses; radar frequencies;

**UNIT-II**

**Continuous Wave Radar:** Doppler's shift; CW Radar with IF amplification; FM radar; Conventional pulse Radar with Super-Heterodyne receiver, multiple frequency CW radar (block diagram and description), Operation and performance etc.

**UNIT-III**

**Moving Target Indication (MTI) & Pulse Doppler Radar (PDR):** Doppler's shift applied to pulse radar; butterfly effects, delay line cancellers; MTI with power amp, Pulsed Doppler Radar with operational Block functions, Frequency Modulated CW Radar

**UNIT-IV**

**Radar Tracking:** Introduction and types of tracking Radar, Block diagram and functions of Tracking Radar, Radar Tracking systems

**UNIT-V**

**Radar Beacons:** Introduction to Synthetic aperture radar (SAR), applications of SAR, Radar displays, Radar RF Sources, Radar RF Modulators, Radar Transmitters

**LIST OF EXPERIMENTS TO BE DONE:**

- 1) To find the radial velocity of a moving target using Doppler effect
- 2) To find the distance of moving target/stationary target from the radar
- 3) To find out the time period of simple pendulum using Doppler radar
- 4) To find out rpm of a fan at some distance D from the radar
- 5) To find out the frequency of a buzzer in presence of various clutter noises.

**REFERENCE BOOKS:**

- 1) Skolnik MI, Radar Systems, Pearson Publications, 3rd Ed.
- 2) Raju GSN, Radar engineering.
- 3) Kulkarni M, Radar Engineering, Umesh Publications, New Delhi
- 4) Sharma, KK., Radar, Sonar and Navigation engineering, Katsons Publications, New Delhi





**ARTIFICIAL NEURAL NETWORKS AND FUZZY LOGIC (ECE- E03 T/P)**  
**(Credits: 4: L – 3; P- 2)**

**UNIT I**

**Introduction to Neural Networks:** Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and artificial Neuron Models, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential applications of ANN.

**UNIT II**

**Essentials of Artificial Neural Networks:** Artificial Neuron Models, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.

**UNIT III**

**Single and multilayer feed Forward Neural Networks:** Introduction, Perception Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perception Networks, Limitations of the Perception Model. Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Learning Difficulties and Improvements

**UNIT IV**

**Associative Memories:** Paradigms of Associative Memory, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, Architecture of Hopfield Network, Storage and Recall Algorithm, Stability Analysis.

**UNIT V**

**Classical & Fuzzy Sets:** Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions. Fuzzification, Membership value assignment, development of rule base and decision making system neural network applications in Process identification and fault diagnosis.

**LIST OF EXPERIMENTS:**

- 1) Train a perceptron to learn the **inclusive OR** function: Train the perceptron at least five times (i.e., with five different initial weight configurations). On average, how much iterations are necessary for the network to reach the stopping criterion?
- 2) Describe the general shape of the learning curve over the different training sessions.
- 3) Lower the stopping criteria to successively stricter criteria (e.g., .01, .001, .0001). Describe the general shape of the learning curve for each case.
- 4) Train a perceptron to learn the **exclusive OR** function: Learn this function multiple times.
- 5) Train a multi-layer perceptron to learn the **exclusive OR** function ten. On average, how much iterations are necessary for the network to reach the stopping criterion?
- 6) Train a Network to verify the out Put of Following Gates: NAND, OR, EX-OR.

**REFERENCE BOOKS:**

- 1) S.Rajasekharan & G. A. Vijayalakshmi, “Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications”, PHI Publication, 2004.
- 2) John Yen and Reza Langan, “Fuzzy Logic: Intelligence, Control and Information”, Pearson, 2004.
- 3) Mohamad H. Hassoun, “Fundamentals of Artificial Neural Networks”, MIT Press.
- 4) Jian-Kang Wu, “Neural Networks and Simulation methods”, CRC Press.
- 5) B. Yegnanarayana, “Artificial Neural Networks”, Prentice Hall India.



**ELECTRON IC DEVICES (ECE- E04 T)**  
**(Credits 4: L- 4; P-0)**

**UNIT I**

**Important parameters governing the high speed performance of devices and circuits:** 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.

**UNIT II**

**Silicon based MOSFET and BJT circuits for high speed operation and their limitations:** Emitter coupled Logic (ECL) and CMOS Logic circuits with scaled down devices. Silicon On Insulator (SOI) wafer preparation methods and SOI based devices and SOICMOS circuits for high speed low power applications.

**UNIT III**

**Materials for high speed devices and circuits:** Merits of III –V binary and ternary compound semiconductors (GaAs, InP, InGaAs, AlGaAs etc.), silicon-germanium alloys and silicon carbide for high speed devices, Brief outline of the crystal structure, dopants and electrical properties such as carrier mobility, velocity versus electric field characteristics of these materials.

**UNIT IV**

**Metal semiconductor contacts and Metal Insulator Semiconductor and MOS devices:** Native oxides of Compound semiconductors for MOS devices and the interface state density related issues. Metal semiconductor contacts, Schottky barrier diode, Thermionic Emission model for current transport and current-voltage (I-V) characteristics

**UNIT V**

**MESFETs, HEMT and HBTs:** Pinch off voltage and threshold voltage of MESFETs, Velocity overshoot effects and the related advantages of GaAs and InP. Modulation Doped FET(MODFET), Principle of operation and the unique features of HEMT, Principle of operation and the benefits of hetero junction BJT for high speed applications.

**REFERENCE BOOKS:**

- 1) S.K Gandhi, “VLSI Fabrication Principles” Wiley, NY, 1994.
- 2) C.Y. Chang & F.Kat “GaAS High Speed Devices: “Physics,Technology & Circuit Applications”,Wiley,NY 1994.
- 3) H.Beneking, “High speed semiconductor Devices:Circuit Aspects and Fundamental Behaviour” Chapman and Hall,London,1994.
- 4) S.M Sze “High speed semiconductor Devices”Wiley,1990.
- 5) Michael Shur, “GaAs Devices and Circuits”Plenum Press,NY,1987



**TELEVISION AND VIDEO ENGINEERING (ECE- E05 T)**  
**(Credits 4: L – 3; P- 0)**

**UNIT I**

Video and audio transmission, horizontal and vertical scanning, Linear and Interlaced scanning, Flicker, Horizontal and Vertical resolution, Video bandwidth, Components of Composite Video Signal (Front Porch, Back Porch, SYNC and Blanking signals)

**UNIT II**

Video signal development in camera tubes, Types of TV camera tubes (Plumbicon, Image orthicon, Vidicon, Solid- state image scanners, (CCD couplers), TV recording (Kinescope recording, Electronic video recording, Magnetic video tape recording and Video disc recording).

**UNIT III**

Black and white transmission, block diagram of transmitter and B/W receiver, Description of tuner, IF section, sync. Section, video section, audio section and AGC section of B/W TV receiver, TV antennas and impedance matching circuits.

**UNIT IV**

Color fundamentals, Mixing of colors, Brightness, Hue and Saturation, Color circle, Color TV camera and picture tubes, Color TV transmission and reception, I and Q signals, NTSC system and PAL system for color TV transmission and reception.

**UNIT V**

Propagation of TV signals: Radio-wave characteristics, Propagation phenomenon, Space-wave Propagation, Line-of-sight Propagation; Distant reception, Shadow zones, Co-channel interference and Ghost images; Introduction to TV via satellite.

**REFERENCE BOOKS:**

- 1) Television Engineering by R. R. Gulati, Wiley Eastern Co
- 2) Introduction to Television by Grobe, Wiley Eastern Ltd.
- 3) Television Engineering by A. M. Dhake



**MEDICAL ELECTRONICS (ECE- E06 T)**  
**(Credits: 3: L – 3; P-0)**

**UNIT I**

**Electro-physiology and bio-potential recording:** The origin of Bio-potentials; bio-potential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

**UNIT II**

**Bio-chemical and non-electrical parameter measurement:** PH, PO<sub>2</sub>, PCO<sub>2</sub>, PHCO<sub>3</sub>, Electrophoresis, colorimeter, photometer, Auto analyser, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

**UNIT III**

**Assist devices and bio-telemetry:** Cardiac pacemakers, DC Defibrillator, Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.

**UNIT IV**

**Radiological equipment:** Ionising radiation, Diagnostic x-ray equipment, use of Radio Isotope in diagnosis, Radiation Therapy

**UNIT V**

**Recent trends in medical instrumentation:** Thermograph, endoscopy unit, Laser in medicine, Diathermy units, Electrical safety in medical equipment.

**REFERENCE BOOKS:**

- 1) Leislle Cromwell, “Biomedical instrumentation and measurement”, Prentice Hall of India, Delhi, 2002.
- 2) Khandpur, R.S., “Handbook of Biomedical Instrumentation”, TATA McGraw-Hill, New Delhi, 1997.
- 3) Joseph J.Carr and John M.Brown, “Introduction to Biomedical equipment Technology”, JohnWiley and Sons, New York, 1997.



**NANOELECTRONICS (ECE- E07 T)**  
**(Credit 4: L – 4; P- 0)**

**UNIT I**

**Electronic Properties, Classification of materials:** Metal, Semiconductor, Insulator, Band structures, Brillouin zones, Mobility, Resistivity, Relaxation time, Recombination centers, Hall effects, Confinement and transport in nanostructure, Current, reservoirs, and electron channels, conductance formula for nanostructures, quantized conductance, Local density of states. Ballistic transport, Coulomb blockade, Diffusive transport, Fock space, Dielectric properties: Polarisation, Ferroelectric behavior

**UNIT II**

**Optical Properties of nanomaterials:** Photoconductivity, Optical absorption & transmission, Photoluminescence, Fluorescence, Phosphorescence, Electroluminescence, Introduction to MEMs / NEMs, Electronic Transport in Nanostructures, Semiconductor devices to Single electron Transistors

**UNIT III**

**Nanosensors:** Temperature Sensors, Smoke Sensors, Sensors for aerospace and defense: Accelerometer, Pressure Sensor, Night Vision System, Nano tweezers, nano-cutting tools, Integration of sensor with actuators and electronic circuitry Biosensors, State of Art Ion-beam exchange in Nanostructure material, Nanostructure based Photovoltaic Cells.

**UNIT IV**

**Molecular Electronics Components:** Characterization of switches and complex molecular devices, polyphenylene based Molecular rectifying diode switches. Technologies, Single Electron Devices, Quantum Mechanical Tunnel Devices, Quantum Dots & Quantum wires

**UNIT V**

**Introduction to Nano electronic and Nano computers:** Single electron circuits, molecular circuits Nano computer Architecture. Spintronic- Introduction, Overview, History & Background, Generation of Spin Polarization Theories of spin Injection, spin relaxation and spin dephasing, Spintronic devices and applications, spin filters, spin diodes, spin transistors.

**REFERENCE BOOKS:**

- 1) Nanoelectronics & Nanosystems: From Transistor to Molecular & Quantum Devices: Karl Goser, Jan Dienstuhl and others.
- 2) Concepts in Spintronics – Sadamichi Maekawa
- 3) Spin Electronics – David Awschalom
- 4) From Atom to Transistor-Supriyo Datta
- 5) Sensors: Micro & Nanosensors, Sensor Market trends (Part 1&2) by H. Meixner.



**ADVANCED COMPUTER ARCHITECTURE (ECE- E08 T)**  
**(Credit 4: L – 4; P- 0)**

**UNIT I**

Overview of Parallel Processing and Pipelining Processing, study and comparison of uni-processors and parallel processors, Conventional and Explicitly Parallel Instruction Computing (EPIC) architecture, Constraints of conventional architecture.

**UNIT II**

Principles and implementation of Pipelining, Classification of pipelining processors, Pipeline Architecture, Study and comparison of processors with and without pipelining, General pipelining reservation table, Pipelining hazards and resolving techniques.

**UNIT III**

Data buffering techniques, Job sequencing and Collision, Advanced pipelining techniques, loop unrolling techniques, out of order execution, software scheduling, trace scheduling, Predicated execution, Speculative loading, Register Stack Engine, Software pipelining, SIMD Computer Organization Masking and Data network mechanism, Inter PE Communication, Interconnection networks of SIMD, Static Vs Dynamic network, cube hyper cube and Mesh Interconnection network.

**UNIT IV**

Microprocessor Architectures, study and comparison of Loosely and Tightly coupled multiprocessors. Processor characteristics of multiprocessors, Inter Processor communication network, Time shared bus, Crossbar switch, Multiport Memory Model, Memory contention and arbitration techniques, Cache coherency and bus snooping.

**UNIT V**

Study of Architecture of Multithreaded processors, Latency hiding techniques, Principles of multithreading, Issues and solutions, Parallel Programming Techniques: Message passing program development, Synchronous and asynchronous message passing, Message passing parallel programming, Shared Memory Programming, Data Parallel Programming.

**TEXT BOOKS:**

- 1) Kai Hwang, Faye A. Briggs, "Computer Architecture and Parallel Processing" Mc GrawHill international Edition.
- 2) Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill References: 1. V.Rajaraman, L Sivaram Murthy, "Parallel Computers", PHI.

**REFERENCE BOOKS:**

- 1) William Stallings, "Computer Organization and Architecture, Designing for performance" Prentice Hall, Sixth edition.
- 2) Kai Hwang, Scalable Parallel Computing.
- 3) Harrold Stone, High performance computer Architecture.
- 4) Richard Y. Kain, Advanced Computer Architecture



**VLSI TECHNOLOGY (ECE- E09 T)**  
**(Credit 4: L – 4; P- 0)**

**UNIT I**

Crystal growth & wafer preparation, Processing considerations: Chemical cleaning, getting the thermal Stress factors etc. Epitaxy - Vapors phase Epitaxy, Basic Transport processes & reaction kinetics, doping & auto doping, equipments, & safety considerations, buried layers, epitaxial defects, molecular beam epitaxy, equipment used, film characteristics, SOI structure.

**UNIT II**

Oxidation-Growth mechanism & kinetics, Silicon oxidation model, interface considerations, orientation dependence of oxidation rates thin oxides. Oxidation technique & systems dry & wet oxidation, Masking properties of SiO<sub>2</sub>. Diffusion -Diffusion from a chemical source in vapor form at high temperature, diffusion from doped oxide source, diffusion from an ion implanted layer.

**UNIT III**

Lithography -Optical Lithography: optical resists, contact & proximity printing, projection printing, electron lithography: resists, mask generation. Electron optics: raster scans & vector scans, variablebeam shape. X-ray lithography: resists & printing, X ray sources & masks. Ion lithography.

**UNIT IV**

Etching - Reactive plasma etching, AC & DC plasma excitation, plasma properties, chemistry & surface interactions, feature size control & apostrophic etching, ion enhanced & induced etching, properties of etch processing. Reactive Ion Beam etching, Specific etches processes: poly/polycide, Trench etching.

**UNIT V**

Metallization - I, Problems in Aluminium Metal contacts, IC BJT - From junction isolation to LOCOS, Problems in LOCOS + Trench isolation, More about BJT Fabrication and Realization, MOSFET - Metal gate vs. Self-aligned Poly-gate, CMOS Technology.

**REFERENCE BOOKS:**

1. S. M. Sze, “Modern Semiconductor Device Physics”, John Wiley & Sons, 2000.
2. B.G. Streetman, “Solid State Electronics Devices”, Prentice Hall, 2002.
3. Chen, “VLSI Technology” Wiley, March 2003.



**SYSTEM DESIGN (ECE- E10 T)**

**(Credit 3: L – 3; P- 0)**

**UNIT I**

**Interconnect:** The Wire, Interconnect Parameter, Electrical And Spice Wire Model, RLC Parasitic, Signal Integrity And High Speed Behavior Of Interconnects: Ringing, Cross Talk And Ground Bounce. Layout Strategies At IC And Board Level For Local And Global Signals, Power Supply Decoupling.

**UNIT II**

**Designing of sequential logic circuit:** Static And Dynamic Latches And Registers, Design And Optimization Of Pipelined Stages, Timing Issues In Digital Circuits, Synchronous And Asynchronous Design Styles, Interface Between Synchronous And Asynchronous Blocks, Concept Of Meta-Stability.

**UNIT III**

**System hardware decomposition:** Data Path And Control Path, Register Transfer Level Description, Control Path Decomposition (Interfacing With FSM), Pitfalls of Decomposition, Control Flow And Data Flow Pipelines, Communication Between Subsystems, Control Dead Locks.

**UNIT IV**

**Subsystem design:** Logic Design Consideration For Arithmetic Building Blocks: Adders, Multipliers, Shifters Logic Design Consideration For Memory Architecture: Address Decoder, Sense Amplifier, Voltage Reference, Drivers/Buffers, Timing And Control Shared Memory Data Hazards And Consistency

**UNIT V**

**Design for test:** Introduction, Test Procedure, Issues In Design For Testability, Ad-Hoc Testing, Scan-Based Test, Boundary Scan Design, Built-In-Self Test (BIST), Test Pattern Generation, Fault Models, Automatic Test Pattern Generation (ATPG).

**REFERENCE BOOKS:**

- 1) Rabaey Jan M., Chandrakasan Anantha and Borivoje Nikolic, "Digital Integrated Circuits (Design Perspective)", Prentice Hall of India, 2nd Ed., 2003.
- 2) Smith M. J. S., "Application Specific Integrated Circuits", Addison Wesley, 1st Ed., 1999.
- 3) Dally W. J. and Poulton J. W., "Digital System Engineering", Cambridge University Press, 1st Ed., 1998.
- 4) Hall S. H., Hall G. W. and McCall J. A., "High Speed Digital System Design", John Wiley & Sons, 1st Ed., 2000.
- 5) Bakoglu H. B., "Circuit Interconnect And Packaging For VLSI", Addison-Wesley, 1st Ed., 1990.
- 6) Wester Neil H. E., Harris D. and Banerjee A. , "CMOS VLSI Design", Addison Wesley, 3rd Ed., 2004.
- 7) Laung-Terng Wang, Cheng-Wen Wu and Xiaoqing Wen, "VLSI Test principles And Architectures Design For Testability", Morgan Kaufmann Publishers, 1st Ed., 2006.





**SCI LAB (ECE- E11 P)**  
**(Credit 4: L – 3; P- 2)**

**UNIT I**

**Introduction:** Basics of MATLAB, Overview of features and workspace and data types, Application of MATLAB, Limitations. **MATLAB and Problem Solving:** Defining the problem, Developing the algorithm, coding and Debugging

**UNIT II**

**Arrays:** Initialization and definition, Array Functions, 1 D & 2D Arrays, Multi dimensional Arrays, Array Storing, Working on Arrays & Array Operations. **Matrices:** Initialization and definition of Matrices, Manipulation of Matrices, Matrix functions, Work on Matrix Operations, Special Matrices.

**UNIT III**

**Plots and Graphs:** Plots and its types, 2D & 3D plotting Graphical Interpretations

**UNIT IV**

**Simulink:** Introduction, Basics of Simulink, Dynamic system and its representation, Applications of Simulink, Limitations.

**UNIT V**

**Principle and Management:** Tool Boxes, Simulink operating principle, Library Browser and function Library sources. **Construction and Parameterizing:** Construction Blocks in Simulink, Parameterizing of Blocks, Basic Simulations.

**TEXT BOOKS:**

- 1) Introduction to MATLAB and Simulink – A project approach, O Beucher & M. Weeks
- 2) MATLAB – A quick introduction for Scientists & engineers, Rudra Pratap



**MOBILE COMMUNICATION (ECE- E12 T)**  
**(Credit 3: L – 3; P- 0)**

**UNIT I**

Introduction to Cellular Mobile Systems: A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, overview of generations of cellular systems.

**UNIT II**

Elements of Cellular Radio Systems Design and Interference: General description of the problem, concept of frequency reuse channels, co-channel interference reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems, Introduction to co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects.

**UNIT III**

Cell Coverage for Signal & Antenna Structures: General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model – characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation,

**UNIT IV**

Characteristics of basic antenna structures, antenna at cell site, mobile antennas. Frequency Management & Channel Assignment, Hand Off & Dropped Calls: Frequency Management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.

**UNIT V**

GSM : GSM Network architecture, signaling protocol architecture, identifiers, channels, Frame structure, speech coding, authentication and security, call procedure, handoff procedure, services and features. Mobile data networks Data oriented CDPD network, GPRS and higher data rates, SMS in GSM. Mobile management, voice signal processing and coding.

**TEXT BOOKS:**

- 1) William, C. Y. Lee, “Mobile Cellular Telecommunications”, 2nd Edition, McGraw Hill, 1990.
- 2) Mischa Schwartz, “Mobile Wireless Communications”, Cambridge University Press, UK, 2005.

**REFERENCE BOOKS:**

- 1) “Mobile Communication Hand Books”, 2nd Edition, IEEE Press.
- 2) Theodore S Rappaport, “Wireless Communication Principles and Practice”, 2nd Edition, Pearson, 2002.
- 3) Lawrence Harte, “3G Wireless Demystified”, McGraw Hill Publications, 2001.
- 4) Kaveh Pahlavan and Prashant Krishnamurthy”, Principles of Wireless Networks”, PHI, 2001.



**NETWORK SECURITY (ECE- E32 T)**  
**(Credit 3: L – 3; P- 0)**

**UNIT I**

Introduction to network security, Secure network services, Attacks, Security, Architecture, Security Mechanism, Introduction to cryptography, Data Encryption Standard, Design and analysis, IDEA(International Data Encryption),RC4

**UNIT II**

Public Key Cryptography and Authentication, Approaches to Message, Authentication , Secure Hash Functions ,Message Authentication Codes ,Public-Key Cryptography Principles ,Public-Key Cryptography Algorithms

**UNIT III**

Web Security Considerations, Secure Socket Layer and Transport Layer Security Transport Layer Security, HTTPS , Secure Shell (SSH)

**UNIT IV**

Firewall, The Need for Firewalls , Firewall Characteristics , Types of Firewalls , Firewall Basing ,Firewall Location and Configurations

**TEXT BOOKS:**

- 1) William Stallings, “Cryptography And Network Security – Principles and Practices”, Prentice Hall of India, Third Edition, 2003.
- 2) Atul Kahate, “Cryptography and Network Security”, Tata McGraw-Hill, 2003.

**REFERENCE BOOKS:**

- 1) Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc, 2001.
- 2) Charles B. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Third Edition, Pearson Education, 2003.
- 3) Networking Essentials by Willium.S.Stallings.



**MOBILE ADHOC NETWORKS (ECE- E33 T)**  
**(Credits: 3: L – 3; P-0)**

**UNIT I**

Introduction: Introduction to Ad Hoc networks – definition, characteristics features, applications. Characteristics of Wireless channel, Adhoc Mobility Models: - entity and group models.

**UNIT II**

Medium access protocols: MAC Protocols: design issues, goals and classification. Contention based protocols, reservation based protocols, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

**UNIT III**

Network protocols: Addressing issues in ad hoc network, Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Power/ Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

**UNIT IV**

End -to - end delivery and security:Transport layer: Issues in designing- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

**UNIT V**

Cross layer design and integration: Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary perspective, Co-operative networks:- Architecture, methods of co-operation, co-operative antennas, Integration of ad hoc network with other wired and wireless networks.

**TEXT BOOKS:**

- 1) C.Siva Ram Murthy and B.S.Manoj, —Ad hoc Wireless Networks Architectures and protocols, second edition, Pearson Education. 2007
- 2) Charles E. Perkins, —Ad hoc Networking, Addison – Wesley, 2000

**REFERENCE BOOKS:**

- 1)Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, —Mobile adhoc networking, Wiley-IEEE press, 2004.
- 2) Mohammad Ilyas, —The handbook of adhoc wireless networks, CRC press, 2002.
- 3) T. Camp, J. Boleng, and V. Davies —A Survey of Mobility Models for Ad Hoc Network Research,
- 4) Wireless Communication and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502.



**MULTI INPUT MULTI OUTPUT (MIMO) SYSTEMS (ECE- E34 T)**  
**(Credit 3: L – 3; P- 0)**

**UNIT I**

Evolution of Wireless Communication Systems 1G - 5G, Elements of Wireless Communication System, Overview of MIMO Communication Systems, Layered View of Transmitter and Receiver : Introduction to wireless channel models

**UNIT II**

Large Scale Propagation Models Path Loss; Shadowing, Small Scale Propagation Multipath Model, frequency flat fading , Envelope Distribution, Signal Correlation, Coherence Time, Doppler Spectrum, Frequency Selective Fading, Coherence Bandwidth, Delay Doppler Characteristics

**UNIT III**

Spatial Channel Characteristics, Expression of MIMO Channel, MIMO Channel Characteristics, Properties of H, Important Results from Linear Algebra, Spatial Diversity,

**UNIT IV**

Selection Combining, Maximal Ratio Combining , Problem of Error in MRC. Diversity Gain and Transmit MRC, Transmit Diversity without Channel known at Tx, MIMO Transmit Diversity

**UNIT V**

Fundamentals of Information Theory, Capacity of Deterministic MIMO Channels, Capacity of Channel Unknown at Transmitter, Capacity of Channel Known at Transmitter, Capacity of Random Channel, MIMO in Practice

**REFERENCES BOOKS:**

- 1) Principles of mobile communication by G stuber, springer , second edition.
- 2) Wireless communication by A Goldsmith, Cambridge
- 3) Introduction to space time wireless communications by A Paulraj, Nabar and Gore, Cambridge
- 4) Elements of information theory by Thomas A cover, Joy A Thomas, Wiley Interscience.
- 5) LTE , UMTS and long term evolution by Sesia ,Toufik and Baker, Wiley Interscience.
- 6) OFDM for wireless communication by R. Prasad, Artech House Publishers.
- 7) Single and multi carrier MIMO transmission for wireless broad band system by R. Prasad, Rehman and S. S. Das, River Publishers



**SATELLITE COMMUNICATION (ECE- E35 T)**  
**(Credits 3: L - 3; P - 0)**

**UNIT I**

**Overview of Satellite Systems & Orbit:** Introduction, Kepler's laws, definitions, orbital element, apogee and perigee heights, orbit perturbations, inclined orbits, calendars, universal time, sidereal time, orbital plane, local mean time and sun synchronous orbits, Geostationary orbit: Introduction, antenna, look angles, polar mix antenna, limits of visibility, earth eclipse of satellite.

**UNIT II**

**Propagation impairments and space link:** Introduction, atmospheric loss, Ionospheric effects, rain attenuation, other impairments. **Space link:** Introduction, EIRP, transmission losses, link power budget, system noise, CNR, uplink, down link, effects of rain, combined CNR.

**UNIT III**

**Space Segment:** Introduction, power supply units, altitude control, station keeping, thermal control, TT&C, transponders, antenna subsystem. **Earth Segment:** Introduction, receive only home TV system, Outdoor unit, indoor unit, MATV, CATV, Tx – Rx earth station.

**UNIT IV**

**Interference and Satellite access:** Introduction, interference between satellite circuits, satellite access, single access, pre-assigned FDMA, SCPC (spade system), TDMA, pre-assigned TDMA, demand assigned TDMA, down link analysis, and comparison of uplink power requirements for TDMA & FDMA, on board signal processing satellite switched TDMA.

**UNIT V**

**Specialized services:** Introduction, orbital spacing, power ratio, frequency and polarization, transponder capacity, bit rates for digital TV, satellite mobile services, USAT, Radar-Sat, GPS, Orb communication and Iridium.

**TEXT BOOK:**

1) Satellite Communications, Dennis Roddy, 4th Edition, McGraw-Hill International Edition, 2006.

**REFERENCES BOOKS:**

- 1) Satellite Communications, Timothy Pratt, Charles Bostian and Jeremy Allnutt, 2nd Edition, John Wiley & Sons, 2003.
- 2) Satellite Communication Systems Engineering, W. L. Pitchand, H. L. Suyderhoud, R. A. Nelson, 2nd Ed., Pearson Education., 2007.



**CADENCE LAB: ANALOG CIRCUIT DESIGN AND SIMULATION LAB (ECE- E36 P)**  
**(Credits 2: L – 0; P – 4)**

**TOOL REQUIRED:** Spice Tool preferably Pspice, Hspice.

**LIST OF EXPERIMENTS**

- 1) Basics of the Spice Tools like Ac analysis, DC analysis, Transient Analysis of basic Analog circuits.
- 2) Design and verification of half and full wave rectifiers.
- 3) Design, simulation and analysis of Filters—Low Pass, High Pass, Band Pass, Notch Filter.
- 4) Design and study of Hartley Oscillator using operational amplifier.
- 5) Design and study of Colpitt Oscillator using operational amplifier.
- 6) Design and verification of Clippers, Clampers and attenuators
- 7) Design and Analysis of Differential amplifiers.

**REFERENCE BOOKS AND LINKS:**

- 1) Spice for circuits and electronics by Mohammad H Rashid, Pearson Publication.
- 2) Analog Design and Simulation Using OrCAD Capture and Pspice by Dennis Fitzpatrick.
- 3) <http://www.uta.edu/ee/hw/pspice/>



**LAB VIEW: VIRTUAL INSTRUMENTATION (ECE- E37 P)**  
**(Credits 3: L - 0; P -6)**

**Lab VIEW: Laboratory Virtual Instrumentation Engineers Workbench.**

**UNIT I**

Review of Virtual Instrumentation: Historical perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming.

**UNIT II**

Programming Techniques: VIS & Sub VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes, local & global variables, string & file Input.

**UNIT III**

Data Acquisition basics: ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation. Common Instrument Interfaces: Current loop, Rs 232C/Rs 485, GPIB, System basics,

**UNIT IV**

interface basics: USB, PCMCIA, VXI, SCXI, PXI etc, networking basics for office & industrial application VISA & IVI, image acquisition & processing, Motion Control.

**UNIT V**

Application of VI: Application in Process Control projects, Major equipments-Oscilloscope, Digital Multimeter, 120 MHz Pentium Computers, Labview Software, Study of Data Acquisition & Control using Labview ® Virtual instrumentation for an Innovative Thermal Conductivity Apparatus to measure the Thermal Conductivity Apparatus- to measure the Conductivity of non-Newtonian fluids while they are subjected to shearing force.

**TEXT BOOKS:**

1) Virtual instrumentation using LABVIEW by **Jovitha Jerome**.

**REFERENCE BOOKS:**

1) **Gary Johnson**, Labview Graphical Programming second edition, MC GrawHill, Newyork, 1997.

2) **Lisa K.Wells & Jeffrey Travis**, Labview for everyone, Prentice Hall, New Jersey, 1997.

**WEB LINKS:**

- [www.ni.com](http://www.ni.com)
- [http://myweb.wit.edu/johnsont/Classes/LabView\\_Labs/LabVIEW\\_Resources.htm](http://myweb.wit.edu/johnsont/Classes/LabView_Labs/LabVIEW_Resources.htm)





**CMOS ANALOG DESIGN (ECE- E38 P)**  
**(Credits 3: L - 3; P -0)**



**List of Electives offered in sister branches (SOT) and external to SOT also. These cannot be offered to parent department since these are core subjects to the parent branch (ECE)**

| Course Code  | Subject  | L-P   | Credits | Preferred Semester | Prerequisite           |
|--------------|--|-------|---------|--------------------|------------------------|
| ECE- E13 T   | Embedded Systems                               | 3 – 0 | 3       |                    | ECE-413 T<br>ECE 512 T |
| ECE- E14 T   | Analog Electronics I                           | 3 – 0 | 3       |                    | Nil                    |
| ECE- E15 T   | Signals & Systems                              | 3 – 0 | 3       |                    | Nil                    |
| ECE- E16 T   | VLSI Design                                    | 3 – 0 | 3       |                    | ECE-311 T<br>ECE 313 T |
| ECE- E17 T   | Digital Signal Processing                      | 3 – 0 | 3       |                    | ECE-414 T              |
| ECE- E18 T   | Electronic Instrumentation & Measurements      | 4 – 0 | 4       |                    | ECE-311 T<br>ECE 313 T |
| ECE- E19 T   | Optical Fibre Communication                    | 3 - 0 | 3       |                    | Nil                    |
| ECE- E20 T   | Communication I                                | 3-0   | 3       |                    | Nil                    |
| ECE- E21 T/P | Digital System Design                          | 3 – 2 | 4       |                    | ECE-313 T              |
| ECE- E22 T   | Applied Electronic Instrumentation             | 4 – 0 | 4       |                    | ECE-311 T              |
| ECE- E23 T   | Analog Electronics – I                         | 4 – 0 | 4       |                    | Nil                    |
| ECE- E24 T   | Digital Electronics & Logic Design             | 4 – 0 | 4       |                    | Nil                    |
| ECE- E25 T   | Electronic Engg materials                      | 4 – 0 | 4       |                    | Nil                    |
| ECE- E26 T   | Analog Electronics – II                        | 4 – 0 | 4       |                    | ECE-311 T              |
| ECE- E27 T   | Computer Organization & Architecture           | 4 – 0 | 4       |                    | ECE-313 T              |
| ECE- E28 T   | Microprocessors                                | 4 – 0 | 4       |                    | ECE-313 T              |
| ECE- E29 T   | Antennas Wave Propagation & Transmission Lines | 4 – 0 | 4       |                    | ECE-413 T              |
| ECE- E30 T   | Data Communication                             | 4 – 0 | 4       |                    | ECE-413 T              |
| ECE- E31 T   | Elements of Digital Logic                      | 3 – 0 | 2       |                    | Nil                    |



**EMBEDDED SYSTEMS (ECE- E13 T)**  
**(Credit 4: L – 4; P- 0)**

**UNIT I**

**Introduction:** Overview of Embedded System, Categories of Embedded System, Microcontroller and Embedded Processors, System and Processor Architecture: von Neumann, Harvard, Super Harvard and their variants

**UNIT II**

**Microcontroller Architecture:** Overview of 8051 Microcontroller family: Architecture, basic assembly language programming concepts, The program Counter and ROM Spaces in the 8051, Data types, 8051 Flag Bits and PSW Register, 8051 Register Banks and Stack Instruction set, Loop and Jump Instructions, Call Instructions

**UNIT III**

**Timers:** Time delay generations and calculations, I/O port programming Addressing Modes, accessing memory using various addressing modes, Arithmetic instructions and programs, Logical instructions, Single-bit instruction programming, Programming of 8051 Timers, Counter Programming

**UNIT IV**

**Communication with 8051:** Basics of Communication, Overview of RS-232, I<sup>2</sup>C Bus, UART, USB, 8051 connections to RS-232, 8051 serial communication programming, 8051 interrupts, Programming of timer interrupts, Programming of External hardware interrupts, Programming of the serial communication interrupts, Interrupt priority in the 8051

**UNIT V**

**Interfacing with 8051:** Interfacing an LCD to the 8051, 8051 interfacing to ADC, Sensors, Interfacing a Stepper Motor, 8051 interfacing to the keyboard, Interfacing a DAC to the 8051, 8255 Interfacing with 8031/51, 8051/31 interfacing to external memory

**TEXT BOOKS:**

1. Raj Kamal, “Embedded Systems”, TMH, 2004.
2. M.A. Mazidi and J. G. Mazidi, “The 8051 Microcontroller and Embedded Systems”, PHI, 2004

**REFERENCES BOOKS:**

1. David E. Simon, “An Embedded Software Primer”, Pearson Education, 1999.
2. K.J. Ayala, “The 8051 Microcontroller”, Penram International, 1991.
3. Dr. Rajiv Kapadia, “8051 Microcontroller & Embedded Systems”, Jaico Press
4. Dr. Prasad, “Embedded Real Time System”, Wiley Dreamtech, 2004.



**ANALOG ELECTRONICS-I (ECE- E14 T)**  
**(Credit 3: L – 3; P- 0)**

**UNIT-I**

**Diode Circuits:** Diode as a circuit element, Rectifiers: Half Wave Rectifier, Full Wave Rectifier (CT and bridge type), Diode Clipping and Clamping Circuits, Voltage Multiplier Circuits, Basic operation of Zener Diode, Zener Diode as a Voltage Regulator, Schottky Diode, Tunnel Diode.

**UNIT-II**

**Transistors (BJT):** Current Components of Transistor, Types, Transistor as an Amplifier, Operation and Characteristics, Analysis and Design of CE, CB and CC Configurations, Input-Output Characteristics and Graphical Analysis of Basic Amplifier Circuits.

**UNIT-III**

**Transistor Biasing:** Operating Point, Load Lines, Need for Bias Stabilization, Biasing Configurations: Fixed Bias, Collector-to-Base Bias, Bias Circuit with Emitter Resistor, Voltage Divider Biasing, Emitter Bias, Bias Stability, Stability Factor, Thermal Stability.

**UNIT-IV**

**Transistor at Low Frequency:** Two port devices and hybrid model, Transistor hybrid model, h-parameters, Analysis of a transistor amplifier circuit using h-parameters, Miller's Theorem, Cascading transistor amplifiers.

**UNIT-V**

**Transistor at High Frequency:** Hybrid Pi ( $\pi$ ) Common Emitter Transistor model, Hybrid  $\pi$  Capacitances, Common Emitter Short Circuit Current Gain, Validity of Hybrid  $\pi$  Model. Multistage amplifiers, RC Coupled, Direct Coupled, Transformer Coupled, Frequency response of an amplifier.

**TEXT BOOKS:**

1. Electronic Circuits by D. Schelling and C. Belove
2. Integrated Electronics by Millman & Halkias.
3. Electronic circuits by G. Grob.
4. Electronic Devices and Circuit Theory by Boylestead and Nashelsky. 1994
5. Microelectronic Circuits Adel S. Sedra and Kenneth C. Smith



**SIGNALS AND SYSTEMS (ECE- E15 T)**  
**(Credit 3: L – 3; P- 0)**

**UNIT I**

**Representation of Signals:** Continuous and discrete time signals: Classification of Signals, Complex exponential and sinusoidal signals, properties of discrete time complex exponential unit impulse – unit step impulse functions. Determination of Fourier series representation of continuous time and discrete time periodic signals – Explanation of properties of continuous time and discrete time Fourier series

**UNIT II**

**Analysis of Continuous Time Signals and Systems :** Continuous time Fourier Transform and Laplace Transform analysis with examples, properties of the Continuous time Fourier Transform and Laplace Transform basic properties, Convolution in time and frequency domains. Basic properties of continuous time systems: Linearity, Causality, time invariance, stability, magnitude and Phase representations of frequency response of LTI systems -Analysis and characterization of LTI systems using Laplace transform

**UNIT III**

**Sampling Theorem and z-Transforms:** Representation of continuous time signals by its sample - Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals, sampling of band pass signals. Basic principles of z-transform - z-transform definition – region of convergence – properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform, Relationship between z-transform and Fourier transform.

**UNIT IV**

**Discrete Time Systems:** Computation of Impulse & response & Transfer function using Z Transform. DTFT Properties and examples – LTI-DT systems -Characterization using difference equation – Block diagram representation – Properties of convolution and the interconnection of LTI Systems – Causality and stability of LTI Systems.

**UNIT V**

**Systems with Finite and Infinite Duration Impulse Response :** Systems with finite duration and infinite duration impulse response – recursive and non-recursive discrete time system – realization structures – direct form – I, direct form – II, Transpose, cascade and parallel forms

**TEXT BOOK:**

- 1) Alan V. Oppenheim, Alan S. Willsky with S. Hamid Nawab, Signals & Systems, 2nd edition., Pearson Education, 1997
- 2) Signals and systems by Simon Haykins and Barry Van Veen

**REFERENCE BOOKS:**

- 1) John G. Proakis and Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms and Applications, 3rd edn, PHI, 2000.
- 2) M. J. Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.
- 3) Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999
- 4) K. Lindner, “Signals and Systems”, McGraw Hill International, 1999.
- 5) Moman .H. Hays,” Digital Signal Processing “, Schaum’s outlines, Tata McGraw-Hill Co Ltd., 2004.
- 6) Ashok Amhardar, “Analog and Digital Signal Processing”, 2nd Edition Thomson 2002.



**VLSI DESIGN (ECE- E16 T)**  
**(Credit 3: L –3; P- 0)**

**UNIT I**

**MOS Transistor Theory:** nMOS Enhancement Transistor, pMOS Enhancement transistor, V-I characteristics, Threshold voltage, short channel effects: Channel length modulation (CLM), Body effect, subthreshold current, Impact ionization, hot electron effect, drain punchthrough, FN tunnelling, Introduction of CMOS circuits, quality metrics of digital design.

**UNIT II**

**Manufacturing CMOS Integrated Circuits:** Wafer processing, photolithography: Oxidation, Epitaxy, Deposition, Ion-implantation and diffusion, Etching, simplified CMOS Process Flow, CMOS Technology, basic n-well CMOS process, p-well process.

**UNIT III**

**Operation of MOS transistor :** MOS transistor as a switch, CMOS Logic, The Inverter, Noise margin,  $\beta_n/\beta_p$  ratio, NAND gate, NOR Gate, combinational logic, Compound Gate, MUX, alternate circuit representations, layout. Ratioed logic, Psuedonmos inverter, saturated load inverters.

**UNIT IV**

**CMOS Inverters:** Static Characteristics, Switching Characteristics, power consumption: static dissipation, dynamic dissipation, pass transistor logic, complementary pass transistor logic, Transmission gate, dynamic logic, Issues in dynamic design, glitching, cascading dynamic gates, Domino logic.

**UNIT V**

**Sequential MOS Logic Circuits:** Latches, CMOS subsystem design: adders, Carry Ripple Adder (CRA), Carry Look-ahead Adder (CLA), Carry skip adder, Manchester chain carry adder, Carry select adder, transmission gate adder, SR flip flop.

**TEXT BOOKS:**

- 1) Neil H. E. Weste & K.Eshranghian, “Principles of CMOS VLSI design”, 2<sup>nd</sup> Edition, Wesley, 2003
- 2) J. M.Rabaey, A.Chandrakasan and B.Nikolic, Digital Integrated Circuits:A Design Perspective, Pearson/PH, 2003.
- 3) S-M. Kang and Y.Leblebici, CMOS Digital Integrated Circuits: Analysis and Design, McGraw-Hill.
- 4) Douglas A. Pucknell, “Basic VLSI Design, 3<sup>rd</sup> Edition, 2004.



**DIGITAL SIGNAL PROCESSING (ECE- E17 T)**  
**(Credit 3: L – 3; P- 0)**

**UNIT I**

**Signals and systems:** Basic elements of digital signal Processing –Concept of frequency in continuous time and discrete time signals –Sampling theorem –Discrete time signals. Discrete time systems –Analysis of Linear time invariant systems Convolution

**UNIT II**

**Fast fourier transforms:** Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 – Decimation in Time – Decimation in Frequency algorithms – Use of FFT algorithms in Linear Filtering and correlation.

**UNIT III**

**IIR filter design:** System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain.

**UNIT IV**

**FIR filter design: Symmetric & Antisymmetric FIR filters:** Linear phase filter – Windowing technique – Rectangular, Kaiser Windows–Frequency sampling techniques.

**UNIT V**

**Finite word length effects:** Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representation – comparison – over flow error – truncation error – co-efficient quantization error - limit cycle oscillation – signal scaling –Applications of DSP.

**TEXT BOOK:**

1) John G Proakis and Dimtris G Manolakis, “Digital Signal Processing Principles, Algorithms and Application”, PHI/Pearson Education, 2000, 3rd Edition.

**REFERENCE BOOKS:**

1) Alan V Oppenheim, Ronald W Schafer and John R Buck, “Discrete Time Signal Processing”, PHI/Pearson Education, 2000, 2nd Edition

2) Johny R. Johnson, “Introduction to Digital Signal Processing”, Prentice Hall of India/Pearson Education, 2002

3) Sanjit K. Mitra, “Digital Signal Processing: A Computer – Based Approach”, Tata McGraw-Hill, 2001



**ELECTRONIC INSTRUMENTATION AND MEASUREMENTS (ECE- E18 T)**  
**(Credit 4: L – 4; P- 0)**

**UNIT I**

**Basic Measurement Concepts:** Measurement Systems, Static and Dynamic characteristics, Units and Standards of measurements, Errors in Measurements, Methods of Error Analysis, Statistical Analysis, Gaussian Error Distribution, Probability of Errors, Accuracy and Precision,

**UNIT II**

**Measurement of Basic Parameters:** Measurement of Low Medium and High Resistances, Measurement of Self-Inductance and Mutual Inductance, Measurement of Capacitance, **Indicating Instruments:** Construction and Theory of D' Arsonval galvanometer and its use as moving coil ammeters voltmeters, moving iron type ammeters and voltmeters, induction type energy meter, D.C. and A.C. potentiometers and their application.

**UNIT III**

Electronic Multimeters, D V M, Cathode Ray Oscilloscope, Block Schematic, Applications, Analog and Digital Storage Oscilloscope, Sampling Oscilloscope, Q meters, Vector Meters, True RMS Meters, electronic wattmeter, Vector Voltmeter, Vector Impedance Meter

**UNIT IV**

**Transducers:** Principle and Classification of Transducers, Different types of Transducers, Displacement, Strain Gauge, LVDT, Potentiometer, Capacitive and Inductive, Piezoelectric, Temperature, Optical Transducers, Measurement of Parameter: Measurement of Length, Angle, Area, Temperature, Pressure Flow, Speed, Concentration, stress, strain

**UNIT V**

**Signal Generators and Analyzers:** Function Generators, Pulse and Square Wave Generators, RF Generator, Sweep Generators, Frequency Synthesizer, Wave Analyzer, Measurement of Harmonic Distortion, Digital Spectrum Analyzer, RF Power Measurement, Digital RLC Meters, Random Noise generator.

**TEXT BOOKS:**

- 1) Electrical Measurements by Cooper.
- 2) Electronic and Electrical measurements instrumentation by A.K.Sawhney

**REFERENCE BOOKS:**

- 1) A course in Electronic and Electrical measurements instrumentation by J.B. Gupta
- 2) Electrical and Electronic Measurements by Banerjee, Gopal Krishna
- 3) Electrical Measurements and instrumentation by U.A Bakshi, A.V Bakshi





**OPTICAL FIBER COMMUNICATION (ECE- E19 T)**  
**(Credit 3: L – 3; P- 0)**

**UNIT I**

Introduction to optical fiber communication system- Advantages & Block diagram. Structure of optical fiber ,light propagation in optical fiber using ray theory, postulates of ray theory, Snell's Law, TIR, Numerical aperture, Meridional & Skew Rays, step and graded index fibers.

**UNIT II**

Wave Theory for optical propagation (Basics). Single & Multimode fibers, cut-off wavelength mode field diameter, effective refractive index and group delay, B-V diagram

**UNIT III**

Transmission Characteristics of Optical fiber, Attenuation in optical fibers, intrinsic and extrinsic absorption, linear and nonlinear scattering losses, and fiber bends losses.

**UNIT IV**

Dispersion and pulse broadening, intramodal and intermodal dispersion for step and graded index fibers, modal noise, over all fiber dispersion for multimode and monomode fiber. Dispersion shifted fibers, modal birefringence.

**UNIT V**

Einstein relations and population inversion optical feedback and threshold conditions, direct and indirect band gap semiconductors spontaneous and stimulated emission in p-n junction. Optical detectors: Requirement for photo detections p-n photodiode, characteristics of photo detections, p-i-n and avalanche photodiodes.Principal components of an optical fiber communication system, source laminations, optical transmitter circuits, and optical receiver block diagram.

**REFERENCE BOOKS:**

1. Optical Communication: J. Gowar PHI, 2nd Ed.
2. Optical fiber Communication: G.E. Keiser Mc Graw-Hill, 3rd Ed.
3. Optoelectronics: Wilson & Hawkes PHI, 2nd Ed.
4. Optical fiber Communication: John M.S Senior PHI, 2nd Ed.



**COMMUNICATION-I (ECE- E20 T)**  
**(Credit 3: L –3; P- 0)**

**UNIT I**

Introduction and benefits of communication technology, Review of signal spectra, Modulation & Need for modulation. Amplitude modulation (AM): definition, AM modulation index, spectrum of AM signal, power analysis of AM signal.

**UNIT II**

Frequency modulation (FM): Basic definition, Frequency modulation index, Carson bandwidth of FM signal, Narrow band and broad band FM signal

**UNIT III**

Elements of digital communication systems, advantages of digital communication systems, Sampling, Quantization and Coding, Quantization error (proof not required), Sampling theorem (proof),

**UNIT IV**

Digital Modulation techniques, generation and detection of ASK, FSK, PSK., Pulse modulation Techniques-Pulse Amplitude modulation (PAM), Pulse Position Modulation (PPM) Pulse Width Modulation (PWM).

**UNIT V**

Tuned radio frequency receiver, Heterodyne receiver, image frequency, Receiver characteristics,

**TEXT BOOKS:**

1. Electronic Communication system; G. Kennedy
2. Electronic Communication Systems(Fundamentals through advanced), W. Tomassi, Pearson Education
3. Communication System by Simon Hykin

**REFERENCE BOOKS:**

1. Communication system; Analog and Digital, Sanjay Sharma
2. Electronic Communications, Roody- Coolan, PHI
3. Electronic Communication by Louis. E. Frenzel



**SYSTEM DESIGN (ECE- E21 T/P)**  
**(Credit 4: L – 3; P- 2)**

**UNIT I**

**Introduction:** History. Why use VHDL? Hardware design construction, design levels, Hardware Simulation and Synthesis, Using VHDL for design synthesis. **Programmable Logic Devices:** Architecture of Programmable Logic Arrays, Programmable Array Logic, Microcell Structures, Simple PLDs, Complex PLDs, Field Programmable Gate Arrays (FPGA), Architecture and features of FPGAs.

**UNIT II**

**Behavioral, Data Flow and Structural Modelling:** Entity Declaration, Architecture Body, Data Types, Operators & Attributes, Signals and Variables, Concurrent Signal, Sequential Signal, WHEN, GENERATE (Simple & Selected), Wait, If, Case, Null, Loop, Exit, Next and Assertion statements, Block Statements, Arrays in VHDL, Sequential Code: PROCESS, IF, WAIT, CASE, LOOP.

**UNIT III**

**Functions and procedures:** Functions, Procedures, Declarations, Function Location, procedure Location, Packages and Components: Package Declarations, Package Body, Use Clause, Predefined Package Standard, Design Libraries, Component Declaration, Component Instantiation, Port Map.

**UNIT IV**

**Finite State Machines (FSM):** Mealy/Moore state machine diagram, State Tables, State Graphs, Design of Finite State Machines

**UNIT V**

**Additional Circuit Design:** Carry Ripple adder, Carry Look Ahead adder, Barrel shifter, comparators, Memory Design, ASICs.

**EXPERIMENTS TO BE PERFORMED:**

1) To learn the Xilinx Simulator

**VHDL Programming:**

- 1) Write a VHDL Program to implement a 3:8 decoder.
- 2) Write a VHDL Program to implement an 8:1 multiplexer.
- 3) Write a VHDL Program to implement a 1:8 demultiplexer
- 4) Write a VHDL Program to implement 4 bit addition/subtraction.
- 5) Write a VHDL Program to implement 4 bit comparator.
- 6) Write a program to design a 2 bit ALU containing 4 arithmetic & 4 logic operation
- 7) Design of different Sequential and Combinational circuits using Xilinx Simulator.

**TEXT BOOKS:**

- 1) Pedroni, VHDL
- 2) D. Perry, VHDL, 3rdEd.- TMH.
- 3) J. Bhasker, A.VHDL- Primer, PHI.
- 4) Skahil, VHDL for Programmable logic- 2<sup>nd</sup> edition



**APPLIED ELECTRONIC INSTRUMENTATION (ECE- E22 T)**  
**(Credit 4: L – 4; P- 0)**

**UNIT I**

**Basic measurement concepts:** Measurement system- static and dynamic characteristics, units and standards of measurements, primary and secondary standards- error, accuracy and precision

**UNIT II**

**Basic electronic measurements:** Electronic multi-meters CRO - block schematic-applications, AC and DC measurement-DC voltmeter, ammeter, ohmmeter, digital type voltmeter, ammeter, ohmmeter, AC measurement, ammeter, and ohmmeter

**UNIT III**

**Transducers and sensor:** Active and passive transducers, types-resistive, inductive, capacitive, piezoelectric, measurement of physical, physiological, chemical quantities (temperature, pH, luminescence, flow, torque, pressure, speed, acceleration, rotation, stress, strain)

**UNIT IV**

**Signal generators and analysers:** Function generators, RF signal generator, sweep generator, frequency synthesizer, wave analysers for audio and radio frequency waves.

**UNIT V**

**Data acquisition system:** Components of data acquisition system, interfacing of transducer, single and multichannel system, Multiplexing, interfacing with micro controllers.

**TEXT BOOKS:**

- 1) Electronic measurements by W. Cooper
- 2) Electrical & Electronic measurements by A.K. Sawhney



**DIGITAL ELECTRONICS AND LOGIC DESIGN (ECE- E24 T)**  
**(Credit 4: L – 4; P- 0)**

**UNIT I**

**Number Systems and Codes:** Binary, octal, and hexa- decimal number systems, binary arithmetic, binary code, excess-3 code, gray code, error detection and correction codes. Boolean algebra: Postulates and theorems, logic functions, minimization of Boolean functions using algebraic, Karnaugh map and Quine – McClusky methods, realization using logic gates.

**UNIT II**

**Combinational Circuits:** Introduction to combinational circuits, realization of basic combinational functions like Adder, Subtractor, Encoder/Decoder, Multiplexer, Comparators, delays and hazards in combinational circuits, Code converters – Implementation using MUX and ROM

**UNIT III**

**Sequential Circuits:** Flip-Flops: SR, JK, T, D, Master/Slave FF, triggering of FF, Analysis of clocked sequential circuits-their design, state minimization, state assignment, circuit implementation, Registers: shift registers, inter-conversion of shift registers, Counters.

**UNIT IV**

**Programmable Logic Devices (PLD's):** Programmable Array Logic, Programmable Logic Array – GAL, RISC, CISC – basic concepts.

**UNIT V**

**Logic Families:** RTL, DCTL, I<sup>2</sup>L, DTL, HTL, TTL, ECL, NMOS and CMOS logic gates, circuit diagram and analysis, characteristics and specifications, tri-state gates, totem-pole configuration.

**TEXT BOOKS:**

1) Morris Mano, "Digital logic and Computer Design ", Prentice-Hall of India.

**REFERENCE BOOKS:**

- 1) Floyd T.L., "Digital Fundamentals ", Charles E. Merrill Publishing Company
- 2) Jain R.P., "Modern Digital Electronics ", Tata McGraw Hill.
- 3) Ronald J. Tocci, "Digital Systems, Principles and Applications", Prentice-Hall of India



**ELECTRONIC ENGINEERING MATERIALS (ECE- E25 T)**  
**(Credit 4: L – 4; P- 0)**

**UNIT I**

Crystal structure: crystalline state, Bravais lattices, Miller indices, Reciprocal lattice, Common Crystal structures, Crystalline Interference, Bragg Diffraction, crystal imperfections

**UNIT II**

Free electron theory, Energy bands in solids, metals, insulators, semiconductors and semi-metals, free electron in one and three-dimensions, free electron and density of states, Fermi-Dirac statistics, conduction in metals and alloys, conductors and resistors, Materials for resistors, capacitors and inductors.

**UNIT III**

Growth of single crystals, the Czochralski Technique, Zone refining technique, GaAs crystal growth technique, Epitaxial growth, Vapour phase and molecular beam Epitaxy, Diffusion Technology and Photolithography , Metallization and Etching ,

**UNIT IV**

Magnetism, magnetic properties of materials; diamagnetic, paramagnetic and ferromagnetic properties of materials, ferro-magnetism and anti-ferromagnetism, ferrites ,Dielectric materials, Piezoelectricity ,Polarization and Dielectric Constant, Superconductivity, London equation and BCS theory(qualitative only), Josephson effect.

**UNIT V**

Introduction to Nanotechnology, Nanostructures, Carbon Nanotubes (CT), Quantum Dots and Semiconductor Nanoparticles, Nanophotonics, Nanosensors, Future prospectus and application of Nanotechnology.

**RECOMMENDED BOOKS:**

- 1) Introduction to solid-state physics by Kittel
- 2) Solid state physics by Dekker
- 3) Material science & Engineering by Raghavan
- 4) Electronics & materials by Streetman
- 5) Physics of semiconductor devices by D.K Roy
- 6) Semiconductor Devices Physics And technology by S.M Sze
- 7) The material Science of Semiconductors by Augus Rochett
- 8) Nanotechnology: Fundamentals and Applications by Mansi Karkare
- 9) Nanotechnology: A Gentle Introduction to the Next Big Idea by Mark A Ratner, Daniel Ratner



**ANALOG ELECTRONICS-II (ECE- E26 T)**  
**(Credit 3: L – 3; P- 0)**

**UNIT I**

**JFET's:** JFET Operation, JFET Volt-Ampere Characteristics, Analysis and design of Common Source, Common Drain and Common Gate Configuration, Low Frequency and High Frequency response of Common Source and Common Drain Amplifiers, FET Biasing, MOSFET's: Types, Operation and Characteristics.

**UNIT II**

**Feedback Amplifiers:** Feedback Basics, Types of Feedback, Negative Feedback, General Characteristics of Negative Feedback Amplifiers, Effect of Negative Feedback on Amplifier Bandwidths, Types of Feedback Amplifiers, Current-Shunt, Current-Series, Voltage-Shunt and Voltage Series Feedback,

**UNIT III**

**Sinusoidal Oscillators:** Classification of Oscillators, Basic Operation, Barkhausen Criterion, Analysis of general Oscillator Circuits, Types of Oscillator Circuits and their analysis: Hartley Oscillator, Colpitts Oscillator, Phase Shift Oscillator, Wien Bridge Oscillator, Crystal Oscillator, Design of Practical Oscillator circuits

**UNIT IV**

**Power Amplifiers:** Need for Power Amplifiers, Classification of Power Amplifiers, Class A, Class B, Class AB, Class C and Class D Power Amplifiers, Analysis & Design, Harmonic distortion in Power Amplifiers, Efficiency, Push -Pull Amplifiers, Distortion in Push- Pull Amplifiers,

**UNIT V**

**Multivibrators:** Bi-stable Multivibrators, Monostable Multivibrators and Astable Multivibrators, Circuits & their Analysis, Bi-stable Circuit as a Memory Element, Generation of Square, Triangular Waves using Astable Multivibrator, Waveform Generators, Triangular & Square wave Generators.

**TEXT BOOKS:**

- 1) Integrated Electronics by Millman & Halkias
- 2) Electronic Devices by Robert L Boylested & Louis Nashlesky



**COMPUTER ORGANIZATION AND ARCHITECTURE (ECE- E27 T)**  
**(Credit 3: L – 3; P- 0)**

**UNIT I**

**Register Transfer and Micro-operations:** Introduction and comparison of Computer Architecture & Organisation, Computer Registers, Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic Micro-operations, Shift Micro-operations, Arithmetic Logic Shift Unit.

**UNIT II**

**Basic Computer Organization and Design:** Control Organization – Hard wired and micro programmed control. Instruction Codes, Computer Instructions, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Control Memory, Address Sequencing,

**UNIT III**

**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Program Control, Decimal Arithmetic Unit.

**UNIT IV**

**Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access.

**TEXT BOOKS:**

- 1) M Mano, “Computer System and Architecture”, PHI
- 2) W. Stallings, “Computer Organization & Architecture”, PHI

**REFERENCE BOOKS:**

- 1) J. P. Hayes, “Computer Architecture and Organization”, McGraw Hill
- 2) J. L. Hennessy and D. A. Patterson, “Computer Architecture: A quantitative approach”, Morgan Kaufman, 1992
- 3) Computer Systems Organization and Architecture, John D. Carpinelli, Pearson Education Inc





**MICROPROCESSORS (ECE- E28 T)**  
**(Credit 4: L – 4; P- 0)**

**UNIT I**

8085 pinout diagram, function of different pins, data bus, address bus, multiplexing and de multiplexing of address/data lines, control bus, control and status signals, internal architecture (ALU, Register Array, timing and Control Unit), flags, Different addressing modes, instruction set, arithmetic and logic operations, 8085 assembly language programming, (addition, subtraction, multiplication, Division), timing diagrams, Instruction cycle.

**UNIT II**

Addressing techniques, memory mapped I/O and I/O mapped I/O scheme, Partial and absolute address decoding, Basic interfacing concepts, interfacing input devices, interfacing output devices, 8085 Interrupts, stack and subroutines, counters and time delays.

**UNIT III**

8086 architecture, addressing modes, Instruction set, Basic programming concepts, interrupts.

**UNIT IV**

Interfacing peripheral devices, Multi-purpose programmable device (8155, Programmable peripheral interface (8255), 8259A programmable interrupt controller, Direct memory access and DMA controller (8237), The 8254 programmable interval timer.

**UNIT V**

Interfacing 8085 and 8086 using 8155 & 8255, with different devices - stepper motor, A/D and D/A converters, Interfacing with LCD.

**TEXT BOOKS:**

- 1) Ramesh S Gaonkar, Microprocessor Architecture, Programming and Applications with 8085. PRI Publishing (India) Pvt. Ltd.
- 2) 8086 Microprocessor, by D. Hall

**REFERENCE BOOKS:**

- 1) Gilmore, Microprocessors, TMH India.
- 2) K.L. Short, Microprocessors and Programming Logic
- 3) A.K Roy



**ANTENNAS, WAVE PROPAGATION AND TRANSMISSION LINES (ECE- E29 T)**  
**(Credit 4: L – 4; P- 0)**

**UNIT I**

**Transmission Line Theory:** The transmission line general solution, Basic definitions, Distortion less line, telephone cables, inductance loading, line not terminated in  $Z_0$ , reflection open and short circuited lines, Reflection co-efficient, Reflector factor and reflection loss. Parameters of open-wire and coaxial lines at radio frequency, constants of a dissipation less line, Standing Wave Ratio, Input, Impedance of loss less, open wire and short circuited lines, Quarter wave lines as impedance transformer, Half wave and eight wave lines. Impedance matching. The smith diagram and its application

**UNIT II**

**Antennas:** Basic Antenna parameters, Half wave antenna, vertical antenna above ground, the grounded quarter wave antenna, Directivity and Antenna gain, Bandwidth and beam width, Radiation patterns, Folded dipole and applications. Antenna arrays, Parabolic reflector, properties and feed mechanism.

**UNIT III**

**Propagation of Waves:** Waves in free space, Attenuation, Absorption And polarization, effects of environment, Ground wave propagation, sky wave propagation, space wave propagation, Troposcatter propagation and Extra-terrestrial propagation

**UNIT IV**

**Design of Antenna:** Yagi Antenna and Horn Antenna, Parabolic Antenna

**TEXT BOOKS:**

- 1) Network, lines and fields by J D Ryder.
- 2) Electronic communication system by G. Kennedy.

**REFERENCE BOOKS:**

- 1) Fields and waves in comm. Electronics by R W V Duzer.
- 2) Antennas by J. D .Kraus, McGraw Hill Pub.ss
- 3) Handbook of Modern Electronics & Electrical Engineering, Charles Belove, Wiley Inter-Science, New York 1992.



**DATA COMMUNICATION (ECE- E30 T)**  
**(Credit 3: L – 3; P- 0)**

**UNIT I**

Transmission of Data, Pulse Modulation, Bit & Baud Rate, Channel, Capacity, Shannon's Law, Synchronous & Asynchronous Transmission, Line Encoding, Unipolar Encoding, Polar Encoding, Bipolar Encoding, Manchester Encoding,

**UNIT II**

Modems, Basic Definition, Modem Types, Modem Modulation (ASK, FSK, PSK, QAM – Basic concepts), Multiplexing & multiple access techniques, FDM, TDMA, CDMA, OFDM, FDM channel groups, TDM.

**UNIT III**

Error detection and Correction techniques- parity coding, linear block coding, VRC & HRC, cyclic redundancy check. Secure message communication, Active and passive attacks, Cryptography, Transposition cipher, substitution cipher, product cipher and Data encryption standard, public key and private key encryption.

**UNIT IV**

LAN, MAN, WAN, Network Topologies (Bus Topology, Star Topology, Ring Topology, Tree Topology), Data Communication Modes (Simplex, Half Duplex and Full Duplex), Communication Hardware, Bridges, Gateways, Routers, Network Interface Unit.

**UNIT V**

Open System Interconnection (OSI) model of a Network, TCP/IP model, Internet Technology- Transmission and security, Circuit Switching, Packet Switching, Routing & Congestion.

**TEXT BOOKS:**

1) Forouzan B, Data communication and Networking, TMH

**REFERENCE BOOKS:**

- 1) Tanenbaum, Computer Networks, PHI.
- 2) Louis E. Frenzel, Principles of Electronic Communication system, TMH, 2008
- 3) Larry Hughes, Data communication, Narosa Publishing House.



**ELEMENTS OF DIGITAL LOGIC (ECE- E31 T)**  
**(Credit 3: L – 3; P- 0)**

**UNIT I**

**Number Systems and Codes:** Binary, octal, and hexa- decimal number systems, binary arithmetic, binary code, excess-3 code, gray code. Boolean algebra: Postulates and theorems, logic functions, minimization of Boolean functions using algebraic, Karnaugh map.

**UNIT II:**

**Combinational Circuits:** Introduction to combinational circuits, Adder, Subtractor, Encoder/Decoder, Multiplexer.

**UNIT III:**

**Sequential Circuits:** Flip-Flops: SR, JK, T, D, Master/Slave FF, Register, Counters.

**TEXT BOOKS:**

1) Morris Mano, "Digital logic and Computer Design ", Prentice-Hall of India.

**REFERENCE BOOKS:**

- 1) Ronald J. Tocci, "Digital Systems, Principles and Applications", Prentice-Hall of India.
- 2) Jain R.P., "Modern Digital Electronics ", Tata McGraw Hill.
- 3) Floyd T.L., "Digital Fundamentals ", Charles E. Merrill Publishing Company