SYLLABUS

SEMESTER VII

CHOICE BASED CREDIT SYSTEM
(Vetted in BOS, Sep -2017)

For
B. Tech Electronics and Communication Engineering

Four Years Programme
(For Batches 2017 onwards)

SEMESTER-VII

Course Code	Course Title	L – P	Credit
ECE 711 T	Microwave Engineering	4 – 0	4
ECE 712 T	Data Communication	4 – 0	4
ELE 717 T	Power System	4 – 0	4
XXX Exx X	Elective-V (DC) *	x – x	X
XXX Exx X	Elective-VI (DC) *	x– x	X
ECE 713 P	Microwave Engineering Lab	0 – 2	1
ECE 714 P	Data Communication Lab	0 – 2	1
ELE 718 P	Power Systems Lab	0 – 2	1
ECE 715 P	Practical Training	0 – 2	1
ECE 716 P	Seminar	0 – 3	2
	Total Credits	**(12+x+x) – (11+x+x)**	**(18+x+x)**

* 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)

MICROWAVE ENGINEERING (ECE 711 T)
(Credit 4: L – 4; P- 0)

UNIT I

Microwave Rectangular Waveguides: Solutions of wave equations in rectangular coordinates, TE modes in rectangular waveguides, Power transmission and losses in rectangular waveguides, Excitation of modes in rectangular waveguides, Characteristics of standard waveguides

UNIT II

Microwave Circular Waveguides: Solutions of wave equations in cylindrical coordinates, TE modes in circular waveguides, TM modes in circular waveguides, TEM modes, Power transmission in circular waveguides and transmission lines, Excitations of modes in circular waveguides, characteristics of Standard Circular waveguides

UNIT III

Microwave components: Circular cavity resonator, Q-factor of a cavity resonator, Microwave junctions, waveguide Tee, Magic Tee, directional couplers, Matrix of hybrid couplers, Circulators, Isolators, Waveguide corners and bends

UNIT IV

Microwave Solid State Devices: Microwave Tunnel diodes, Microwave JFET's and MESFET's, Transferred electron devices (TED's), Gunn effect, Ridley-Watkins-Hilsum Theory, Gunn-diode Microwave Oscillator, Avalanche Transit time devices, READ diode, IMPATT diodes , TRAPATT diode, BARITT diode, Parametric Amplifier

UNIT V

Microwave linear Beam and crossed field Tubes: Klystrons, Bunching and velocity modulation process, multi-cavity klystron amplifier, Reflex Klystron, Helix Traveling wave tube (TWT's), Microwave crossed field tubes: Magnetron Oscillator, Linear Magnetron, FWCFA.

TEXT BOOKS:

1) S.Y. Liao, Microwave Devices and circuits, Prentice-Hall (Pearson Edu), 2003 Ed

REFERENCE BOOKS:

1) KC Gupta, Microwave , New Age International Publishers, New Delhi, 2004 Ed
2) VL Gupta and ML Sisodia, New Age International publishers, New Delhi
3) David M. Pozar, Microwave Engineering, John Wiley

DATA COMMUNICATION (ECE 712 T)
(Credit 4: L – 4; P- 0)

UNIT I
Transmission of Data, Pulse Modulation, Bit & Baud Rate, Channel, Capacity, Shannon's Law, Synchronous & Asynchronous Transmission, UART, USART, 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- T1 carrier system, telephone system, AMPS, Software defined Radio (SDR), Cognitive radio.

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, substation cipher, product cipher and Data encryption standard, public key and private key encryption, Scramblers & Descramblers.

UNIT IV
LAN, MAN, WAN, Value Added Networks, High speed Networks, Public Switched Networks, Network Topologies (Bus Topology, Star Topology, Ring Topology, Tree Topology), Data Communication Codes, 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, TCPIP model, Internet Technology-Transmission and security, Internet service provider, Flow & Error Control. Random Access, Controlled Access Circuit Switching, Packet Switching, Routing & Congestion Control Internet Service Provider: Transmission and security.

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.

POWER SYSTEMS (ELE 717 T)
(Credit 4: L – 4; P- 0)

UNIT I

Fundamentals of Power System: Introduction to Power System, Single line diagram, impedance and reactance diagram of a power system, Single Phase and Three Phase Transmission, Overhead and Underground transmission System, Elements of AC distribution, Single fed, double fed and ring main distributor.
Per unit Systems: PU method of representing quantities, PU impedance diagram of a Power System.

UNIT II

Overhead line insulators and Insulated Cables: Types of insulators and their applications, Potential distribution over a string of insulators, String efficiency & methods of equalizing potential drop, Classification of cables, Cable conductors, insulating materials, insulation resistance, electrostatic stress, grading of cables, Capacitance calculation, losses and current carrying capacity.

UNIT III

Overhead Transmission Lines: Transmission line parameters, types of overhead conductors with calculations of inductance and capacitance, effect of earth on capacitance of a transmission line, Bundled conductors, Skin and proximity effect, corona, interference of power lines with communication lines.

UNIT IV

Performance of lines: Representation of lines, Modelling and Performance analysis of short, medium and long transmission lines, ABCD constants, Transposition of transmission conductors, Surge impedance loading, and Ferranti effect.

UNIT V

Fault Analysis: Faults, types of faults, Symmetrical components of a three phase system, Evaluation of components, three phase power in terms of symmetrical components, Sequence impedances, Introduction, Sequence network equations, calculation of fault currents for unsymmetrical faults: single line to ground, line-to-line, double line to ground faults and for symmetrical 3-phase balanced faults, current limiting reactors.

TEXT BOOKS:

1) Electric Power Systems C.L. Wadhwa New age international 2010

REFERENCE BOOKS:

1) Power System Analysis J.J. Grainger and W.D Stevenson Mcgraw hill 1994
2) Power System Engineering Nagrath and Kothari Tata Mcgraw hill 2007
3) Transmission and Distribution of Electrical Energy H.Cotton Hodder Arnold 3rd Revised edition
4) Power Systems by J.B. Gupta, SK Kataria and sons

MICROWAVE ENGINEERING LAB (ECE 713 P)
(Credit 1: L – 0; P- 2)

LIST OF EXPERIMENTS:

1) To study Gunn Oscillator as a source of Microwave power and to study
2) To study I –V Characteristics
3) To study Power and Frequency as a function of bias characteristics
4) To study Klystron Oscillator as a source of Microwave power and to study its operation (Electronic Tuning and Electronic Tuning Sensitivity)
5) To study the directional coupler and to verify its power at different ports
6) To study a slotted waveguide section and its application in the measurement of VSWR
7) To measure the attenuation of microwave signals by substitution method
8) To study a PIN diode modulator in conjunction with Gunn Oscillator and to study Modulation depth.
9) To study the radiation Characteristics (Gain v's Frequency) of microwave Horn antenna
10) To study the radiation characteristics of a microwave helical antenna

DATA COMMUNICATION LAB (ECE 714 P)
(Credit 1: L – 0; P- 2)

LIST OF EXPERIMENTS:

1) To study Modem.
2) To Study QPSK modulation.
3) To implement Scrambler and Descrambler.
4) To study Encryption and Decryption Techniques.
5) To implement error detection using parity coding.
6) To study Linear Block Codes (LBC) for error detection and correction.
7) Implementation of Time Division Multiplexing (TDM) and De-multiplexing.
8) To generate a PN –Code sequence using a 3-stage shift register using JK Flip flops.

POWER SYSTEMS LAB (ELE 718 P)
(Credits: 1: L – 0; P-2)

LIST OF EXPERIMENTS:

1. To study different types of insulators.
2. To study potential distribution across different units of a string of insulators with and without guarding.
3. To study different parts of a power cable.
4. To measure the insulation resistance of a cable.
5. To determine the charging current of a cable.
6. To study different types of overhead conductors.
7. To determine ABCD parameters of a transmission line.
8. To determine voltage regulation and efficiency of a transmission line.
9. Study of Ferranti effect.

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^{th} – 8^{th}	Nil
ECE-E 02 T/P	Radar Systems	3 – 2	4	7^{th} – 8^{th}	ECE-413T & ECE-611T
ECE- E03 T/P	Artificial Neural Networks & Fuzzy Logic	3 – 2	4	8^{th}	Nil
ECE- E04 T	Electronic Devices & Circuits	4 – 0	4	5^{th}	ECE-311T ECE-411T
ECE- E05 T	TV & Video Engineering	4 – 0	4	5^{th}	ECE-311T ECE-413T
ECE- E06 T	Medical Electronics	3 – 0	3	6^{th}	ECE-311T ECE-511T
ECE- E07 T	Nano Electronics	4 – 0	4	6^{th}	ECE-314T
ECE- E08 T	Advance Computer Architecture	4 – 0	3	5^{th}	ECE-313T ECE-412T
ECE- E09 T	VLSI Technology	3 – 0	3	5^{th}	ECE-311T ECE-411T
ECE- E10 T	System Design	3 – 0	3	8^{th}	ECE-313T ECE-813T
ECE- E11 T	Sci Lab	0 – 3	2	4^{th}	Nil
ECE- E12 T	Mobile Communication	3 – 0	3	7^{th}	ECE-611T ECE-712T
ECE- E32 T	Cyber Laws	3 – 0	3	5^{th}	Nil
ECE- E33 T	Network Security	3 – 0	3	5^{th} onwards	ECE-412 T
ECE- E34 T	Mobile Ad hoc Networks	3 – 0	3	6^{th}	ECE 413 T
ECE- E35 T	Multi Input Multi Output	3 – 0	3		
ECE- E36 T	Satellite Communication	3 – 0	3	5^{th} onwards	Nil
ECE- E37 T	Cadence Lab	0 – 2	2	5^{th} onwards	Nil
ECE- E38 T	Lab View	0 – 2	2	5^{th} onwards	Nil
ECE- E39 T	CMOS Analog Design	3 – 0	3		
ECE-E40T/P	EDA	3 – 2	4		
ECE-E41T/P	Advanced Computer organisation and Architecture	3 – 2	4		
ECE-E42T/P	Deep Learning	3 – 2	4		
ECE-E43T	Probability and Statistics	3 – 2	4		
ECE-E44T/P	Pattern Recognition	3 – 2	4		
ECE-E45T/P	Antenna Design and Basics	3 – 2	4		
ECE-E46T/P	Principles of Modern Radar	3 – 2	4		

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: chair 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 Learniy (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 if 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, "Fundemanatals 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 Applicaqtions",Wiley,NY 1994.
3) H.Beneking, "High speed semiconduuctor Devices:Circuit Aspects and Fundamental Behaviour" Chapman and Hall,London,1994.
4) S.M Sze "High speed semiconduuctor 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, PO2, PCO2, PHCO3, 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) Leislie 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 SiO2. 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: roster 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, Applicationof 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 Opertions, 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, Apploications of Sim ulink, 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 Simulinl – 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) KavehPahlavan 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

UNITII

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 brand 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 sharing 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://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/ 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 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 ECE-313 T
ECE- E19 T	Optical Fibre Communication	3 – 0	3		Nil
ECE- E20 T **ECE- E21 T/P**	Communication I Digital System Design	3 - 0 3 – 2	3 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 ad 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^2C 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 (π) Common Emitter Transistor model, Hybrid π Capacitances, Common Emitter Short Circuit Current Gain, Validity of Hybrid π 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, β_n/β_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", 2nd 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, 3rd 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 & Antisymteric 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

2) Write a VHDL Program to implement a 3:8 decoder.
3) Write a VHDL Program to implement an 8:1 multiplexer.
4) Write a VHDL Program to implement a 1:8 demultiplexer
5) Write a VHDL Program to implement 4 bit addition/subtraction.
6) Write a VHDL Program to implement 4 bit comparator.
7) Write a program to design a 2 bit ALU containing 4 arithmetic & 4 logic operation
8) Design of different Sequential and Combinational circuits using Xilinix 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- 2nd 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 – 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^2L, 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 Kittle
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 Mutivibrator, 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", Morgon Kauffman, 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_o, reflection open and short circulated lines , Reflection co-efficient, Reflector factor and reflection loss .Parameters of open-wire and coaxial liens 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, substation 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, TCPIP 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. Floyd T.L., "Digital Fundamentals ", Charles E. Merrill Publishing Company

Electronic Design Automation (EDA)

CADENCE/ADS

1.

a) To Simulate a half wave and a full wave rectifiers (bridge and center-tapped) and to study their performance.

b) To suppress the ripple of half wave rectifier, bridge and center-tapped rectifiers using RC filter.

2. To Simulate Zener diode as a voltage regulator
3. To Design & simulate Zener diode based voltage regulated power supply with short circuit protection.
4. To Design & simulate a LPF,HPF.
5. To Simulate and observe the performance of clipping and clamping circuits.
6. To Simulate a CB amplifier and observe i t s performance.
7. To Simulate a CE amplifiers with various biasing configurations.
8. To Simulate a CC amplifiers with various biasing configurations.
9. To Design & Simulate a two stage RC-coupled amplifier and observe its output.

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B: MATLAB/SIMULINK:

1 .Basic Array Operations
2. 2D plotting and 3D plotting.
3. Control structure programming.
4. Working with audio and pictures.

C: LAB VIEW:

1. Computing expressions using graphical programming.
2. Creating a VI to find the decimal equivalent of a binary number.
3. Creating a sub VI to find Grey Code Equivalent ofa BCD number.
4. Create a VI to display a waveform chart.
5. Build a VI to generate a sine waveform with options to vary amplitude,frequency and offset.

ADVANCED COMPUTER ORGANIZATION AND ARCHITECTURE (ECE-E41 T)
L – P
4 -- 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, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt, Complete Computer Description, Control Memory, Address Sequencing, Micro program Example.
UNIT III
Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control. Computer Arithmetic: Addition and Subtraction, Decimal Arithmetic Unit.
UNIT IV
Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access.
UNIT V
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

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”, Morgon Kauffman, 1992
3) Computer Systems Organization and Architecture, John D. Carpinelli, Pearson Education Inc

Course Title: Deep Learning (ECE-E42T/P) 3-1-0

UNIT I: Basics of Neural Networks, Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability. Convergence theorem for Perceptron Learning Algorithm. XOR Problem.
UNIT II: Feedforward Networks: Multilayer Perceptron, Gradient Descent method of Learning, Backpropagation Neural Networks, Empirical Risk Minimization, regularization, autoencoders. Deep Neural Networks: Difficulty of training deep neural networks, Greedy layerwise training.
UNIT III: Better Training of Neural Networks: Newer optimization methods for neural networks (Adagrad, adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in neural networks, Regularization methods (dropout, drop connect, batch normalization).
UNIT IV: Recurrent Neural Networks: Back propagation through time, Long Short Term Memory, Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs, Convolutional Neural Networks: LeNet, AlexNet.
UNIT V: Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines, Generative Adversarial Networks.

Textbooks
Deep Learning, Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press, 2016.

References:
Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
Pattern Recognition and Machine Learning, Christopher Bishop, 2007

Probability and Statistics (ECE-E43 T) Credits o4

Probability, Set definitions and set operations, Axioms of probability, Joint and conditional probability, Independent events, Combined experiments, Bernoulli trials, Random Variables (R.V), The random variable concept, CDF, PDF, Some Important R.V.'s, Some Important R. V.'s
Conditional distribution and density functions.
Expectation, Moments, Characteristic function, Transformations of a R.V., Multiple random variables, Pairs of R.V.'s, Properties of joint distribution and joint density, Conditional distribution and density, Statistical Independence
Distribution and density of a sum of R.V.'s, Central Limit Theorem, Expected value of a function of R.V's
Joint characteristic functions, Jointly Gaussian R.V.'s, Transformations of multiple R.V.'s, Linear transformations of Gaussian R.V.'s, Sampling and some limit theorems.
Random Processes –Temporal Characteristics, Concept of a random process , Stationarity and independence, Correlation functions and their properties, Gaussian random process, Poisson random process, Random Processes – Spectral Characteristic, Power Spectral Density and its properties, Relationship between PSD and autocorrelation function, Linear systems with random inputs, Random signal response of linear systems, Spectral characteristics of system response

Textbook

Peebles, P. Z. "Probability, Random Variables, and Random Signal Principles", McGraw-Hill, 4th Edition, 2001.

References

Leon-Garcia, A. "Probability and Random Processes for EE", Addison Wesley, 2nd Edition, 1994.
Ross, S. . "A First Course in Probability", Prentice Hall, Fifth Edition, 1998.
Helstrom, C.W. "Probability and Stochastic Processes for Engineers", Addison-Wesley, 2nd Edition, 1992.
Walpole, R.E., Myers, R.H. and Myers, S. L., "Probability and Statistics for Engineers and Scientists", Prentice Hall, Sixth Edition, 1998.

Antenna Design and Basics (ECE-E45 T/P) 3-1-0

Introduction, Planar Radiators Bandwidth Definitions, Impedance Bandwidth, Pattern Bandwidth, Polarization or Axial-ratio Bandwidth, Planar Antennas, Suspended Plate Antennas, Bent Plate Antennas, Broadband Microstrip Patch Antennas, Microstrip Patch Antennas, Patch Shapes, Substrates Feeding Structures, Rectangular Microstrip Patch Antennas, Broadband Techniques, Lowering the Q, Using an Impedance Matching Network, Case Study: Microstrip Patch Antenna with Impedance Matching Stub, Introducing Multiple Resonances, Case Study: Microstrip Patch Antenna with Stacked Elements.

Broadband Suspended Plate Antennas, Techniques to Broaden Impedance Bandwidth , Capacitive Load,

Slotted Plates, Case Study: SPA with an omega-shaped Slot, Electromagnetic Coupling,

Nonplanar Plates, Vertical Feed Sheet, Techniques to Enhance Radiation Performance, Radiation Characteristics of SPAs, SPA with Dual Feed Probes, SPA with Slots and Shorting Strips, Arrays with Suspended Plate Elements, Mutual Coupling between Two Suspended Plate Elements, Reduced-size Array above Double-tiered Ground Plane

Planar Inverted-L/F Antennas, The Inverted-L/F Antenna, Broadband Planar Inverted-F/L Antenna, Planar Inverted-F Antenna, Planar Inverted-L Antenna, Case Studies, Handset Antennas, Laptop Computer Antennas, Planar Monopole Antennas and Ultra-wideband Applications

Planar Monopole Antenna, Planar Bi-conical Structure, Planar Monopoles, Roll Monopoles, EMC Feeding Methods, Planar Antennas for UWB Applications, Ultra-wideband Technology, Considerations for UWB Antennas and Source Pulses, Planar UWB Antenna and Assessment,

Text/Reference Books:

1. Zhi Ning Chen and Michael Y. W. Chia., Broadband Planar Antennas Design and Applications, *Jhon Wiley and Sons*

2. Gupta, Kuldip C._ Hall, Peter S - Analysis and design of integrated circuit--antenna modules-Wiley-Interscience (2000)

ECE-E46 T/P Principles of Modern Radar 3-1-0

Introduction to Radar, Basic Radar, Simple form of Radar Equation, radar Block Diagram, radar Frequencies, Applications of Radar, The origin of radar, radar Detection of Signals and Noise, Receiver noise and the Signal-to-Noise Ratio, probability density functions, integration to radar pulses, radar Cross section of Targets, Radar cross section fluctuations, transmitter power, Pulse repetition frequency, Antenna Parameters, System Losses,
MTI and Pulse Doppler Radar, introduction to Doppler and MTI Radar, outline of delay line cancellers, brief idea about Staggered Pulse repetition Frequencies
Tracking, Tracking of Radar, Tracking with radar, Mono-pulse tracking, Conical Scan and Sequential Lobing, limitations of Tracking accuracy, Low-angle tracking, tracking range, Various different trackers, Automatic tracking with surveillance Radars (ADT). Detection Criteria, detectors, automatic detection, integrators, CFAR receiver, CACFR, CAFR loss, clutter edges, effect of multiple targets, range resolution, Clutter map.
Clutter:, Introduction to Radar Clutter, Surface-Clutter radar Equation, High grazing angle, grazing , introduction to propagation of radar waves
Radar operator, Signal Management, basic Radar measurement, Theoretical Accuracy of Radar measurements, introduction to target recognition, target recognition applications

Text/Reference Books:

1. Skolnik. M. I., Introduction to Radar Systems, *McGraw Hill Education*
2. Peebles P.Z . Radar Principle, *Wiley Education*