DETAILED SYLLABUS

Under

Choice Based Credit System (CBCS) Scheme

For

M. Sc Programme in Electronics

(Academic Session 2015 and onwards)

APPROVED BY BOS, HELD ON 23-05-2015

P. G. D e p a r t m e n t o f E l e c t r o n i c s &
I n s t r u m e n t a t i o n T e c h n o l o g y
University of Kashmir, Hazratbal, Srinagar-6, J&K

Course: M. Sc. (Electronics) SEMESTER-I

Course Code	Course Title	Category	L	T	P	Credits
ELE-15101C	Circuit Analysis and Synthesis	Core	2	0	2	2+1
ELE-15102C	Antennas and Wave Propagation	Core	2	0	2	2+1
ELE-15103C	Linear Integrated Circuits and Applications (LICA)	Core	2	0	2	2+1
ELE-15104C	Digital Electronics and C-Programming Lab	Core	0	1	4	1+2
ELE-15105DCE	Engineering Mathematics	DCE	2	1	0	2+1
ELE-15106DCE	Signals and Systems	DCE	2	0	2	2+1
ELE-15107DCE	CMOS VLSI and Nano-Electronics –I (MOSFET Theory)	DCE	2	0	2	2+1
ELE-15108DCE	Electronics Engineering Materials and Components	DCE	2	0	2	2+1
ELE-15109DCE	Statistical Communication Theory	DCE	2	0	2	2+1
ELE-15110DCE	Instrument Fabrication and Maintenance	DCE	2	0	2	2+1
ELE-15111DCE	Opto-Electronic Devices	DCE	2	0	2	2+1
ELE-15112DCE	Data and Computer Communication	DCE	2	0	2	2+1
ELE-15113DCE	Programming and Problem Solving Techniques	DCE	2	0	2	2+1

Generic & Open Electives offered by the Department for Semester-I

Generic Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15114GE	Engineering Mathematics	2	1	0	2+1
ELE-15115GE	Signals and Systems	2	0	2	2+1
ELE-15116GE	CMOS VLSI and Nano-Electronics –I (MOSFET Theory)	2	0	2	2+1
ELE-1517GE	Data and Computer Communication	2	0	2	2+1
ELE-15118GE	Programming and Problem Solving Techniques	2	0	2	2+1
ELE-15119GE	Electronics Engineering Materials and Components	2	0	2	2+1
ELE-15120GE	Statistical Communication Theory	2	0	2	2+1
ELE-15121GE	Instrument Fabrication and Maintenance	2	0	2	2+1
ELE-15122GE	Opto-Electronic Devices	2	0	2	2+1

Open Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15119OE	Computing and Informatics–I	1	0	2	1+1
ELE-15120OE	Basic Electrical and Electronics Engineering	1	0	2	1+1

Course: M.Sc. (Electronics) SEMESTER-II

Course Code	Course Title	Category	L	T	P	Credits
ELE-15201C	Analog Communication Systems	Core	2	0	2	2+1
ELE-15202C	Microprocessor, Architecture, Interfacing and Programming	Core	2	0	2	2+1
ELE-15203C	Power Electronic Circuits and Systems	Core	2	0	2	2+1
ELE-15204C	Microwave Engineering	Core	2	0	2	2+1
ELE-15205DCE	VLSI Technology	DCE	2	1	0	2+1
ELE-15206DCE	Optical Communication and Networks	DCE	2	0	2	2+1
ELE-15207DCE	CMOS VLSI and Nano-Electronics –II (Digital IC Design)	DCE	2	0	2	2+1
ELE-15208DCE	Design and Analysis of Active Filters	DCE	2	0	2	2+1
ELE-15209DCE	Simulation and Modeling using MATLAB	DCE	2	0	2	2+1
ELE-15210DCE	Data Structures	DCE	2	0	2	2+1
ELE-15211DCE	Wireless Adhoc and Sensor Networks	DCE	2	0	2	2+1
ELE-15212DCE	Communication Hardware Design	DCE	2	0	2	2+1

Generic & Open Electives offered by the Department for Semester-II

Generic Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15213GE	VLSI Technology	2	1	2	2+1
ELE-15214GE	Optical Communication and Networks	2	0	2	2+1
ELE-15215GE	CMOS VLSI and Nano-Electronics –II (Digital IC Design)	2	0	2	2+1
ELE-15216GE	Design and Analysis of Active Filters	2	0	2	2+1
ELE-15217GE	Simulation and Modeling using MATLAB	2	0	2	2+1
ELE-15218GE	Data Structures	2	0	2	2+1
ELE-15219GE	Wireless Adhoc and Sensor Networks	2	0	2	2+1
ELE-15220GE	Advanced Programming	2	0	2	2+1
ELE-15221GE	Communication Hardware Design	2	0	2	2+1

Open Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15222OE	Computing and Informatics –II	1	0	2	1+1
ELE-15223OE	Basic Electronic Devices and Circuits	1	0	2	1+1

Course: M.Sc. (Electronics) SEMESTER-III

Course Code	Course Title	Category	L	T	P	Credits
ELE-15301C	Physics of Semiconductor Devices	Core	2	1	0	3
ELE-15302C	Control Systems Engineering	Core	2	0	2	2+1
ELE-15303C	Digital Signal Processing	Core	2	0	2	2+1
ELE-15304C	Computer Networks	Core	2	0	2	2+1
ELE-15305DCE	Microcontrollers, Architecture, Interfacing and Programming	DCE	2	0	2	2+1
ELE-15306DCE	Advanced Communication Systems	DCE	2	0	2	2+1
ELE-15307DCE	Digital System Design using HDL	DCE	2	0	2	2+1
ELE-15308DCE	Speech and Audio Processing	DCE	2	0	2	2+1
ELE-15309DCE	CMOS VLSI and Nano-Electronics –III (Analog and Mixed IC Design)	DCE	2	0	2	2+1
ELE-15310DCE	RF Engineering	DCE	2	0	2	2+1
ELE-15311DCE	Microwave Integrated Circuits (MICs)	DCE	2	0	2	2+1
ELE-15312DCE	Soft Computing and Neural Networks	DCE	2	0	2	2+1
ELE-15313DCE	Coding Theory	DCE	2	0	2	2+1
ELE-15314DCE	Cryptography and Information Security	DCE	2	0	2	2+1
ELE-15315DCE	Advanced Microprocessors	DCE	2	0	2	2+1

Generic & Open Electives offered by the Department for Semester-III

Generic Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15316GE	Microcontrollers, Architecture, Interfacing and Programming	2	0	2	2+1
ELE-15317GE	Advanced Communication Systems	2	0	2	2+1
ELE-15318GE	Digital System Design using HDL	2	0	2	2+1
ELE-15319GE	Speech and Audio Processing	2	0	2	2+1
ELE-15320GE	CMOS VLSI and Nano Electronics –III (Analog and Mixed IC Design)	2	0	2	2+1
ELE-15321GE	RF Engineering	2	0	2	2+1
ELE-15322GE	Microwave Integrated Circuits (MICs)	2	0	2	2+1
ELE-15323GE	Soft Computing and Neural Networks	2	0	2	2+1
ELE-15324GE	Coding Theory	2	0	2	2+1
ELE-15325GE	Cryptography and Information Security	2	0	2	2+1
ELE-15326GE	Advanced Microprocessors	2	0	2	2+1

Open Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15327OE	Electronic Equipment and Maintenance	1	0	2	1+1
ELE-15328 OE	Basic Radio and TV Engineering	1	0	2	1+1

Course: M.Sc. (Electronics) SEMESTER-IV

Course Code	Course Title	Category	L	T	P	Credits
ELE-15401C	Digital Communication and Information Theory	Core	2	0	2	2+1
ELE-15402C	Electronic Instrumentation	Core	2	0	2	2+1
ELE-15403C	Industrial Training and Seminar Work	Core	0	1	4	1+2
ELE-15404C	Project Work	Core	0	0	8	4
ELE-15405DC	Computer Organization and Architecture	DCE	2	0	2	2+1
ELE-15406DCE	Multimedia Technology and Security	DCE	2	0	2	2+1
ELE-15407DCE	Mobile Communication	DCE	2	0	2	2+1
ELE-15408DCE	CMOS VLSI and Nano Electronics –IV (Nanotechnology and Nano Electronics)	DCE	2	0	2	2+1
ELE-15409DCE	Fundamentals of RF Circuit Design	DCE	2	0	2	2+1
ELE-15410DCE	Bio-Medical Instrumentation	DCE	2	0	2	2+1
ELE-15411DCE	Digital Image Processing	DCE	2	0	2	2+1
ELE-15412DCE	Parallel Computation and Architecture	DCE	2	0	2	2+1
ELE-15413DCE	Cyber Security and Forensics	DCE	2	0	2	2+1
ELE-15414DCE	Broadband Wireless Networks	DCE	2	0	2	2+1
ELE-15415DCE	Embedded System Design	DCE	2	0	2	2+1
ELE-15416DCE	Modeling and Simulation of Wireless Communication Systems	DCE	2	0	2	2+1

Generic & Open Electives offered by the Department for Semester-IV

Generic Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15417GE	Computer Organization and Architecture	2	0	2	2+1
ELE-15418GE	Multimedia Technology and Security	2	0	2	2+1
ELE-15419GE	Mobile Communication	2	0	2	2+1
ELE-15420GE	CMOS VLSI and Nano Electronics –IV (Nanotechnology and Nano Electronics)	2	0	2	2+1
ELE-15421GE	Fundamentals of RF Circuit Design	2	0	2	2+1
ELE-15422GE	Bio-Medical Instrumentation	2	0	2	2+1
ELE-15423GE	Digital Image Processing	2	0	2	2+1
ELE-15424GE	Parallel Computation and Architecture	2	0	2	2+1
ELE-15425GE	Cyber Security and Forensics	2	0	2	2+1
ELE-15426GE	Broadband Wireless Networks	2	0	2	2+1
ELE-15427GE	Embedded System Design	2	0	2	2+1
ELE-15428GE	Modeling and Simulation of Wireless Communication Systems	2	0	2	2+1

Open Electives					
Course Code	**Course Title**	**L**	**T**	**P**	**Credits**
ELE-15429OE	Automobile Electronics	1	0	2	1+1
ELE-15430OE	Electronics for Hobbyists	1	0	2	1+1

DETAILED SYLLABUS

FOR

M. Sc Electronics

SEMESTER I

Course No. ELE-15101C **Circuit Analysis and Synthesis**
Paper type: Core **Credits: 2L+0T+2P**

Unit I: Graph Theory and Network Equations

Definition of Node, Branch, Graph, Sub-Graph, Path, Loop, Tree, Link and Twig, Isomorphism, Network Matrices, Incidence Matrix, Loop Matrix, Fundamental Loop, Cut -Set Matrix, Fundamental Cut Set, Relationship between Matrices, Fundamental Loop Mesh Equations, Nodal equations, Nodal Admittance, Source Transformations, Tellegen's Theorem and its Applications.

Unit II: Two Port Parameters

Various Two Port parameters, O. C. Impedance and S. C. Admittance Parameters, parameters, chain Parameters, Image Impedance, Applications of various Two port Parameters to T and π networks, Relationship between different two port parameters, Interconnection of Two port equivalent networks.

Unit III: Network Functions and Responses

Concept of Complex frequencies, system functions of Network, Driving Point and Transfer functions, Poles and Zeros of a network function, Impulse and step response of a first order system, Poles, Zeros and Frequency response, Physical interpretation of Poles and Zeros, Oscillatory response of Poles and Zeros, Basic consideration in writing state variable equations for electrical Network, Formulation of state equations for Electrical Networks and their solutions.

Unit IV: Passive Network Synthesis

Introduction to passive network synthesis, Hurwitz Positive Real Function (PRF), Basic Synthesis Procedure, Synthesis by inspection method, LC Immittance Functions *(realized by Foster-I and Foster II form, Cauer-I Form, Cauer-II Form),* RC Impedance Function, RL impedance , RC Admittance Functions.

Laboratory Work:

Verification of Source Transformation and TellegensTheorms, Calculation of various two port parameters, To study impulse response of a first order system, To study oscillatory response and its relation with pole location. Synthesis of some passive networks

Books Recommended:

1. Networks and Systems by D.R.Choudury, Wiley Eastern Ltd: New Delhi.
2. Network Analysis By M. E. Valkenburg , Prentice Hall India.
3. Basic Circuit Theory by Charles A. Desoer and Ernest S. Kun, McGraw H
4. Circuit Analysis with Computer Application to Problem Solving by Gupta, BaylessandPiekari, Willey Eastern Ltd, New Delhi
5. Network Analysis theory and compute methods by donson and Watkins, Prentice Hall,New Delhi.

Course No.: ELE-15102C **Antennas and Wave Propagation**
Paper Type: Core **Credit: 2L+0T+2P**

Unit I: Maxwell's Equations

Review of Electromagnetics and EM spectrum,Maxwell's Equations in differential and integral form. Equations of continuity for time varying fields, inconsistency of Amperes law, Displacement current (Physical interpretations), Time varying field equations Boundary condition, Surface Charge and Surface Current, Boundary Conditions at media interface (Dielectric and Conducting interface). some experiments using Antenna Trainer and CST Tool

Unit- II: Electromagnetic Waves

Homogenous unbounded medium, Wave equation for time harmonic fields, solution of the wave equation, uniform plane wave, wave polarization, wave propagation in conducting medium, power flow and pointing vector (Physical interpretation), plane wave at dielectric interface, reflection and refraction of waves in dielectric interface, Normal Incidence on a layered medium, Total Internal Reflection, Wave Polarization at Media interface. Some experiments on Antenna Trainer and CST Tool

Unit- III: Antenna Radiation Mechanism

Basics of antenna radiation, Potential functions, solution of potential functions, radiation from the hertz dipole, total power radiated by the hertz dipole, radiation resistance of the hertz dipole, radiation pattern of the hertz dipole, directivity, antenna gain, effective area of antenna. Some experiments on Antenna Trainer and CST Tool

Unit- IV: Practical Antennas

Folded dipole antennas, modification of folded dioples, loop antennas, far- field patterns of circular loop antennas, horn antennas, reactangular horn antennas, , introduction to microstrip antennas, some experiments using Microwave Antenna Trainer and CST Tool

Laboratory Work:

Measurement of Antenna Parameters using Microwave Antenna Training System, Plot of Polarization (Horizontal and Vertical).Design of dipole antenna system using waveguide.some experiments using Microwave Antenna Trainer and CST Tool.

Books Recommended:

1. Antennas and Wave propagation: John D Kraus, Ronald J Marhefka, Ahmad S Khan McGraw Hill, 4th edition
2. Electromagnetic Waves: R. K. Shevgaonkar Tata McGraw Hill

Course No.: ELE-15103C **Linear Integrated Circuits and Applications**
Paper Type: Core **Credit: 2L+0T+2P**

Unit I: Operational Amplifier characteristics Applications

Differential Amplifier, Emitter coupled differential Amplifier, Transfer characteristics of differential Amplifier, Current Mirrors, Active Loads, Non- ideal parameters of OP- AMPs, Frequency response of OP- Amps, Compensation, Pole – Zero compensation, Dominant pole compensation, Lead compensation, Linear Applications of Op-amps: Amplification (Inverting Amplifier, Non-inverting Amplifier, Instrumentation Amplifier),

Unit II: Operational Amplifier Systems

Integration and Differentiation; Electronic analog computation, Active filters, Sample and hold systems, Analog multiplexer, Logarithmic and Exponential amplifiers, Voltage-to-Frequency and Frequency-to-Voltage Converters, Digital-to-Analog (Weighted Resistor, R-2R Ladder Network) and Analog-to-Digital Converters (Flash, Successive Approximation).

Unit III: Wave shaping and Wave generators

Rectifiers, Clippers and Clampers, Peak Detector, Comparators, Applications of comparators, Schmitt-trigger, Square wave and triangular wave generators, pulse generators, voltage time-base generators, Step (Stair-case) generators, sinusoidal Oscillators: Phase shift oscillator, Wien-bridge oscillator,

Unit IV: Timer, PLL and Voltage Regulators

555 timer: Applications as Astable and MonostableMultivibrator, Phase locked loop (PLL): Applications as Frequency Synthesizer, FM demodulator, PLL motor speed control, Voltage regulators: Fixed voltage regulators, Adjustable voltage regulators, switching regulators.

Laboratory Work:

The laboratory work shall include minimum 10 practicals on Op-Amp Characteristics, Linear applications; Wave shaping, signal generation, PLL and 555 timer.

Books Recommended:

1. Milliman, Integrated Electronics, McGraw hill Book company
2. Milliman and Grabel, Microelectronics, McGraw Hill Company
3. Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, Mc-Graw Hill, 2002.
4. R. A. Gayakward , OP- Amp and Linear Integrated Circuits, Prentice Hall of India Ltd.

Course No.: ELE-15104C **Digital Electronics and C Programming Lab**
Paper Type: Core **Credit: 0L+1T+4P**

Note: Students are required to conduct at least 15 Practicals selecting at least 7 from each Unit.

Unit 1: Experiments on Digital Electronics:

S. No		***Title of Experiment***
1.		To design basic logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR) using discrete components.
2.		To design basic logic gates (AND, OR, NOT) using universal gates.
3.		To verify Boolean expressions using basic and universal gates.
4.		To design and realize Half and Full Adder Circuits using basic logic gates/universal gates. To design a 4-bit magnitude comparator using basic/universal logic gates.
5.		To design a digital clock using IC's.
	(a)	To design a 4:1 multiplexer and 1:4 de-multiplexer circuits using basic/universal logic gates.
6.	(b)	To implement a 4/5 variable Boolean function using a suitable MUX.
	(a)	To design a 2^n to n line encoder using basic universal logic gates.
7.	(b)	To design a control signal generator for 2^n :1 MUX and 1: 2^n DEMUX using decoder.
	(a)	Design a BCD to 7 segment decoder using IC's (7447).
8.	(b)	To design a circuit that can encode a particular sequence and decode the same sequence.
	(a)	To design a ROM that can store a particular sequence.
9.	(b)	To implement a 4/5 variable Boolean function using ROM and decoders.
	(a)	To design the following flip-flops using universal gates. I) S-R flip-flop II) D flip-flop III) J-K flip-flop and IV) T flip-flop
10.	(b)	Study race around condition of J-K flip-flop and design edge-triggered J-K-flip flop and M/S flip-flop to eliminate race around condition.
11.	(a)	To design an n-bit serial adder using full adder and D type flip flop IC's.
	(b)	To design a universal shift register and demonstrate SISO, SIPO, PISO and PIPO functions.
12.	(a)	To design a modulo-n Asynchronous and synchronous counter using JK/T-Flip Flop IC's.
	(b)	To design an up-down synchronous counter with direction control that can count a particular sequence.
	(c)	To design Jhonson& Ring counter.

Unit II: Programming with C Language

S. No		***Title of Experiment***
1.	a)	Write a program to evaluate the sine series using the following formulas: $$sin\,(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots\ldots\ldots\ldots$$ $$sin\,(x) = \sum_{n=0}^{\infty} \frac{[(-1)n * x(2n+1)]}{(2n+1)!}$$ Use recursive and non-recursive functions.
2.		Write down and execute a C-Programme for the following:
	a)	To determine the value of a given Resistor from its color Code.
	b)	To match a frequency with the various divisions of the frequency spectrum and display its location.
	c)	To check whether a transistor is NPN or PNP.
	d)	To accept the name of a transistor and output the package type, manufacturer, operating frequency range, and material used.

e) To accept parameters of a transformer and calculate its output voltage.

f) To accept one of the three parameters (peak voltage, average and rms) of a signal and calculate the other two parameters in half-wave and full-wave rectifier along with ripple factor.

g) To accept the changes in the current IB, IC, and IE of a transistor and calculate the current amplification factors in cases of common-base, common-emitter, and common-collector amplifiers.

h) To calculate the extreme points of a load line and operating point using the given parameters.

i) Current flowing through a Semiconductor diode is given by

$$I_D = Is[\exp(v_D/nv_{th}) - 1]$$

Where VD is Voltage across diode, Is is saturation current, n is Emission coefficient and Vth is Thermal voltage. Write a program to calculate and plot the current flowing through the diode for voltages from –4.0 Volts to 1.0 Volts in steps of 0.1.

3. a) Write down a program which will convert a decimal number to its equivalent representations in hexadecimal, octal and binary number systems. The program should display the number in all of above number systems.

b) Write a C program that converts a decimal number to its equivalent number in new base. The decimal number and the new base are to be read as command line arguments.

4. Write down a program to compute

a) Equivalent resistance of the resistors connected in
I). Series, II). Parallel.

b) Equivalent capacitance of the capacitors connected in
I). Series, II). Parallel.

c) Equivalent inductance of the inductors connected in
I). Series, II). Parallel.

5. a) Write down a program to calculate the output voltage for Damped Sinusoidal Oscillator.

b) Write down a program to calculate the oscillating frequency of a damped RLC circuit.

c) Calculate the energy stored in an inductor which is given by:

$$E = \tfrac{1}{2} \times \text{inductance} \times \text{current}^2$$

6. Write down a program to calculate the total percentage Harmonic Distortion of a device for the given strengths of fundamental and harmonic components.

7. Write a program to accept the color code of resistors and sort them in ascending or descending order of their values using arrays.

8. Write a program to read a string and a key. Encrypt the string using this key. Display the encrypted string. In the same program read the key again decrypt the string and display the original string using functions.

9. Write a computational program for solving simultaneous algebraic equations by Guassian Elimination method and use it for solving a given linear network.

Books Recommended:

1. Malvino and Leach “Digital principles and Applications” Tata McGraw Hill.
2. Jain R P “Modern Digital Electronics”, Tata McGraw-Hill, Third Edition, (2003)
3. Mano M Morris, “Digital Design” Pearson Education, Third Edition, (2006)
4. Deitel, “C How To Program”
5. Byron Gottfried "Programming with C”
6. E. Balaguruswamy, "Programming with ANSI-C"
7. A. Kamthane, "Programming with ANSI & Turbo C"

Course No.: ELE-15105DCE/ELE-15114GE **Engineering Mathematics**
Paper Type: DCE/GE **Credits: 2L+1T+0P**

Unit I: Fourier Transform

Dirichlet's Condition, Determination of Fourier Coefficients, Fourier Series for arbitrary period, Half-wave expansion, Fourier Integral Theorem, Fourier Sine and Cosine integrals, Fourier Transforms: Properties of Fourier Transforms, Fourier Transform and Dirac delta function, Application of Fourier Transformation in Electronics.

Unit II: Laplace Transformation

Laplace transforms & its properties, Inverse of Laplace transform by partial fractions, solution of second order differential equation using Laplace transform, Application of Laplace transform in Electrical Networks.

Unit III: Function of Complex Variable

Analyticity of Complex variables, Cauchy Riemann Conditions, Cauchy integral Theorem, Laurent's Series, Singularities, Poles, Residues, Residue Theorem, Contour integration for Trigonometric functions (0 to 2π) , Contour Integration for functions ($-\infty$ to $+\infty$), Application of Functions of Complex variables in System Stability. Bessel and Legender Polynomials.

Books Recommended:

1. Applied Mathematics for Engineers and Physicist by Pipes and Harvill, McGraw Hill Book Company.
2. Advanced Engineering Mathematics by Edwin Kreyzing, Wiley Eastern Ltd.
3. Advanced Engineering Mathematics by H. K. Das, S. Chand Publishing Company.
4. Numerical Methods for Engineers and Scientists by A.C. Bajpai, I. M. Calus and J. A.Fairley, John Wiley & Sons
5. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S. R. K. Iyengar, R. K. Jain. New Age International Publisher.
6. Statistical Methods by S. P. Gupta, S Chand and Company.
7. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale, TMH
8. Fourier Transformation and Laplace Transformations, Schaum Series Book ,TMHCourse

Course No.: ELE-15106DCE/ELE-15115GE **Signals and Systems**
Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Introduction to Signals and Systems

Representation and Classifications of Continuous and Discrete Time Signals and Systems; Fourier Series Representation; Singularity Functions; Convolution Integral; Impulse Response and Its Properties.

Unit II: Transform Techniques

Fourier Transform and Its Properties; Hilbert Transform; Review of Laplace Transform; Sampling; Z-Transform and Its Properties; Discrete Time Fourier Transform; Discrete Fourier Transforms.

Unit III: Analysis Using Transforms

System Analysis Using Fourier and Laplace Transforms of I & II Order Systems; Transfer Function; Feedback Systems; Block Diagram & Signal Flow Graph Techniques; Discrete Time System Analysis Using Z-Transform.

Unit IV: Random Signals

Review of Random Variables; Probability Distribution and Probability Density Functions; Uniform, Gaussian, Exponential and Poissan Random Variables; Statistical Averages; Random Processes; Correlation; Power Spectral Density; Analysis of Linear Time Invariant Systems With Random Input; Noise and Its Representations

Laboratory Work:

Generation of various signals and sequences using MATLAB.Computation of Correlation and convolution of various signals using MATLAB. Fourier Transform and DFT computation, Study of sampling and quantization. Study of PSD of various signals.System solutions.

Books Recommended:

1. Alan V, Oppenheim and A.S Wilsky, Signals and Systems, prentice Hall India
2. Simon Hykin, Signals and systems, John Wiley.
3. B. P Lathi, Signals and systems,
4. Simon hykin, Communication systems, John wiley.

Course No.: ELE-15107DCE/ELE-15116GE **CMOS VLSI and Nano-Electronics-I (MOSFET Theory)**

Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit I: MOSFET Operation

Long Channel MOSFET devices: Drain current model, MOSFET I-V characteristics, Regions of operation, sub-threshold characteristics, MOSFET channel mobility, MOSFET capacitance and inversion layer capacitance effect, MOSFET parasitic elements. MOS transistor with Ion-Implanted channels: Enhancement n-MOS transistors, Depletion n-MOS transistors, Enhancement p-MOS transistors.

Unit II: Threshold Voltage and Small Channel Effects

Threshold Voltage: Threshold variation with device length and width and temperature dependence of threshold voltage. Small channel effects: Channel length modulation, barrier lowering, two dimensional charge sharing and threshold voltage, Punch Through, Carrier velocity saturation, Hot carrier effect-substrate current, gate current and breakdown, effect of surface and drain series resistance, effects due to thin oxides and high doping.

Unit III:MOSFET Scaling and Parasitics

Scaling theory in MOSFETs: Effect of scaling theory on drain current, device capacitances, delay, power dissipation, Transconductance and output impedance.VLSI device structure: Gate material, non-uniform channel doping, source drain structures, device isolation, MOSFET parasitic elements, MOS capacitor with no applied voltage and at non-zero bias.

Unit IV: MOS Modeling, Layout and Simulation

SPICE Modeling of the MOSFET: long and short channel modeling, Introduction to Processing and Layout, An Introduction to PSPICE, Generating a Netlist File, PSPICE Schematics, Circuit description, DC circuit analysis, Transient analysis, AC circuit analysis

Laboratory Work:

The laboratory work shall include minimum 10 practicals on MOSFET characteristics, Modelling and PSPICE

Books Recommended:

1. N. Arora, MOSFET Models for VLSI Circuit Simulation, Springer-Verlag Wien New York.
2. Yuan Taur and Tak H. Ning, Fundamentals of modern VLSI Devices, Cambridge University Press.
3. YannisTsividis, Operation and Modeling of MOS transistor, WCB/McGraw-Hill, New York.

Course No.: ELE-15108DCE/ELE-15119GE **Electronic Engineering Materials & Components**

Paper Type: DCE/GE **Credits: 2L + 0T + 2P**

UNIT-I: Electrical Properties of Materials
Classification of electrical materials; Fundamentals of Atomic Structure and Chemical Bonding; Structure and properties of conductors, semi-conductors and insulators;

UNIT-II: Magnetic Properties of Materials
Structure and properties of magnetic materials, ferroelectric, piezo-electric, ceramic optical and superconducting materials.Structure of solids : Crystalline and Non-crystalline states; Crystallographic directions and phases; Determination of crystal structures.

UNIT-III: Electronic Components
Passive components; Resistors, capacitors, inductors and their types; color coding; ferrites, Quartz crystal and ceramic resonators, electromagnetic and electromechanical components.

UNIT IV: Physical Electronics
Electrons and holes in semiconductors; Hall effect; mechanism of current flow in a semi-conductor, junction theory, different types of diodes and their characteristics (rectifying, Zener, LED, Photo). Introduction to three terminal devices (BJT and FET).

Laboratory Work:

The students are required to conduct at least 10 experiments using hardware/software on theory part of the syllabus.

Books Recommended:

1. Electronic Devices and Circuit Theory. By: Robert Boylestad& Louis Nashelsky. Prentice Hall.
2. Elements of Materials Science & Engineering. By: L.H. Van Vlack. Addison-Wesley Publishing Company, New York.

Course No. ELE-15109DCE/ELE-15120GE **Statistical Communication Theory**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Random Variables

Discrete Time Random Processes: Random Variables, Ensemble Averages, Jointly distributed random variables, Uncorrelated and Orthogonal Random Variables, Linear Mean Square Estimation.

Unit II: Random Process and Statistical Properties

Gaussian Random Variables, Parameter Estimation: Bias and Consistency, Random Processes, Stationary Processes, Autocovariance and Autocorrelation, Ergodicity, Power Spectrum.

Unit III: Filtering

Filtering Random Processes: Spectral factorization, Wiener Filtering, the FIR Wiener filter, Linear Prediction, Noise Cancellation, IIR Wiener filter, Noncausal IIR Wiener filter, Causal IIR Wiener filter Discrete Kalman filter.

Unit IV: Adaptive Filtering

Adaptive filtering-LMS algorithm. Spectrum Estimation: Bay's estimation, Nonparametric methods, Minimum variance spectrum estimation, Frequency estimation.

Laboratory Work:

Matlab Implementation and study of Filtering Random Processes: Spectral factorization, Wiener Filtering, the FIR Wiener filter, Linear Prediction, Noise Cancellation, IIR Wiener filter, Noncausal IIR Wiener filter, Causal IIR Wiener filter Discrete Kalmanfilter.Adaptive filtering-LMS algorithm. Spectrum Estimation: Bay's estimation, Nonparametric methods, Minimum variance spectrum estimation, Frequency estimation.

Books Recommended:

1. An introduction to statistical communication theory, David Middleton, McGraw-Hill, 1960
2. An Introduction to Statistical Communication Theory: An IEEE Press Classic Reissue.DavidMiddletonWiley, 08-May-1996 - Technology & Engineering - 1152 pages

Course No.: ELE-15110DCE/ELE-15121GE **Instrument Fabrication and Maintenance**

Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit-I: Transformers, UPS and Batter ies

Transformers: Single-Phase Transformers, Construction, Types, Transformer ratio, Cooling, Auto Transformer, Transformer Tests, Efficiency of Transformer, Transformer winding, auto cuts and line protection. Three phase transformers - connections, parallel operation. Fabrication and repairs of Transformers. UPS: Principle and operation, performance parameters, capacity, Repairs of UPS. Rechargeable Batteries: Principle, types, capacity, AH rating. Fabrication and repairs of batteries.

Unit-II: Generators, Motors and other Appliances

DC/AC Generators: Magnetic induction, Principle, Torque Equation, Main Parts, Types, Application. Motor Winding, Fan Winding, Repairs of DC/AC Motors, Generators & Fans. Repairs of Xerox Machines, FAX Machines &Telephone equipment. Repairs of Washing Machines.

Unit-III: Assembling and maintenance of Computers

Assembling of a computer system, Hardware maintenance of a computer system, memory upgradation, software faults. Maintenance of printers and other computer accessories.

Unit-IV: Mobile Phone, Maintenance and Repair

Mobile phones: Introduction to Mobile Phones, Computerized Chip Level Mobile Repairing, IC Replacement and Rebolling, methods of Flashing, Mobile Unlocking, Mobile Formatting, UI Settings. Mobile Downloading, Blue-Tooth & Card-Reader Cables.

Laboratory Work:

Practical exercises on fabrication of power transformers, transformer winding, UPS assembling, repairs of Xerox machines, Fax machines. Practical exercises on repairs of mobile phones.Assembling of computer system and memory upgradation.

Books Recommended:

1. “Engineering Fundamental and Problem Solving” by Eide, et. al., 2002, John Wiley & Sons.
2. Manuals for Transformer and motor winding
3. Manuals for UPS, Mobile Phones, Bio-medical equipment.
4. Computer Assembling and maintenance manuals.

Course No.: ELE-15111DCE/ELE-15122GE **Opto-electronic Devices**
Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Light Sources

Black body radiation sources of light and their spectral characteristics. Interaction of radiation with matter, photo conductivity, photo detectors and their figures of merits, PIN and APD diodes and their temperature dependence.

Unit II: Solar Cells

Solar Cells, luminescence and their uses, Image Intensifier, light amplifiers. Display devices. Optical sources, LCD, LED optocouplers. TV camera and Photo-transistor, Photo SCR

UnitIII: Lasers

Theory of stimulated emission and optical oscillator in solid state Semiconductor, dye lasers.Laser Diode, Nonlinear optical effect. Propagation characteristics of optical fibre

UnitIV: Materials for Dielectric Waveguides

Material and wave guide dispersions. Modulation and detection of optical signals, nonlinear propagation and interaction, organic and inorganic optical wave guides, fibre amplifiers, integrated optical devices

Laboratory Work:

Characteristics of LED, Characteristics of LD Characteristics of PD & APD Optical Time Domain Reflectometer (OTDR) Kerr effect Pockel's effect Spectral characteristics of LED and LD Wavelength division multiplexing of signals, Fiber-Optic System Bandwidth estimation, Single Mode Fiber Characteristics

Books Recommended:

1. J. Wilson & J.F.B. Hawkes, "Optoelectronics – An Introduction", Prentice Hall, India, 1996.
2. P. Bhattacharya, "Semiconductor optoelectronic devices", Second Edn Pearson Education,Singapore, 2002**.**

Course No.: ELE-15112DCE/ ELE-15117GE **Data and Computer Communication**
Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Introduction

Data representation and flow, Analog and Digital Data, Analog and Digital Signals, Periodic Analog Signals (Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth), Digital Signals (Bit Rate, Bit Length), Digital Signal as a Composite Analog Signal, Transmission of Digital Signals, Transmission Impairment (Attenuation, Distortion, Noise), Data rate limits (Noiseless Channel: Nyquist Bit Rate, Noisy Channel: Shannon Capacity), Performance Parameters, Digital Transmission: Digital to Digital Conversion, analog to digital conversion, transmission modes), Analog Communication: Digital to Analog Conversion, Analog to Analog Conversion). Introduction to multiplexing and spectrum spreading.

Unit II: Transmission Media and Switching

Guided media (Twisted pair cable, coaxial cable, fiber-optic cable), unguided media (radio waves, microwaves, infrared), Circuit Switching and Packet Switching: Switching Networks, Circuit-Switching Networks, Circuit-Switching Concepts, Control Signaling, Softswitch Architecture, Packet- Switching Principles, X.25, Frame Relay.

Unit III: Error Detection and Correction

Types of errors, Redundancy, Detection versus Correction, Coding, error detection, Cyclic Redundancy Check, Cyclic Code Encoder Using Polynomials, Cyclic Code Analysis, Advantages of Cyclic Codes, Other Cyclic Codes, Hardware Implementation, checksum, Forward error correction using Hamming distance, XOR, Chunk Interleaving, etc.

Unit IV: Introduction to Protocol Architecture

The Need for a Protocol Architecture, A Simple Protocol Architecture, OSI, The TCP/IP Protocol Architecture, Data Link Control: Framing, Flow and Error Control, Introduction to DLC protocols, High-Level Data Link Control (HDLC), Point-to-Point Protocol (PPP), and Media Access Control.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. B. A. Forouzan, Data Communications and Networking, TMH.
2. William Stallings, Data and Computer Communications, 10/E, Pearson.
3. P.C. Gupta – Data Communications and Computer Networks, PHI.

Course No.: ELE-15113DCE/ELE-15118GE **Programming and Problem Solving Techniques**

Paper Type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Introduction

The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation, Algorithms for Problem Solving - Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate 'sin x' as sum of a series, Reverse order of elements of an array, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial.

Unit II: Basic Programing Constructs of C/C++ Programming Language

Character set, Variables and Identifiers, Built-in Data Types, Variable Definition, Arithmetic operators and Expressions, Constants and Literals, assignment and Basic input/output statement, Conditional Statements and Loops - Decision making within a program, Conditions, Relational Operators, Logical Connectives, if statement, if else statement, while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structured Programming. One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix; Null terminated strings as array of characters, Representation sparse matrices,

Unit III: Functions, Structures and Pointers

Top-down approach of problem solving, Modular programming and functions, Standard Library of C functions, Prototype of a function: Formal parameter list, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference, call by value, Recursive Functions, arrays as function arguments, Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays, unions, Pointers-Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays.

Unit IV: File Processing and Object Oriented Programming in C++

Concept of Files, File opening in various modes and closing of a file, Reading from a file, writing onto a file, Object Oriented Programming Concepts, Classes, Encapsulation, Member Functions, Constructors, Destructors, Inheritance and its types, Function and Operator Overloading, Abstract Class, Function Overriding, Dynamic Binding, Virtual Functions, Exception handling.

Laboratory Work:

The laboratory work shall be based on Unit I to Unit IV. It shall include writing C/C++ programs for Exchanging values of two variables, summation of a set of numbers, Decimal Base to Binary Base conversion, Reversing digits of an integer, GCD (Greatest Common Division) of two numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Evaluate 'sin x' as sum of a series, Reverse order of

elements of an array, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluation of Polynomials, programs using structures and pointers, File processing, programs for solving engineering problems. The lab work shall be carried through Borland C/C++, GCC, NetBeans, Eclipse and Visual Studio.

Books Recommended:

1. Deitel, “C How To Program”, 2. Byron Gottfried "Programming with C”, 3. E. Balaguruswamy, "Programming with ANSI-C", 4. A. Kamthane, "Programming with ANSI & Turbo C", 5. Herbert Schildt C++-The Complete Reference.

Course No.: ELE-15119OE **Computing and Informatics – I**
Paper Type: OE **Credits: 1L+0T+2P**

Computer basics.History, generations and classification of computers; Number systems; Hardware. Components of a computer input/output devices, CPU unit and memory unit, secondary storage. Software, System software; application software; compilers and translators.Operatingsystems.Introduction to operating systems;' types of operating systems and their functions; popular operating systems- Linux, UNIX and Windows, Introduction to office automation and Internet.

Laboratory Work:

Identification of various internal and external parts of computer system, connecting various parts of computer system, learning basic commands for file management on windows operating system, learning to create, format and print documents, spreadsheets and presentations, Internet and applications.

Recommended Books:

1. V. Srivastava “Computing and Informatics” IstEdition S. K. Kataria& Sons.
2. Chandwani “Computing and Informatics” Jain Brothers.
3. AnitalGoel “Computer Fundamentals” Pearson
4. P.K.Sinha “Computer Fundamentals” BPB Publications.

Course No.: ELE-151120OE **Basic Electrical and Electronics Engineering**
Paper Type: OE **Credits: Credits: 1L+0T+2P**

Basic Electrical and Electronics Engineering

Conductors, insulators, Semiconductors, Voltage, current, resistance, Ohm's Law, Classification of resistors, Specifications & use. Color Code.
Voltage and Current sources, concept of AC/DC. Signal Waveforms, Amplitude, frequency, wavelength. Spectrum and bandwidth.
Networks and circuits, Kirchhoff's current law (KCL) and Kirchhoff s voltage law (KVL), Capacitance & capacitive reactance. Classification of capacitors, dielectric constants, materials used. Series and parallel connection. Colour code and application. Inductance, self and mutual inductance, Resonance, Concept of generators & motors. Instantaneous values, R.M.S. values, phase-cycle.
Transformers, step-up and step down, turns ratio and wire guages, efficiency.
Measurement: Meter, Ammeter, Voltmeter, Ohmmeter, Power Supply, Multimeter, Introduction to CRO.
Semi-conductor, Intrinsic & Extrinsic Semiconductors. Temperature co-efficient. Definition of 'P' and 'N' types of semiconductor, PN Junction, Junction-Barrier potential. Diode, Rectifiers: Half wave-Full wave bridge. Introduction to BJT, Transistor action, Biasing, Transistor as switch and Amplifier.

Lab Work:

Resistance calculation using color code, Ohms Law, KCL and KVL, Series and Parallel combination of Resistors and capacitors. Measurement Time period, Frequency and RMS value and Average value of a sinusoid. Current, voltage and resistance measurement using multimeter. Half wave and full wave rectification.

Books Recommended

1. Del Torro, "Electrical Engineering Fundamentals", 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi (1994)
2. W.H. Hayt and J.E. Kemmerly, "Engineering Circuit Analysis," Mc-Graw Hill Delhi (1996).

DETAILED SYLLABUS

FOR

M. Sc Electronics

SEMESTER II

Course No. ELE-15201C **Analog Communication Systems**
Paper type: Core **Credits: 2L+0T+2P**

Unit I: Amplitude Modulation/Demodulation Techniques

Introduction to Signals and its classification**,** Properties of Signals and Noise,**:**Basic Mathematical theory of A. M modulation, Time domain and Frequency domain representation, Generation and demodulation of Amplitude Modulation, Double Side band Suppressed Carrier, (DSB- SC) System: Mathematical Analysis, Generation and Demodulation of DSB- SC signals, Costas receiver.

Unit II: Single Side Band Modulation

Advantages of SSB transmission, Hilbert Transform, properties of Hilbert transform, pplications of Hilbert Transform, Generation of SSB; Vestigial Side-Band Modulation (VSB). SSB and VSB demodulation, independent sideband transmission and receiption.

Unit III: FM Modulation/ Reception

Concept of Angle Modulation: Mathematical theory, Phasor Representation of Angle modulated signal, Bandwidth calculation, Generation of FM by Direct Methods. Indirect Generation of FM; The Armstrong Method, FM Stereo Transmission. FM Receiver Direct Methods of Frequency Demodulation; Slope Detector, Foster Selay or Phase Discriminator, FM Detector using PLL and Stereo FM Multiplex Reception.

Unit IV: Performance of Analog Communication Systems

Noise in Communication System, Time-domain representation of Narrow band Noise, Filtered White Noise, Noise equivalent Band-width, Effective Noise temperature, Noise figure. AM Receiver model, Noise analysis of DSBSC and SSBSC using coherent detection, Noise in AM using Envelope detection, Noise in FM using Limiter-discriminator detection, FM threshold effect, Pre- emphasis and De-emphasis in FM.

Laboratory Work:

Study of ICs (AD633/AD734), Design and realize AM modulator using Square Law modulator and calculate its modulation index and power, design and realize AM detector using Square Law detector and Envelope detector, design and realize DSB-SC signal Modulator using Analog Multiplier, design and realize DSB-SC signal demodulator using Coherent detection and Squaring loop, Simulation of SSB-SC modulator and demodulator using MATLAB/Simulik, Simulation of Hilbert transformer and VSB filter using MATLAB/Simulink.Derivation of modulation index in case of FM signal, to design and realize FM generation and Detection, To study & realize Op-amp based Pre-Emphasis & De-Emphasis circuits.
Field study/ Visit to Radio Kashmir Srinagar.

Books Recommended:

1. Modern Digital and Analog Communication Systems, by B. P. Lathi, Oxford Press.
2. George Kennedy, “Electronic Communication System”, McGraw- Hill.
3. Gary M. Miller and Jeffery S. Beasley, “Modern Electronic Communications “, PHI.
4. Simon Haykin, “ Communication Systems”, 8th edition, Wiley Pubclishers.
5. Wayne Tomasi, “ Electronics Communication systems”, 4th edition, Pearson Publishers.

Course No. ELE-15202C **Microprocessor, Architecture, Interfacing and Programming**

Paper type: Core **Credits: 2L+0T+2P**

Unit 1: Architecture, Addressing Modes, Instruction Set and ALP

Introduction to Microprocessors, Introduction to Intel Processors, Various emerging trends in Microprocessor Design. 8086 Microprocessor, Architecture of 8086 Microprocessor, Functions of BIU and EU, Working of 8086 Microprocessor, Registers of 8086 Microprocessor and their purpose, Addressing Modes of 8086 microprocessor, Memory Segmentation in 8086 Microprocessor based systems.

Unit II: Assembly Language Programming

Introduction to Programming, Various level of Programming, Assembly language programming, Assembler, Linker, Debugger, Instruction set of 8086 Microprocessor, Data transfer instructions, Arithmetic and Logical instructions, Branch Instructions, Processor control instruction, String operation instructions, Assembly language Programming for 8086 microprocessor. Use of Macros in ALP.

Unit III: Interrupts, Timing and Processor Modes

Introduction to procedures, interrupts and interrupt service subroutines, 8086 Interrupt Structures, Interrupt Vector table, various types of Interrupts, Software Interrupts, Hardware Interrupts, Multiple Interrupts, ALP using interrupts, 8259 Programmable Interrupt Controller-Features, Interfacing & Programming, Various Types of 8086 microprocessor, Architecture and operation of 8284A Clock Generator, Buffering and Latching of 8086 Microprocessor, Bus timings, Timing Diagrams, Wait States, Minimum Mode 8086 System, 8288 Bus Controller, Maximum Mode 8086 System.

Unit IV: Peripheral Devices and Interfacing

Peripheral Devices and Interfacing, Introduction to memory and its types, Memory interfacing, Memory mapped and I/O Mapped Schemes, Even and Odd Addressing. Data Transfer Schemes, I/O Interfacing, Isolated and Memory Mapped I/O instructions, Ports. Study of Peripheral chips: Features, Block Diagram, Control & Status Registers, Operating Modes, Interfacing & Programming of 8255 Programmable Peripheral Interface, 8257 Programmable DMA controller, 8254 Programmable Interval timer, Introduction to DAC0830 Digital to Analog Converters, ADC0804 Analog to Digital Converters, 8279 Keyboard and Display Controller, and 8251/16550 (USART).

Laboratory Work:

The Laboratory work shall be based on units I through IV consisting of Assembly Language Programming and interfacing using Assemblers, simulators and trainers.

Books Recommended:

1. Introduction to 8086, 80186, 80286, 80386, 80486, Pentium and Pentium Pro Processors, B. Bray, Tata McGraw Hill Publishing Company.
2. Microprocessor Theory and Applications, M. Rafiq-u Zaman, McGraw Hill Publishing Company.
3. Microprocessor and x86 Programming, V. R. Vengopal, McGraw Hill Publishing Company.
4. The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Application by W. A. Treibel and Avtar Singh, Prentice Hall.
5. Microprocessors and Interfacing Programming and Hardware, D. Hall, TMG.
6. Microprocessor 8086 Architecture, Programming and interfacing by Sunil Mathur. PHI.

Course No. ELE-15203C **Power Electronic Circuits and Systems**
Paper type: Core **Credits: 2L+0T+2P**

Unit I: Power Devices

Review of switching characteristics of semiconductor devices *(Power diodes, BJT's,),* Characteristics of an ideal switch, Types of electronic switches. Thyristor construction and characteristics, Methods of turning ON, Turn-off mechanism, effect of high di/dt and dv/dt , Snubber circuits, Gate triggering circuits, Device specifications and ratings, DIAC, TRIAC and UJT V-I characteristics.

Unit II: Thyristor Circuits and Applications

Controlled rectifiers, AC voltage controllers, Principle of ON- OFF control, Principle of phase control, Single phase bi-directional controllers with resistive loads, Commutation techniques: Natural commutation, Impulse commutation, complementary commutation, external pulse commutation, Load side and line side commutation, Series and Parallel combination of SCRs.

Unit III: Switch Mode DC to DC Power Converters

Principle of step down and step up operation, Performance parameters of DC-DC converters, Design of BUCK converters, BOOST converters, BUCK–BOOST converters, Forward converter, Half-Bridge converter, Push Pull converter and Full Bridge converter.

Unit IV: Inverters and Cyclo-converters

Inverter: Principle of operation, performance parameters, Pulse width modulation techniques,
Design of inverters, Single-phase half bridge inverter, Single phase full bridge inverter, Analysis in each case (for resistive and inductive loads), Cyclo-converters: step up and step down , design of single-phase step down Cycloconverters , Power supplies: SMPS, UPS.

Laboratory Work:

Verify switching action of a Power BJT and MOSFET, IV characteristics of SCR, DIAC, TRIAC and UJT. Calculation of Holding and latching currents of SCR, To study various Commutation Techniques, Design of BUCK, BOOST and BUCK-BOOST converter.

Books Recommended:

1. Power Electronics, Circuits, Devices and Applications by M. H. Rashid, PHI.
2. Power Electronics by Mohan, Undeland, Robbins, John Wiley and Sons.
3. Power Electronics by P. C. Sen, Tata McGraw Hill, Pub. Co.
4. Introduction to Thyristors and their Applications, by M. Ramamorty .

Course No. ELE-15204C **Microwave Engineering**
Paper type: Core **Credits: 2L+0T+2P**

Unit I: Microwave Transmission Lines

Transmission Line and Distributed parameters, Basic Transmission line equations, Solutions, Distortions in Transmission line, Condition for Distortion less line, Characteristic impedance, Propagation Constant, Reflection and Transmission coefficients, Standing wave and Standing wave ratio, Impedance matching by Stubs and Tapped Quarter wave line-transformer, Short circuited line, Open circuited line, Line terminated by arbitrary load.

Unit II: Micro wave Waveguides and Components

Fundamentals of Microwave Waveguides, Rectangular Waveguides, TE & TM modes in Rectangular magnitudes, excitation of modes in Rectangular Wave guides, Degenerative & dominant modes, S-Parameters: Microwave Hybrid Circuits: Waveguide tee: E-plane tee, H-plane tee , Magic tee, hybrid rings (rat-race circuits), directional Couplers, S-Matrix of direction Coupler, Circulators and isolators.

Unit III: Microwave Amplifiers & Oscillators

Microwave tubes: lead inductance and Inter electrode capacitive effects Transient angle effect, Gain bandwidth Limitation, Microwave Cavity Resonators, Klystrons: Multicavity Klystron and Reflex Klystron, Magnetron oscillator (cylindrical), Gunn Oscillator, Parametric amplifier, Introduction to Strip lines: Micro strip and Parallel Strip lines.

Unit IV: Microwave Devices

To study VI characteristics of Gunn diode, To determine the frequency and wavelength in a rectangular wave guide working on TE 10 mode, To determine the standing wave ratio and reflection coefficient, To study functioning and behavior of Isolator, E-Plane Tee, H-Plane Tee, Magic tee, Study of characteristics of Klystron tube and to determine its electronic tuning range.

Laboratory work:

Study of different Microwave guide components, determination the frequency and wavelength in a rectangular wave guide working on TE 10 mode, Finding the standing wave ratio and reflection coefficient. Measurement of an unknown impedance with smith chart, VI characteristics of Gunn diode, O/P power and frequency as a function of voltage in case of Gaunn diode, Magic tee, Characteristics of Klystron tube and determination of its electronic tuning range, various experiments using CST Tool.

Books Recommended:

1. Microwave Devices and circuits by Samuel Y. Liao
2. Microwave Principles By Herbert J. Reich
3. Foundations for Microwave engineering by Robert E. Collin
4. Elements of Engineering Electromagnetics by Nannapaneni NarayanaRao
5. Electromagnetic Field theory by Rishabh Anand

Course No. ELE-15205DCE/ELE-15213GE **VLSI Technology**
Paper type: DCE/GE **Credits: 2L+1T+0P**

Unit I: Crystal Growth, Epitaxy and Diffusion

Crystal Growth and Wafer Preparation, Electronic grade Germanium and Silicon, Zone melting process of purification, Simple purification process, Czhrolaski method. Epitaxy, Vapor phase epitaxy, Transport process and Reaction kinetics, Molecular beam Epitaxy process (introduction). Fick's one dimensional diffusion equation.Diffused layers, Pre deposition step, Drive-in diffusion with expression, Field aided diffusion, Diffusion system, C-V technique for profile measurement, Junction depth and sheet resistance measurement.

Unit II: Oxidation and Lithography

Oxidation Techniques, Growth mechanism and Kinetics of Oxidation layers, Oxidation techniques and Systems. Lithography, Lithography process and Types of Lithography, Optical Lithography, Contact proximity and projection Lithography techniques, Resists, Electron beam Lithography, Electron Resists.

Unit III: Etching, Metallization and IC Fabrication

Etching, Subtractive and Additive method of pattern transfer, Resolution and edge profiles in Subtractive pattern transfer, Selectivity and feature size control of an etching process. Contacts (Ohmic and rectifying), Physical vapor deposition, Methods of physical vapor deposition, Resistance heated evaporation, Electron beam evaporation, Thickness measurement and monitoring. Basic consideration for IC processing and Packaging, Modern IC fabrication.

Books Recommended

1. S. M. Sze, VLSI Technology, Mcgraw Hill Publishing Company.
2. Azeroff and Brophy, Electronic Processes in Semiconductors, McGraw Hill Publishing company.
3. A. S. Grove, Physics and Technology of Semiconductor Devices, John Wiley and Sons, New York.
4. Ben G. Streetman, Solid State Electronic Devices, Prentice Hall of India Ltd, N. Delhi.

Course No. ELE-15206DCE/ELE-15214GE **Optical Communication and Networks**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Optical Fiber: Structures and propagation

Introduction to Optical Communication Systems; Optical fibers, light propagation through fibers, different types of fibers, optical fiber modes and configurations, mode theory, attenuation, dispersion, characteristics of single mode fibers sources and detectors; LED's and lasers, light sourse linearity, reliability consideration

Unit II: Digital and Analog links

Point to point links, power links, error control, coherent detection, differential quadrature phase shift keying (QPSK), overview of analog links, carrier- to- noise ratio, multichannel transmission techniques, RF over fiber, radio over fiber links

Unit III: WDM

Overview of WDM, Passive optical couplers, isolators and circulators, fiber grating filters, phase array based devices, network concepts, network topologies, SONET/ SDH, high speed lightwave links, optical Add/Drop multiplexing, optical switching, WDM examples.

Unit IV: Optical Networks

Passive Optical Networks, IP over DWDM, Optical Ethernet Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers. Optical system design Considerations, Component choice

Laboratory work:

To perform various experiments using OFC training kit, Multiplexing, Point-to- point links, System considerations, Overall fiber dispersion in Multi mode and Single mode fibers, Transmission distance, Line coding in Optical links, Measurement of Attenuation and Dispersion, Eye pattern.

Books Recommended:

1. Microwave Principles by Herbert J. Reich, East- West Press.
2. Antenna and Wave Propagation by A.K. Gautam.
3. Modern Electronic Communications by Jeffrey S. Beasley, PHI.
4. Lasers and Optical Fibre Communications by P. Sarah International Publishing House.

Course No. ELE-15207DCE/ELE-15215GE **CMOS VLSI and Nano-Electronics – II (Digital IC Design**

Paper type: DCE/GE **Credits: 2L+0T+2P**

UNIT I: Introduction to CMOS and Combinational Logic Design

Digital IC, Digital Combinational and sequential circuit, issue in digital IC design, Quality, metrics of Digital Design, Review of CMOS.
Static C-MOS Inverter and its characteristics, CMOS Design consideration Transistor Sizing, Power Dissipation, Design Margining, Ratioed Logic, Pass Transistor Logic

UNIT II: Dynamic CMOS design and Sequential Logic Design

Dynamic CMOS design, basic principle, speeds and power Dissipation of Dynamic Logic, Signal Integrity in Dynamic Design, Cascaded Dynamic.
Static Latches and registrars, Dynamic Latches and Registers, Alternative Register Styles, Pipelining.

UNIT III: Memory Design and Implementation Strategies for Digital ICS

Memory Classification, Memory Architecture and Building Block, Read only Memories, Nonvolatile Read Write Memories, Read-Write Memories, Memory Peripheral Circuit
Custom, Semi-custom Circuit Design, Cell–Based Design Methodology, Array Based Implementation Approach**,** Layout

UNIT IV: Programmable Logic Devices

Introduction to PLA, PAL, PLD/CPLD, PGA/ FPGA, ASIC their applications and Architecture

Laboratory Work:

The laboratory work shall include minimum 10 practicals on Digital design including combinational (Static and Dynamic) and sequential circuits, Memory and Programmable logic devices

Books Recommended:

1. J. M. Rabaey, A. Chandrakasan and B. Nikolic: Digital Integrated Circuits- A Design Perspective, 2nd ed., PHI, 2003
2. D. A. Pucknell and K. Eshraghian, Basic VLSI Design, PHI, 1995
3. N.H.E. Weste and K. Eshraghian, Principles of CMOS VLSI Design - a System Perspective, 2nd ed., Pearson Education Asia, 2002
4. S.M. Kang and Y. Leblevici, CMOS Digital Integrated Circuits Analysis and Design, 3rd ed., McGraw Hill, 2003
5. J. P. Uyemura, Introduction to VLSI Circuits and Systems, John Wiley & Sons (Asia) Pte Ltd, 2002
6. R. Jacob Baker, CMOS Circuit Design, Layout, and Simulation, IEEE Press, 1997

Course No. ELE-15208DCE/ELE-15216GE **Design and Analysis of Active Filters**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Filter Approximation Models and Sensitivity Analysis

Introduction to Analog filter theory, filter approximations, Butterworth approximation, Chebyshev approximation, Bessel filters, frequency transformations, lowpass-lowpass, lowpass- highpass, lowpass-bandpass and low-pass - band reject transformations,

Unit II: Operational Transconductance Amplifier and Current Conveyors

Operational Transconductance Amplifier (OTA), Circuit Descriptions of OTA, Advantages, limitations. Elementary Transconductor Building Blocks: Resistor, Integrator, Amplifier, summers, gyrators and Modulators. First and Second order Filters, High-order filters. Current Conveyors (CCI and CCII)

Unit III: Sensitivity and Active filter Synthesis

Sensitivity study, Sensitivity function, magnitude and pass sensitivities, single parameter sensitivity, multiple parameter sensitivity. Cascade approach, Simulated Inductance Approach, Operational Simulation of LC ladders and FDNR approach. Immitance converters and inverters, Generalized Impedance converter.

Unit IV: Switched Capacitor filters

The MOS switch, The Switched capacitor/resistor equivalence, analysis of switched capacitor filter using charge conservation equations, First-order building blocks (Inverting and Non-inverting Amplifier, Integrator and Differentiator), Sampled-Data operation, Switched capacitor
First and Second order Filters, Switched capacitor High-order filters.

Laboratory Work:

The laboratory work shall include minimum 10 practicals on filter synthesis, operational transconductance amplifier and switched capacitor filters

Books Recommended:

1. Kendall Su, Analog Filters, Second Edition, Kluwer Academic Publishers, 2002
2. Larry D. Paarmann, Design and Analysis of Analog Filters: A Signal Processing Perspective, Kluwer Academic Publishers, 2003.
3. M. E. van Valkenburg and Rolf Schumann, Analog Filter Design, Oxford University Press, 2005.
4. Mingliang Liu, Demystifying Switched-Capacitor Circuits, Newnes, Elsevier, 2006.

Course No. ELE-15209DCE/ELE-15217GE **Simulation and Modeling using MATLAB**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Introduction to MATLAB

Introduction, MATLAB Windows, Types of Files, Constants, Variables and Expressions; Character Set, Data Types, Operators, Built-in Functions, Vectors and Matrices; Matrix Manipulations, Matrix and Array Operations, Control Structures; Loops and Branch Control Structures,

Unit II: MATLAB Editor and MATLAB Graphics

MATLAB Editor, Creating M-Files, Function Subprograms, Types of Functions, Function Handlers, Errors and Warnings, MATLAB Debugger, Two- Dimensional Plots, Multiple Plots, Subplots, Specialized Two-Dimensional Plots, Three-Dimensional Plots..

Unit III: Data and Image Visualization in MATLAB

Understanding Color maps, Using Color to Describe a Fourth Dimension, Image Data Matrices, Image Formats, Image Files, Image Utilities, Reading and Displaying Image, Image Compression, Image Denoising, Image Filtering, Introduction to Movies and Sound in MATLAB.

Unit IV: Simulink Basics

Starting Simulink, Simulink Modeling, Solvers, Data Import/Export, State-Space Modeling and Simulation, Simulation of Non-Linear Systems, Creating a random bit stream System objects and their benefits, Modulating a bit stream using Digital Modulation Techniques, Applying pulse-shaping to the transmitted signal, Modeling a QPSK receiver for a noiseless channel, Comuputing bit error rate

Laboratory Work:

A minimum of 20 programs to be simulated on MATLAB software across all the four units

Books Recommended:

1. P.A. Rajammal, *"A handbook of Methodology of Research",* Vidyalaya Press, 1976.
2. BuaneHanselman, Bruce Littlefield, *"Mastering MATLAB 7",* Pearson, 2013
3. Agam Kumar Tyagi, *"MATLAB and Simulink for engineers",* 2nd Edition, 2012.
4. Raj Kumar Bansal, *"MATLAB and its Applications in Engineering"*, Pearson, 2009.

Course No. ELE-15210DCE/ELE-15218GE **Data Structures**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Lists, Stacks and Queues

Lists, Abstract Data Type-List, Array Implementation of Lists, Linked Lists, Doubly Linked Lists, Circularly Linked - Implementation and Applications. Stacks, Abstract Data Type-Stack, Implementation of Stack, Implementation of Stack using Arrays, Implementation of Stack using Linked Lists, Applications. Queues Abstract Data Type-Queue, Implementation of Queue, Array Implementation, Linked List Implementation, Implementation of Multiple Queues, Implementation of Circular Queues, Array Implementation, Linked List Implementation of a circular queue, Implementation of DEQUEUE, Array Implementation of a dequeue, Linked List Implementation of a dequeuer.

Unit II: Trees

Trees, Abstract Data Type-Tree, Tree Traversals, Binary Trees, Binary Tree Traversals, Recursive Binary Tree Traversals, Non Recursive Binary Tree Traversals, Applications. Binary Search Trees, Traversing a Binary Search Trees, Insertion of a node into a Binary Search Tree, Deletion of a node from a Binary Search Tree, AVL Trees, Insertion of a node into an AVL Tree, Deletion of a node from and AVL Tree, AVL tree rotations, Applications of AVL Trees, B-Trees, Operations on B-Trees ,Applications of B-Trees.

Unit III: Graphs

Graphs Definitions, Shortest Path Algorithms, Dijkstra's Algorithm, Graphs with Negative Edge costs, Acyclic Graphs, All Pairs Shortest Paths Algorithm, Minimum cost Spanning Trees, Kruskal's Algorithm, Prims's Algorithm, Applications, Breadth First Search, Depth First Search, Finding Strongly Connected Components.

Unit IV: Searching, Sorting and Advanced Data Structures

Linear Search, Binary Search, Applications. Internal Sorting, Insertion Sort, Bubble Sort, Quick Sort, 2-way Merge Sot, Heap Sort, Sorting on Several Keys. Splay Trees, Splaying steps, Splaying Algorithm, Red-Black trees, Properties of a Red Black tree, Insertion into a Red-Black tree, Deletion from a Red-Black tree, AA-Trees.

Laboratory Work:

Design, Implementation and Tests of Linked Lists, Stacks, Queues, Trees (Binary Tree, Recursive Implementation of Binary Tree Traversals, Non Recursive Implementations of Binary Tree Traversals, Applications.), Advanced Trees, Graphs, Searching, Sorting Techniques. C/C++ programming language shall be used in the laboratory for programming.

Books Recommended:

1. Tenenbaum, Data Structures through C
2. Weiss, Data Structures and Algorithms in C++
3. SamiranChattopadhy, Data Structures through C Language
4. Patel, Data Structures with C
5. Wiener and Pinson, Fundamentals of OOPS and Data Structures in Java

Course No. ELE-15211DCE/ELE-15219GE **Wireless Adhoc and Sensor Networks**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Introduction

Wireless Network, Wireless Network Architecture, Wireless Switching Technology, Wireless Communication problem, Wireless Network Reference Model, Wireless Networking Issues & Standards. Wireless LAN (Infrared Vs radio transmission, Infrastructure and Ad-hoc Network, IEEE 802.11: System Architecture, Protocol Architecture, 802.11b, 802.11a)

Unit II: Ad Hoc Wireless Networks (MAC and Routing Protocols)

Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless Internet, MAC protocols, Issues in Designing a MAC Protocol for Ad hoc Wireless Networks, Design Goals for a MAC Protocol for Ad hoc Wireless Networks, Classifications of the MAC Protocols, Other MAC Protocols. Routing Protocols, Issues in Designing a Routing Protocol for Ad hoc Wireless Networks, Classifications of Routing Protocols.

Unit III: Ad Hoc Wireless Networks (Transport Protocols and Security)

Transport Layer for Ad Hoc Wireless Networks, Issues in Designing a Transport layer protocol for Ad hoc Wireless Networks, Design goals of a Transport layer protocol for Ad hoc Wireless Networks, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Other Transport layer protocols for Ad hoc Wireless Networks, Security protocols for Ad hoc Wireless Networks Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks

Unit IV: Sensor Networks

Basics of Wireless, Sensors and their Applications: The Mica Mote, Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors, Applications Data Retrieval in Sensor Networks: Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs. Sensor Network Hardware: Components of Sensor Mote, Operating System in Sensors– TinyOS, LA-TinyOS, SOS, RETOS
Imperative Language: nesC, Dataflow style language: TinyGALS, Node-Level Simulators, ns-2 and its sensor network extension, TOSSIM.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. Adhoc Wireless Networks – Architectures and Protocols, C.Siva Ram Murthy, B.S.Murthy, Pearson Education.
2. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications / Cambridge University Press.
3. Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group.
4. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers.
5. Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group.

Course No. ELE-15220GE **Advanced Programming**
Paper type:GE **Credits: 2L+0T+2P**

Unit 1: Dot Net Architecture

DOT NET framework, MSIL, CLR, CLS, Name spaces, Assemblies Common Language Implementation Assemblies Metadata and Intermediate Language. Garbage Collection Versioning and Side-by-Side Execution. Integration Development Environment of VB, User Interface, Designing, Basics of Event driven programming. From- Designing, Showing & Hiding.

Unit II: Windows Programming Foundations

VB language- Data types, Variables & Constant, Arrays, Function, Collections, Procedures, Arguments passing, Control Flow statements: if- then, if-then-else, select case, looping statement: Do-loop, For-next, While-Wend, Nested Control Structure, Exit statement. Intrinsic and Active X Controls, Properties & Methods – Text box, List box, combo box, Scrollbar, slider Controls.

Unit III: Windows Programming with Active X Controls, Menus and Multiple Forms

Advance Active X Control – Common Dialog controls, Color, Font, File open, file save using Rich Textbox Controls. String Manipulations on Textboxes. Graphics controls – Picture Box, Coordinate system, Graphics Methods - Text drawing, Lines & Shape, Filling Shapes Grid methods. Menu editor: Pull-down, Pop-up Menus. Multiple Document Interface- Parent & Child Forms & Methods.

Unit IV: Advanced Windows Programming

OLE – Basics, OLE control Properties & Methods, Error handling in VB- Types of Errors, Error handling methods and functions. Database Programming with VB database Models, Visual Data manager, DATA Control- Methods, Properties, Connectivity with database, DATA bound controls, ADO Database Controls, Creating & using Database with object model, Attaching Queries with database. Filtering Data. DATA Report Designer.

Laboratory Work:

Programming exercises using VB.NET for problem solving involving use of arrays, collections, procedures, control flow, intrinsic and active-x controls, files, SDI and MDI interfaces and databases.

Books Recommended:

1 .Mastering VB .NET by EvangelosPeteroutsos, WROX Publications
2. Dietel and Dietel, “Visual Basic, How To Program”, Pearson Education.
3. Peter Norton’s Guide To Visual Basic 6 By Peter Norton
4. Beginning Visual Basic 6 By Peter Wright, Shroff Publishers
5. Programming In Visual Basic 6.0 By Mohammed Azam, Vikas Publishing House

Course No. ELE-15212DCE/ELE-15221GE **Communication Hardware Design**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Design of High Frequency Amplifier and Oscillators

Review of Noise in Electronic Networks; Network Noise Representation, Broad Banding Techniques - Input Compensation, Feedback, Lossless Feed-back Amplifiers, Neutralization, Cascode Amplifiers; Theory of Automatic Gain Control; AGC System Components; Design Examples; High Frequency Oscillator Circuits; Amplitude and Phase Stability; Parallel Mode and Series Mode Crystal Oscillators; Voltage Control Oscillators; Design Examples

Unit II: Phase Locked Loop (PLL) and Their Applications

Introduction; Linear Model of the Phase Locked Loop, Phase Detectors, VCOs and Loop Filters Design Examples and Applications; Tracking Filters; Angle Modulation: Frequency Demodulation, Amplitude Demodulation; Phase Shifters; Signal Synchronizers; Costas Loop; Digital Phase Lock Loop

Unit III: Frequency Synthesizers

Introduction; Direct Frequency Synthesis; Frequency Synthesis by Phase Lock; Effect of Reference Frequency on Loop Performance; Variable Modules Dividers; Methods for Reducing Switching Time; Direct Digital Synthesis; Synthesizer Design Examples; Output Noise Considerations

Unit IV: Mixers, High Efficiency Amplifiers

Frequency Mixers; Switching Type; Mixers and Their Performance; Square Law Mixers; BJT and FET Mixers; Balanced Modulator ICs, Class C Power Amplifier Design; Frequency Multiplication; Class D, E and S Amplifiers; Modulators and Amplifiers Using Vacuum Tubes and Power Electronic Devices.

Laboratory Work:

The students are required to conduct at least 10 experiments using hardware/software on theory part of the syllabus.

Books Recommended:

1. J. Smith, Modern Communication Circuits, McGraw Hill Book, 1996.
2. D. Roddy& J. Coolan, Electronic Communication, Prentice Hall of India, New Delhi, 1987.
3. Sidney Soclof, Applications of Analog ICs, Prentice Hall of India, New Delhi, 1990.

Course No.: ELE-15222OE **Computing and Informatics –II**
Paper Type: OE **Credits: 1L+0T+2P**

Introduction to algorithms and flow charts, Introduction to programming, types and categories of programming languages.Introduction to C programming language, declarations, expressions, control statements, arrays, functions, and pointers.Introduction to database management system, basic networking concepts, electronic mail and WWW, introduction to information security.

Lab Work:

Writing C programs using basic programming elements including control statements, arrays, function and pointers. Familiarity with e-mail and information security.

Recommended Books:

1. YashwantKanitker "Let Us C" 13th Edition BPB Publication.
2. Michael E. Whitman"Principles of Information Security" 4th Edition, Cengage Learning India.
3. S. K. Srivastava "C in Depth" BPB Publications.
   Philipa,Wingate "Internet for Beginners" E.D.C Publishing

Course No.: ELE-15223OE **Basic Electronic Devices and Circuits**
Paper Type: OE **Credits: 1L+0T+2P**

Review of Active and Passive components; Signals and Waveform Spectra.
Bipolar Junction Transistor (BJT), Types of transistors, Symbol, Biasing of transistor, transistor Configurations. ALPHA & BETA of a transistor. Amplification, Transistor as an amplifier. Classification of Amplifiers, Class A, B.C. Power amplifier, Impedance matching, Introduction to JFET and MOSFET, Typical Public Address system..

Oscillators, importance, applications to electrical circuits. Factors controlling oscillation. Types of Oscillators, A.F and R.F Oscillators, Crystal Oscillator, Oscillators used in Radio circuits,

Power supply. AC/DC Voltage/Current, Unregulated and regulated power supplies, introduction to IC based regulated power supplies. Study of 78XX and 79 XX series. SMPS Power Supply, DC/AC Inverters, working principle. UPS.

Lab Work:

Testing a Transistor, Terminal determination, Calculation of Alpha and Beta. Transistor configurations, Transistor as an amplifier. Regulated Power Supply, Study of 78XX and 79XX series. Study of various Oscillators.

Books Recommended:

1. Boylested, Electronic Devices and Circuit Theory.
2. Sidra and Smith, Microelectronic Circuits.
3. M. H. Rashid, Power Electronics circuits and devices, PHI

DETAILED SYLLABUS

FOR

M. Sc Electronics

SEMESTER III

Course No. ELE-15301C **Physics of Semiconductor Devices**
Paper type: Core **Credits: 2L+1T+0P**

Unit I: Crystal Structure and Carrier Transport

Crystal Structure, Space lattices, Primitive and Unit Cell, Index system for crystal planes, Separation between the parallel planes of a cubic crystal, Description of Schrodinger wave equation and its application to free space and Potential well, Physical interpretation of wave function, Kroning Penney Model, K-space diagramEffective mass, Concept of Hole, Derivation of Density of state functions, Fermi-Dirac Distribution function, Carrier concentration at thermal equilibrium, Carrier transport Equation, Decay of photo excited carriers, carrier lifetime, Hall effect.

Unit II: Semiconductor and BJT's

Abrupt and Graded PN junction, Current- voltage characteristics of PN junction, Depletion Capacitance, Diffusion capacitance, Junction breakdown phenomenon, Schottky effect, Bipolar junction transistors, current gain parameters, minority carrier distribution and terminal currents, Eber-Moll model.

Unit III: Field Effect Transistors, Microwave and Opto Electronic Devices

Field effect transistors, JFET and MOSFET- Basic device characteristics with analysis, MOS Capacitors, MOSFET Types- Basic device Characteristics with analysis, Equivalent Circuit. IMPATT: Static and Dynamic Characteristics, Gun diode and its Modes of operation, P -N Junction Solar Cells, V-I Characteristics, Ideal Conversion efficiency.

Books Recommended:

1. Donald E. Neaman, Semiconductor Physics and Devices, Basic Principles, McGrawHill Publishing, 3rd Edition, 2003.
2. Ben G. Streetman, Solid State Electronic Devices, Prentice Hall of India Ltd, N. Delhi.
3. S. M. Sze, Physics of Semiconductor Devices, Wiley eastern Ltd.
4. AzeroffandBrophy, Electronic Processes in Semiconductors, McGraw Hill Publishing Company.
5. A. S. Grove, Physics and Technology of Semiconductor Devices, John Wiley and Sons, New York.

Course No. ELE-15302C **Control Systems Engineering**
Paper type: Core **Credits: 2L+0T+2P**

Unit I: Control Systems and System Representation

Control Systems, types of control systems, feedback & its effects, linear & non-linear systems, superposition in linear systems, cascade and feed-forward control, Signal Flow Graph modeling of electrical and electronic systems, SISO and MIMO systems, Transfer function calculation using block diagram algebra and signal flow graph methods, Control of Physical Systems: Speed and temperature.

Unit II: Time Domain Analysis of Control Systems

Standard test signals, time response of first order and second control systems, Steady- state and transient response, Transient response specifications, S-plane root location & the transient response, Error analysis, Static and dynamic error coefficients, Controllers: Proportional, PI,PD and PID controllers.

Unit III: Stability and Frequency Analysis

Stability : Conditional an absolute stable systems, location of poles and stability, Routh- Herwitz criterion, Root-locus plot , effect of addition of poles and zeros on root locus, Frequency domain analysis, advantages and disadvantages, Frequency domain specifications, Polar plot, Bode plot, gain margin and phase margin, Nyquist criterion.

Unit IV: Introduction to Modern Control Theory

State equations, advantages of state space techniques, State space representation of electrical networks, state transition matrix, state transition equations, state diagrams, Block diagram representation of state equations, state space representation from ordinary differential equations, concepts of controllability and observability.

Laboratory Work:

Time domain analysis of 1st and 2^{nd} order system (Impulse and Step Response), Design of PI, PD and PID controllers, Root Locus Plot, Polar Plot, Study of Gain Margin and Phase Margin using MATLAB.

Recommended Books:

1. Modern Control Engineering by K-Ogata.
2. Feedback & Control Systems by Disteflno, Stubberud and Williams, McGraw HillInternational
3. Automatic Control systems by B. C. Kuo.
4. Linear Control System Analysis & Design by D. Azzo, Houfil.

Course No. ELE-15303C **Digital Signal Processing**
Paper type: Core **Credits: 2L+0T+2P**

Unit-I: Discrete Time Signals and Systems

Review of Signals and Discrete Time Systems, Properties of Systems, Difference Equations: FIR systems, IIR systems, Recursive Systems, Non- recursive Systems, Correlation: Cross- Correlation and Auto- Correlation, Properties, A/D Conversion Process: Sampling, Frequency Relationships, Aliasing, Quantization, Encoding, Anti-Aliasing Filter. Fourier Series and Fourier Transform, Sampled data and discrete time convolution, Z transform and its Properties.

Unit –II: Discrete Fourier Transform (DFT)

Introduction, Frequency Domain Sampling, Properties of DFT, Linear Filtering Techniques based on DFT, Spectrum Analysis using DFT, Efficient Computation of DFT: FFT algorithms, Properties of WN, Radix- 2 FFT algorithms: Decimation in Time and Decimation in Frequency FFT algorithms.

Unit -III: Infinite Impulse Response (IIR) Filters

Frequency response for rational system functions, All pass minimum phase functions; Basic structures for IIR systems: Design of IIR from continuous time filters, Frequency transformation of IIR low pass filters

Unit -IV: Finite Impulse Response (FIR) Filters

Linear systems with generalized linear phase; Basic network structures for FIR filters; Design of FIR filters; window functions.Frequency sampling technique. Comparison of FIR and IIR filters. Introduction to finite word length effects in DSP.

Laboratory Work:

Introduction to digital signal processing toolbox (MATLAB). Commonly used DSP based commands in MATLAB, Computation of Correlation and convolution of various sequences using MATLAB. DFT computation, Optimal order FIR filter design in MATLAB. Performance analysis of various windowing techniques for a given set of specifications using MATLAB

Books Recommended:

1. Digital Signal Processing, A. V. Oppenheim and R. W. Shafer, Prentice Hall, 1985
2. Introduction to digital Signal Processing, J. G. Proakis and DG Manolakis, Prentice Hall
3. Introduction to Digital Signal Processing, Roman Kue, McGraw Hill Book Co.

Course No. ELE-15304C **Computer Networks**
Paper type: Core **Credits: 2L+0T+2P**

Unit 1: Introduction

Introduction to computer networks, history and development of computer networks, network topologies, network architecture, network protocols and standards, network models, layered architecture, OSI model, TCP/IP model, other network models, Design issues in protocols at different layers.

Unit II: Network Interface Layer

Physical Layer: Transmission medium: guided and unguided media, errors in transmission: attenuation, noise. Repeaters. Encoding (NRZ, NRZI, Manchester, 4B/5B, etc.). MAC Layer: Aloha, CSMA, CSMA/CD, CSMA/CA protocols. Wired LANs: Ethernet, IEEE Standards, Fast Ethernet, Gigabit Ethernet, wireless LANs: and WiFi (IEEE 802.11), Token Ring and Bluetooth, WiMax. Connecting LANS: Connecting devices, Backbone networks, Virtual LANS. Virtual circuit networks: Architecture and Layers of Frame Relay and ATM. Error detection (Parity, CRC), Sliding Window, Stop and Wait protocols. LAN: Design, specifications of popular technologies, switching (circuit and packet switching).

Unit III: Network Layer

Internet Protocols (IPv4 & IPv6), ARP, DHCP, ICMP, IGMP, Routing algorithms :(unicast, multicast) Distance vector, Link state, Metrics, addressing techniques: address Classless (class A, class B, class C), CIDR, Sub netting, Network Address Translation.

Unit IV: Transport and Application Layer

Transport layer: Process to process delivery, user datagram protocol (UDP), transmission control protocol (TCP). Connection establishment and termination, flow and congestion control, timers, retransmission, TCP extensions, etc. Quality of services, techniques to improve QoS. Application Layer (Presentation Layer and Session Layer). Protocols at application layer: FTP, TFTP, DNS, SMTP, email, IMAP, POP, HTTP, WWW, browsers, static, dynamic and active webpages etc. Introduction to Network Security.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. Behrouz A. Foruzan, “Data communication and Networking”, Tata McGraw-Hill, 2006:
2. Andrew S. Tannenbaum, “Computer Networks”, Pearson Education, Fourth Edition, 2003:
3. Andrew S Tanenbaum, DJ Wetherall, Computer Networks, 5th Ed., Prentice-Hall, 2010.
4. LL Peterson, BS Davie, Computer Networks: A Systems Approach, 5th Ed., Morgan-Kauffman, 2011.
5. W Stallings, Cryptography and Network Security, Principles and Practice, 5th Ed., Prentice-Hall, 2010

Course No. ELE-15305DCE/ELE-15316GE **Microcontrollers, Architecture, Interfacing and Programming**

Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Architecture

Microcontroller versus General-purpose Microprocessors, Microcontrollers for embedded systems, Embedded applications, choosing a Microcontroller. Architecture of Atmel AT89C51Microcontroller, input/output pins, ports and circuits, external memory, counter and timer, serial data input and output, interrupt, Other members of 8051 family of microcontrollers.

Unit II: Instruction Set and Programming

Addressing modes: immediate and register addressing modes, accessing memory using various addressing modes. Arithmetic instructions and programs: unsigned addition and subtraction, unsigned multiplication and division, signed members concepts and arithmetic operations. Logic Instruction and programs: Logic and compare instructions rotate and swap instructions. Jump, Loop and call instructions; Loop and jump instructions, call instructions, time delay, generation and calculation. Single bit instructions and programming: single bit instruction programming, single bit operation with carry reading input pins versus port latch. I/O port programming: I/O programming, bit manipulation.

Unit III: Timer / Counter, Serial Communication and Interrupts Programming

Timer / Counter programming: programming 8051 timers, counter programming, pulse frequency and pulse width measurements. Serial communication programming: Basics of serial communication, 8051 connection to RS232, 8051 serial communication programming. Interrupts programming: Interrupts of 8051; programming timer interrupts, programming external hardware interrupts, and programming serial communication interrupts.

Unit IV: Interfacing and PIC Microcontrollers

Programmable peripheral interface (PPI)-8255, programming 8255, 8255 interfacing with 8051. Interfacing Key board. Interfacing LED/ LCD, Interfacing A/D & D/A converters, Interfacing stepper motor.Introduction to PIC series of Microcontrollers. Architecture and programming of 8-bit and 16-bit PIC microcontrollers.

Laboratory Work:

The Laboratory work shall include 10 Practicals based on units I through IV consisting of Assembly Language Programming and interfacing using Assemblers, simulators and trainers.

Books Recommended:

1. Muhammad Ali Mazidi, Janice GillispieMazidi, The 8051 Microcontroller, and Embedded Systems, Prentice Hall 2000.
2. Kenneth J. Ayala., "The 8051 Microcontroller Architecture Programming and Applications", Penram International Publishing (India). 1996.
3. MykePredko, Programming and Customizing the PIC Microcontroller
4. Fernando E. Valdes-Perez, Ramon Pallas-Areny, Microcontrollers: Fundamentals and Applications with PI

Course No. ELE-15306DCE/ELE-15317GE **Advanced Communication Systems**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit-I Modern Radar System

Fundamentals of Surveillance Radar and Design: Bandwidth considerations, prf, Un-ambiguious range and velocity, Pulse length and Sampling, Radar Cross-section and Clutter. Tracking Radar Tracking and Search Radars, Antenna beam shapes required, Radar guidance, Frequency agility, Importance of Mono pulse Radar.

Unit-II Telecommunication Switching Techniques

Time division switching: Time switching, space switching, Three stage combination switching, n-stage combination switching; Traffic engineering: Hybrid switching, Two/Four wire transmission, Erlang formula and signaling

Unit-III Satellite Communication

Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design Of Down Links, Domestic Satellite Systems Using Small Earth Stations, Uplink Design, Design Of Satellite Link For Specified (C/N).

Unit-IV Multiple Access Techniques

Multiple Access Techniques, Frequency Division Multiple Access (FDMA), TDMA, CDMA, Estimating Channel Requirements, Practical Demand Access Systems, Random Access, Multiple Access With On Board Processing. VSAT.

Laboratory Work:

To develop a simple switching model using Matlab, to study various multiplexing techniques used telecommunication networking, to study stored program based space division switch, to under fading in satellite communication using wireless communication link, to verify radar equation in Matlab

Books Recommended:

1. J.G. Proakis, “Digital Communication”, MGH 4TH edition.
2. Edward. A. Lee and David. G. Messerschmitt, “Digital Communication”, AlliedPublishers (second edition).
3. J Marvin.K.Simon, Sami. M. Hinedi and William. C. Lindsey, “DigitalCommunication Techniques”, PHI.

Course No. ELE-15307DCE/ELE-15318GE **Digital System Design using HDL**
Paper type: DCE **Credits: 2L+0T+2P**

UNIT I: Hardware Description Languages and VHDL

Hardware Description Languages: Introduction to VHDL, Design flow, Code structure: Library declarations, Entity and Architecture, Introduction to behavioral, dataflow and structural modeling. Data types: BIT, Standard logic, Boolean, Integer, real, Signed and Unsigned Data types, Arrays, Bit vector and Standard logic vectors, Operators and attributes:
Assignment, Logical, Arithmetic, Relational and concatenation operators

UNIT II: Concurrent, Sequential Codes and State Machines

Concurrency, Concurrent verses Sequential codes, advantages of concurrent codes, concurrent and sequential statements: WHEN (simple and selected), GENERATE, PROCESS, IF, ELSIF, WAIT, CASE, LOOP, Signal versus Variable, Bad Clocking, Brief concepts of Finite State Machines,(Melay and Moore Machines), state diagrams and state tables.

UNIT III: Combinational and Sequential Circuit Design.

Elements combinational and sequential circuits, VHDL modeling combinational systems: Gates, Binary adders and Subtractors, Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, Boolean functions using Multiplexer. Shanons expansion theorm, VHDL Modelling of Sequential Circuits: Flip-Flops, Shift Registers, Counters UPDOWN,
Johnson and Ring Counters.

UNIT IV: System Design and Programmable Logic Devices.

Introduction to COMPONENTS and FUNCTIONS, Port Mapping, Digital system design: VHDL modeling of ALU, Pseudo random Number Generator, Sequence detector, Traffic Light Controller, Barrel shifter, Programmable Logic Array (PLA), Programmable Array Logic(PAL), Introduction to Complex Programmable Logic Devices (CPLD) and Field Programmable Logic Arrays(FPGA), Advantages of FPGAs, Application Specific integrated Circuits (ASIC), FPGA design flow.

Laboratory Work:

Familiarity with Quartus Altera/ Xilinx ISE Suite. Combinational systems Implementation: Adder, Subtractor MUX, DEMUX, Encoder, Decoder and Comparator etc. Sequential system Implementation: Flip Flop, Shiftregisters, ALU, LFSR.

Books Recommended:

1. Pedroni V. A., Circuit Design with VHDL, PHI, 2008.
2. J.Bhasker, VHDL Primer, Pearson Education, India.
3. Wakerly J. F., Digital Design – Principles and Practices, Pearson Education,2008.
4. Brown S. and Vranesic Z., Fundamentals of Digital Logic with VHDL Design,TMH.2008.

Course No. ELE-15308DCE/ELE-15319GE **Speech and Audio Processing**
Paper type: DCE/GE **Credits: 2L+0T+2P**

UNIT-I: Fundamentals of Speech

The human speech production mechanism, LTI model for speech production, nature of the speech signal, linear time varying model, types of speech, voiced and unvoiced decision making, audio file formats: nature of WAV file, parameters of speech, spectral parameters of speech

UNIT-II: Linear prediction of speech and Quantization

Lattice structure realization, forward linear prediction, auto correlation covariance method, uniform and non-uniform quantization of speech, waveform coding of speech,the .726 standarad for ADPCM, parametric speech coding technique, RELP based vocoder, Transform domain coding of speech, sub-band coding of speech

UNIT-III: Speech Synthesis

History of text- to- speech system, synthesizer technologies, HMM based speech synthesis, sine wave synthesis, speech transformation, emotion recognition from speech, watermarking for authentication of a speech/ Music signal, digital watermarking, watermarking in capestral domain.

UNIT- IV Speech Processing Applications

Speech Recognition systems, Architecture of a Large Vocabulary Continuous Speech Recognition System, Deterministic Sequence Recognition for ASR, Statistical Sequence Recognition for ASR, VQ-HMM based speech recognition. Speech Enhancement, Adaptive Echo Cancellation.

Laboratory Work:

To simulate speech processing model using Matlab, Speech recognition systems implementation Acoustic analysis, linear time warping, dynamic time warping (DTW), Statistical Sequence Recognition for ASR: Bayes rule, Hidden Morkov Model (HMM), VQ- HMM based speech recognition. Speech watermarking using Discrete cosine Transform (DCT), Discrete Wavelet Transform

Books Recommended:

1. Speech and Audio Processing, Dr. Shaila D. Apte, Wiley Publications
2. Digital Signal Processing, Dr. Shaila D. Apte, Wiley Publications
3. Theory and Applications of Signal Processing, L. R. Rabiner and B. Gold, Prentice Hall 1985
4. Digital Signal Processing, A. V. Oppenheim and R. W. Shafer, Prentice Hall, 1985
5. Introduction to Digital Signal Processing, J. G. Proakis and DG Manolakis, Prentice Hall

Course No. ELE-15309DCE/ELE-15320GE **CMOS VLSI and Nano-Electronics–III (Analog and Mixed IC Design)**

Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Analog CMOS Sub-circuits

MOS Switch; MOS Diode/Active Resistor; Current Sinks and Sources, Translinear Circuits: Ideal Translinear Element, Translinear-loop-circuit synthesis, Various Translinear circuits, Squarer/divider, Squarer rooting, Current Mirrors, The Basic Current Mirror, Cascoding the Current Mirror, Biasing Circuits

Unit II: Amplifiers

Amplifiers, Gate-Drain Connected Loads, Current Source Loads, Common-Source Amplifier, TheCascode Amplifier, The Common-Gate Amplifier, The Source Follower (Common-Drain Amplifier), The Push-Pull Amplifier, Differential Amplifiers, The Source-Coupled Pair, The Source Cross-Coupled Pair, Cascode Loads
The Gilbert Cell

Unit III: References, Multistage Amplifiers and Nonlinear Circuits

Voltage and Current References, MOSFET-Resistor Voltage References, Parasitic Diode-Based References, Bandgap Reference Design, Operational Amplifiers, The Two-Stage Op-Amp, The Operational Transconductance Amplifier (OTA), Basic CMOS Comparator Design, MOS Analog Multipliers: Multiplier Design Using Squaring Circuits, The Multiplying Quad, Simulating the Operation of the Multiplier; Mixing, Modulation and Frequency Translation: Single-Device Mixers, Modulation and Demodulation using Analog Multipliers

Unit IV: Data Converters

Analog Versus Discrete Time Signals; Converting Analog Signals to Digital Signals; Sample-and-Hold (S/H) Characteristics; Digital-to-Analog Converter (DAC) and Analog-to-Digital Converter (ADC) Specifications; DAC Architectures: R-2R Ladder Network DAC, Cyclic DAC; Pipeline DAC; ADC Architectures: Flash ADC; Two-Step Flash ADC, Pipeline ADC, Integrating ADC, The Successive Approximation ADC; Oversampled converters; First-Order ΣΔ Modulator; Higher Order ΣΔ Modulators.

Laboratory Work:

The laboratory work shall include minimum 10 practicals on Analog CMOS subcircuits, amplifiers, References and Data converters

Books Recommended:

1. P. R. Gray, P. J. Hurst, S. H. Lewis and R. J. Meyer, Analysis and Design of analog integrated circuits, John Wiley and Sons, 2001.
2. R. Jacob Baker, CMOS, Circuit Design, Layout, and Simulation, JOHN WILEY & SONS, 2010.
3. P. E. Allen and D. R. Holberg, CMOS analog circuit design, Oxford University Press, 2002.
4. Shih-Chii Liu et al, Analog VLSI: Circuits and Principles, The MIT Press, 2002.

Course No. ELE-15310DCE/ELE-15321GE **RF Engineering**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: RF Passive Components and Transmission Line Analysis

High frequency Resistors, Capacitors and Inductors – Transmission Line Analysis line equation –Micro stripe line – SWR voltage reflection co-efficient propagation constant, phase constant, phase velocity – smith chart – parallel RL and RC circuits ABCD parameters and S parameters.

Unit II: RF Circuits Design
RF Oscillator Design, Fixed frequency oscillator – Dielectric resonant oscillator, Voltage controlled oscillator- sun element oscillator – RF mixer design – single ended mixer – double ended mixer – RF filter resonator and filter configuration – Butterworth and chebyshev filters – Design of micro stripe filters.

Unit III Communication Circuits

Integrated Circuit Requirements for Modern RF/Wireless System; RF Circuits – Low-Noise Amplifier (LNA) and Power Amplifier (PA); Oscillators; Mixers; Modulators and Demodulators; Integration Issues of RF and Baseband Circuits

Unit IV: RF System Design

Link design – Fading design – Protected and non protected microwave systems – Path calculation Spread spectrum microwave system – Compatibility – Safety co-ordinate systems – Datam's& GPS Receiver design receiver architecture dynamic range – frequency conversion and filtering examples of practical receivers FM broadcast, Digital cellular, Multimeter wave point to point,Direct conversion GSM receiver-RF MEMS: Concept, Implementation and Applications

Laboratory Work:

Hands on training using Network optimization and planning tool. Field visit at any Cell site, Study of various physical and logical channels in GSM system. Study of tilting of antenna system in GSM

Books Recommended:

1. Reinhold Ludwig and PavelBretchko, "RF circuit design," Pearson Education, 2007.
2. David Pozar, "Microwave and RF design of Wireless systems," Johnwiley, 2008.
3. Josn Rogers and Calvin Plett, "Radio frequency Integrated circuit design," Artech house, 2002.
4. FerriLosee, "RF systems, Components and Circuits handbook," Artech house, 2002.
5. Joseph.J.Carr, "Secrets of RF circuit design," Tata McGraw Hill, 2004.
6. VivekVaradhan," RF MEMS and their applications", Wiley Eastern edition, 2003.

Course No. ELE-15311DCE/ELE-15322GE **Microwave Integrated Circuits (MICs)**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: MICROSTRIP LINES DESIGN ANALYSIS

Introducion, Types of MICs and their technology, Propagating models, Analysis of MIC by conformal transformation, Numerical method, Hybrid mode analysis, Losses in microstrip, Introduction to slot line and coplanar waveguide.Expermiments using MMIC CAD tools and simulation techniques.

Unit II: COUPLED MICROSTRIP, DIRECTIONAL COUPLERS AND LUMPED ELEMENTS
Introduction to coupled microstrip, Even and odd mode analysis, Branch line couplers, Design and fabrication of lumped elements for MICs, Comparison with distributed circuits.Experiments using MMIC CAD tools and simulation techniques.

Unit III:NON-RECIPROCAL COMPONENTS AND ACTIVE DEVICES

Ferromagnetic substrates and inserts, Microstrip circulators, Phase shifters, Microwave transistors, Parametric diodes and amplifiers, PIN diodes, Transferred electron devices, Avalanche, IMPATT,BARITT diodes. Experiments using MMIC CAD tools and simulation techniques.

Unit IV:MICROSTRIP CIRCUIT DESIGN AND APPLICATIONS
Introduction, Impedance transformers, Filters, High power circuits, Low power circuits, MICs inSatellite and Radar, Fabrication process of MMIC, Thick film and thin film technology and materials. Experiments using.

Laboratory Work:

Laboratory work shall consist of at least ten practical across all four units using MMIC CAD tools.

Books Recommended:

1. Monolithic Microwave Integrated Circuits: Technology & Design (Artech House Microwave Library) Hardcover – January 1, 1989, Ravender Goya.

2. Advances in Monolithic Microwave Integrated Circuits for Wireless Systems: Modeling and Design Technologies, ArjunaMarzuki , Ahmad Ismat Abdul Rahim , MouradLoulou

Course No. ELE-15312DCE/ELE-15323GE **Soft Computing and Neural Networks**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Overview of Crisp Sets, Fuzzy Sets and Relations

Basic Concepts of Crisp Sets and Fuzzy Sets, Basic Types of Fuzzy Sets, Sets, Representation of Fuzzy Sets, Fuzzy Relations, Operation on Fuzzy relations, Composition of Relations, Extension Principle for Fuzzy Sets, Concept and models of Fuzzy logic Circuits-viz. AND, OR and NOT.

Unit II: Fuzzy Logic and Rule based Systems

Overview of classical logic, Multi-valued logic, Fuzzy sets and probability theory, Probability vs. possibilities, Approximate reasoning, Fuzzy rule based Systems: Structure of Fuzzy rules, decomposition of compound rules, aggregation of fuzzy rules, Graphical techniques of inferences, Types of fuzzy rule based models.

Unit III: Introduction to Neural Networks

Biological and Artificial Neurones, Neuron Models: Classification and Linear Separability, X-OR Problem, Hopfield Networks, Overview of Neural Networks Architectures: Mulyilayered Feed forward and Recurrent Networks, Learning: Supervised, Unsupervised and Reinforcement, Learning Laws. Back-propagation (BP) Networks, Generalized delta rule, BP Training Algorithm and Derivation for Adaptation of Weights,

Unit IV: Programming

Implement fuzzy set operation and properties; verify various laws associated with fuzzy set; Demonstration of Mamdani and TSK rule based system using fuzzy logic tool box; Implement basic logic functions using Adaline and Madaline with bipolar inputs and outputs; implement composition of fuzzy and crisp relations; Implement discrete Hopfield network and test for input pattern; implement back propagation network for a given input pattern;

Laboratory Work :

Laboratory work shall consist of at least 15 practical across all four units using MATLAB tool.

Books Recommended:

1. Fuzzy Sets and Fuzzy Logic: Theory and Applications, G. Klirabd B. Yuan, Printice Hall of India
2. Neural Networks and Fuzzy systems,: A Dynamical System Approach to Machine Intelligence, Printice Hall of India
3. Neura;l Networks in Computer Intellligence, Limin Fu, Mcgraw Hill International
4. Adaptive Recognition and Neural Networks, Yoh-Han Pao, Addison Weseley
5. Introduction to the Theory of Neural Computations, John Hertz, Anders Krogh and Richard G. Palmer, Addison Wesley.

Course No. ELE-15313DCE/ELE-15324GE **Coding Theory**
Paper type: DCE **Credits: 2L+0T+2P**

UNIT I: Modern Algebra for Coding

Introduction to Algebra: Groups, identity element, inverse of an element, finite group, fields, modulo addition and multiplication, characteristic of field, Galois field, polynomial over GF(2), irreducible and primitive polynomials, construction of GF(2^m), power, polynomial and m-tuples representations, Vector spaces, properties, subspace, linear combination, linear interdependence, spanning of a vector space, basis and dimension of a vector space, dual space, row space, orthogonality.

UNIT II: Linear Block Coding

Linear Block Codes: Definition, message and code words, Generator matrix, systematic code word, parity-check matrix, encoding circuit, syndrome, error detection, syndrome circuit, minimum distance and minimum weight, error-detecting and error-correcting capabilities, standard array and syndrome decoding, decoding circuit

UNIT III: Convolutional Coding

Convolutional codes: Encoder, constraint length, code tree, code trellis, state diagram, fractional rate loss, generator polynomials, structural properties, branch and path gains, generating function, Viterbi algorithm

Unit IV: Spreading Sequences

Spreading Codes in CDMA: Linear Feedback Shift Register (LFSR), LFSR Generator Implementations-Fibonacci and Galois implementation, Maximal length sequences-generation, properties, Generation of Gold codes, Kasami sequences, Walsh codes. Turbo Codes: Generation and properties.

Laboratory Work:

MATLAB implementation of Block codes, Convolution codes and Spreading Codes (At least 10 practicals).

Books Recommended:

1. Introduction to Coding Theoryby Ron Roth, March 20, 2006, SBN-13: 978-0521845045 ISBN-10: 0521845041
2. Essential Coding Theory,by VenkatesanGuruswami, AtriRudra, Madhu Sudan - University at Buffalo ,2014.

Course No. ELE-15314DCE/ELE-15325GE **Cryptography and Information Security**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Conventional Encryption Techniques

Introduction to security attacks, services and mechanism, Conventional Encryption Model, Steganography, Classical Encryption Techniques, Simplified Des, Block Cipher Principles, Data Encryption Standards, Differential And Linear Cryptography Principles, Block Cipher Design Principles, Modes of Operations, Algorithms Like Triple Des, International
Data Encryption Algorithm, Blowfish, Rc5, Cast-128, Rc2, Characteristics of Advanced Symmetrical Block Cipher, Issues Of Conventional Encryption Like Traffic Distribution, Random Number Generation, Key Distribution.

Unit II: Public Key Cryptography

Principles of Public-Key Cryptography, RSA Algorithm, Key Management, Elliptic Curve Cryptography, Diffie-Hellman Key Exchange. Number Theory: Prime And Relative Prime Numbers, Modular Arithmetic, Euler's Theorem, Euclid's Algorithm, Discrete Logarithm Tics

Unit III: Message Authentication and Hash Functions

Authentication Requirement, Functions, Message Authentication Code, Hash Functions, Security of Hash Functions and Macs, MD5 Message Digest Algorithm, Secure Hash Algorithm, Ripemd-160, HMAC

Unit IV: Network Security

Identifying Risks to Network Security, Open and Closed Security Models, Trends Driving Network Security, Information Security Organizations, Digital Signatures, Implementing Authentication, Data Integrity, and Non repudiation, Authentication Protocols, Digital Signature Standards, Application Authentication Techniques Like Kerberos, X.509 Directory Authentication Services, SNMP, Security Policies and Procedures, Firewalls, IDS, Log Files, Honey Pots, etc.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations (at least 10 Practicals to be conducted).

Books Recommended:

1. Cryptography & Network Security, Forouzan, Mukhopadhyay, McGrawHill
2. Cryptography and Network Security (2nd Ed.), AtulKahate, TMH
3. Information Systems Security, Godbole, Wiley-India
4. Information Security Principles and Practice, Deven Shah, Wiley-India
5. Michael E. Whitman, Herbert J. Mattord, "Principles of Information Security", 2nd Edition, Cengage Learning Pub.

Course No. ELE-15315DCE/ELE-15326GE **Advanced Microprocessors**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Intel 8086, 80186 and 80286 Processors

Architecture and working of 8086 and 80186 Microprocessor, Register set of 8086 and 80186 Microprocessor, Addressing Modes and memory segmentation in 8086 and 80186 microprocessor, Differences between 8086 and 80186 microprocessors. Intel 80286 Microprocessor, 80286 Architecture, system connection – Real and Protected mode operations.

Unit II: Intel 80386 Processor: Architecture and Programming

Intel 80386 Microprocessor, 80386 Architecture and system connection – Real operating mode – 386 protected mode operation – segmentation and virtual memory – segment privilege levels and protection – call gates – I/O privilege levels – Interrupts and exception handling – task switching – paging mode – 80386 virtual 86 mode operation.

Unit III: Intel 80486 and Pentium Processors: Architecture and Programming

80486 – Processor model – Reduced Instruction cycle – five stage instruction pipe line – Integrated coprocessor – On board cache – Burst Bus mode, Recent trends in microprocessor design. Pentium – super scalar architecture – u-v pipe line – branch prediction logic – cache structure – BIST (built in self-test) – Introduction to MMX technology.

Unit IV: Advanced and Special Purpose Processors

Architecture, addressing and programming of Digital Signal Processors, co-processors and I/O processors. Difference between CISC and RISC processors, various emerging trends in Microprocessor Design. Introduction to graphics and other special purpose processors, Introduction to architecture of multi-core processors.

Laboratory Work:

The Laboratory work shall be based on units I through IV. The laboratory work shall include al least 10 practicals on the study of instruction sets of Intel Processors, Programming exercises for 16, 32 and 64 bit data processing, Use of Macros and Procedures, IVT and ISR, DSP programming for Image Processing such as Image Compression, Image Restoration, Image Enhancement, etc.

Books Recommended:

1. Introduction to 8086, 80186,80286, 80386, 80486, Pentium and Pentium Pro Processors, B. Bray, Tata McGraw Hill Publishing Company
2. Advanced Microprocessors by Daniel Tabak McGraw-Hill.
3. Advanced Microprocessors by A. P. Godse, D. A. Godse Technical Publications.
4. Advanced Microprocessors and Peripherals by K. M. Burchandi, A. K. Ray Tata McGraw Hill Education
5. Advanced Microprocessors by Y. Rajasree, New Age International.

Course No. ELE-15327OE **Electronic Equipment Maintenance**
Paper type: OE **Credits: 1L+0T+2P**

Pre-requisite for the course: Evidence of the student having passed a basic course in Electronics

Transformers, UPS and Batteries
Transformers: Single-Phase Transformers, Transformer ratio, Transformer winding, auto cuts and line protection. Fabrication and repairs of Transformers. UPS: Principle and operation, performance parameters, capacity, Repairs of UPS. Rechargeable Batteries: Principle, types, capacity, AH rating. Fabrication and repairs of batteries.

Assembling and maintenance of Computers
Assembling of a computer system, Hardware maintenance of a computer system, memory upgradation, software faults.

Mobile Phone, Maintenance and Repair
Mobile phones: Introduction, IC Replacement and Reballing, methods of Flashing, Mobile Unlocking, Mobile Formatting, UI Settings. Mobile Downloading, Blue-Tooth & Card-Reader Cables.

Lab Work:

The teacher shall provide practical demos and training to the students on all the theory topics.

Books Recommended:

1. "Engineering Fundamental and Problem Solving" by Eide, et. al., 2002, John Wiley & Sons.
2. Manuals for Transformer and motor winding
3. Manuals for UPS, Mobile Phones, Bio-medical equipment.
4. Computer Assembling and maintenance manuals.

Course No. ELE-15328OE **Basic Radio and TV Engineering**
Paper type: OE **Credits: 1L+0T+2P**

Concept of Voltage and Current, AC/DC Voltage/Current, Current sources.
AC signals and waveforms, amplitude, frequency, wavelength, electromagnetic signals, Bandwidth, speed; classification of em-spectrum, concept of radiation and antenna, relation between antenna height and wavelength.
Review of Active and Passive elements: Resistors, Capacitors, Inductors, Semiconductors, symbols, Intrinsic/Extrinsic and P/N type semiconductors, Diodes, symbol, Example of Diodes, Characteristics of Diode. Simple examples/circuits.
Filter circuit, Types of Filter circuits, High pass, Low pass, Band pass filters.
Bi-polar Junction Transistor (BJT), symbol, BJT action, Types, BJT Biasing, BJT amplifier circuit. Introduction to Op-Amp.
Sound/Audio signals, Bandwidth, conversion of sound into electrical signal, microphones, types, Loudspeakers.
Concept of Oscillators, simple oscillator circuit and applications, crystal oscillator.
Need for modulation, definition of modulation, types of modulation, A.M., F.M., Broadcasting, Bandwidth, Demodulation.
Radio Broadcasting, Radio Receiver circuit, super heterodyne receiver, IF, RF and amplifier stages, concept of tuning, Service manual of radio receiver.
Concept TV broadcasting, converting an optical image into electric signal, Video signal, concept of scanning, flicker, basic video camera, TV Transmitter, Basic TV Receiver, Block Diagram, CRT.
Concept of Luminance and Chrominance, Color signal, Color video camera, Color TV broadcasting, Introduction to NTSC and PAL systems, Block diagram of Colr TV receiver, LCD and LED TV receivers.
Service manual of Color TV receivers, fault finding.

Books:

1. Basic Electronics by Malvino.
2. Basic Radio and TV Engineering. By R R Gulati
3. Digital and Analog Communication by Tomasi.

DETAILED SYLLABUS

FOR

M. Sc Electronics

SEMESTER IV

Course No. ELE-15401C **Digital Communications and Information Theory**
Paper type: Core **Credits: 2L+0T+2P**

UNIT I: Information Theory

Introduction to Information Theory, Measure of information, Information content of Messages, Information sources, Markoff Model for Information sources, Information Content of a Discreate Memoryless Channel ,Entropy and Information rate of Markoff sources, Joint Entropy and Conditional Entropy,Mutual Information, Discrete Communication Channels, Channel representation and Channel Matrix, Mutual information for each channel, Channel Capacity, Shannon's Theorem, Shannon- Hartley Theorem, Bandwidth S/N Trade–off, Source Encoding, Coding Efficiency, Shannon- Fano Coding, Huffman Coding.

UNIT II: Pulse Code Modulation

Sampling Theorem, Signal Reconstruction: The Interpolation Formula, Elements of Pulse Code Modulation (PCM), Quantization: Uniform and Non-uniform Quantization, Compading Characteristics, Encoding, Bandwidth and Noise in PCM Systems, Differential PCM, Delta modulation and Adaptive DM.

UNIT III: Band Pass Digital Carrier Modulation and Channel Coding

Digital modulation techniques: Generation and Detection of Amplitude Shift Keying (ASK), frequency Shift keying (FSK), Phase Shift Keying, and Differential Phase Shift Keying (PSK and DPSK), base band receiver Optimum Filter, Correlator, Probability of Error in each Scheme,. Error Control Coding: Linear Block codes, (7, 4) Linear Block Coding, matrix representation of linear block codes, Cyclic Codes, polynomial representation (examples).

UNIT IV: Wide Band Digital Communications

Basics of Wide band Systems, Generation of Spreading Codes (PN Codes, Gold Codes), Properties of PN codes, Theory of Spread Spectrum Modulation, Model of Spread Spectrum Digital Communication System, Direct-Sequence Spread Spectrum (DSSS): Processing Gain, Performance and Generation and Detection, Frequency Hopping Spread-Spectrum (FHSS): Generation and Detection, Types, Introduction to Digital Cellular Communication Systems: Architecture of GSM.

Laboratory Work:

The laboratory work shall consist of at least 10 practicals based on unit I through unit IV and shall use hardware implementation as well as experiments using MATLAB/Simulink.

Books Recommended:

1. Digital Communication By Simon Hykin.
2. Digital and Analog Communication by K. Shan Mugam.
3. Digital and Analog Communication by Tomasi.
4. Digital Communications By Bernard Sklar, Pearsons Education.
5. Digital Communications By John G. Proakis McGraw- Hill International Editions.
6. Information Theory Coding and Cryptography by Ranjan Bose, TMH.

Course No. ELE-15402C **Electronic Instrumentation**
Paper type: Core **Credits: 2L+0T+2P**

Unit I: Measurements and Instrumentation

Fundamentals of Measurements Errors in measurement; Controlling and Networking of Instruments; Signals and Signal Conditioning; Noise and Interference

Transducers: Classification of transducers, characteristics and choice of transducers; Resistance, Capacitance, Peizoelectric, Thermoelectric, Hall effect, Photoelectric, Techogenerators, Measurement of displacement, velocity, acceleration, force, torque, strain, speed, and sound, temperature, pressure, flow, humidity, thickness, pH, position.

Unit II: Digital Measurements

Counters, Digital frequency meters and time meters, Universal counter timer. Digital Voltmeter: General Characteristics, Ramp type DVM, Staircase ramp DVM, Successive approximation type DVM, Integrating type DVM Dual slope A/D DVM, Digital ohm meter, Digital capacitance meter, Digital modulation index meter, Digital quality factor meter, Digital tan delta meter, Digital IC tester.

Unit III: Oscilloscopes and Analyzers

Multi Trace Oscilloscope, Dual trace Oscilloscope, Dual beam Oscilloscope, Sampling Oscilloscope, Storage Oscilloscope, Analog storage Oscilloscope, Digital storage Oscilloscope, Comparison between Analog and Digital storage Oscilloscope

Harmonic distortion analyzer, Wave analyzer, Frequency selective wave analyzer, Heterodyne wave analyzer, Application of Wave analyzer, Spectrum Analyzer, Spectrum Analyzer characteristics, Real time spectrum analyzer, Swept tuned spectrum Analyzer, Logic Analyzer

Unit IV: Analytical Instruments

Bio-medical Instruments- ECG, Blood Pressure measurements, Spectrophotometers, Electron Microscope, X-ray diffractometer, Noise and interference in Instrumentation, Instrumentation Amplifiers and Radio Telemetry.

Laboratory Work:

The laboratory work shall include minimum 10 practicals on transducers, digital measurements and signal analyzers.

Books Recommended:

1. NihalKularatna, Digital and Analogue Instrumentation testing and measurement, The Institution of Electrical Engineers, 2003
2. J. G. Webster, Measurement, Instrumentation and Sensors Handbook, CRC Press, 1999.
3. T. S. Rathore, Digital Measurement Techniques, Narosa Publishing House, New Delhi.

Course No. ELE-15403C **Industrial Training and Seminar Work**
Paper type: Core **Credits: 0L+1T+2P**

I. Industrial Training:

The students are required to undergo training at some centre of excellence, outside the State, to get additional exposure in the new and emerging areas in the field of Electronics. Training Incharge/s from the Department shall accompany the students for making necessary academic and other arrangements at the host institute. At the end of the training programme, the performance of the students shall be evaluated by the host institute in collaboration with the Training Incharge.

II. Seminar Work

Each student shall be required to deliver a power point presentation on any topic pertaining to some latest area in the field of Electronics & Communication. Each student shall be evaluated for his/her Seminar Work by a team of faculty members headed by the Seminar Incharge.

Course No. ELE-15404C **Project Work**
Paper type: Core **Credits: 0L+0T+8P**

The students shall be divided into groups, with not more than 4 students in a group. Each group of students shall choose to work on a hardware/software project pertaining to the area of Electronics. The major theme of the project shall be to develop a prototype solution for a commercially needful application.

Each Project Group shall work under the supervision of Project Guide allocated within/outside the Department. The project Reports prepared by the students, as well as the working prototype shall be evaluated by an external Examiner.

Course No. ELE-15405DCE/ELE-15417GE **Computer Organization and Architecture**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Structure, Function and Measuring Performance

Computer Level Hierarchy and Evolution, Von-Neumann Architecture, Structure and Components of Computers, Computer Functions, Instruction Execution and Instruction Cycle State Diagrams, Computer Buses, Bus Interconnection and Hierarchy, Elements of Bus Design, Bus Arbitration and Timings, introduction to High speed buses. Measuring Performance – MIPS, FLOPS, CPI/IPC, Benchmark, Geometric and Arithmetic Mean, Speedup, Amdahl‟s and Moore‟s Laws.

Unit II: Memory Organization and Instruction Set Architecture

Memory Hierarchy, types and Characteristics, Primary Memory- Types, Working, Chip Organization, Expansion, Cache Memory- Mapping Schemes, Replacement Policies, Hit and Miss, Write policies, Coherence. Introduction to Virtual Memory, Overlays, Paging, Segmentation, Fragmentation, RAID and CAM. Instructions and Instruction Set–Characteristics, Types, Functions, Execution, Representation, Format, Addressing Modes.

Unit III: Register Set and I/O Organization

CPU Registers – Organization, Programmer Visible, Status/Control, Accumulator, and general purpose registers, Stack based CPU, Micro-operations and RTL – Register Transfer, Bus and Memory Transfer, Arithmetic, logical and shift micro-operations, Implementation of simple Arithmetic, logical and shift units, Micro-operations and instruction execution, I/O Organization – I/O Module, its functions and structure, I/O Techniques, Introduction to I/O Interfaces.

Unit IV: Data Representation, ALU and Control Unit Design

Scalar Data Types Sign Magnitude, One‟s and Two‟s Complement representations of Integers, Integer Arithmetic‟s (Negation, Addition, Subtraction, Multiplication, Division, Incrementation and Decrementation). Booths Algorithms and Hardware Implementation. Floating Pont Representation and IEEE Standards. Floating Point Arithmetic‟s (Negation, Addition, Subtraction, Multiplication and Division). ALU – Fixed and Floating point ALU Organization. Control Unit – Functional Requirements, Structure, Control Signals, hardware and Micro-programmed /Wilkes Control unit, Micro-instructions and its formats, Control Memory. Introduction to Pipelining and Parallel Processing.

Laboratory Work:

The Laboratory work shall be based on units I through IV. It shall include digital design of binary adders, subtractors, comparators, fast adders, etc. Chip implementation of various arithmetical and logical circuits, Design of 4/8 bit ALU. Study of Booths algorithm and its hardware implementation, understanding format and representation of various data types in High and low level languages, Design of a floating point adder.

Books Recommended:

1. Computer Organization and Architecture by Stallings, PHI.
2. Computer Organization by M. Mano, PHI.
3. Computer Organization and Architecture by Gilmore, TMH.
4. Computer Organization and Design, Patterson Henessney, Harcourt India

Course No. ELE-15406DCE/ELE-15418GE **Multimedia Technology and Security**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Introduction to Multimedia Systems and Processing

Introduction to multimedia systems, Multimedia signals, various sources of multimedia signals, Motivation for growth of multimedia theory, different elements of multimedia communication system, Challenges involved with multimedia signal processing and communication

Unit II: Lossless Compression

Redundant information in images.Lossless and lossy image compression. Elements of an image compression system, Huffman coding. Limitations of Huffman coding.Arithmetic coding (Basic principal). Encoding and Decoding procedure of an arithmetic coded bitstream. Coding limitations of arithmetic coding. Introduction to Lempel-Ziv and Run length coding

Unit III: Lossy Compression

Theory of Quantization, uniform and non-uniform quantization, scalar and vector quantization.Lloyd-Max quantizer.Rate-distortion function, Lossy predictive coding.Pixel encoding using Delta modulation, source coding theorem.

Unit IV: Information Security

Need for information security, Information Hiding versus Encryption, Requirements of a Data Hiding System, Hiding Capacity, Robustness and Imperceptibility, Steganography and watermarking. Hiding in Spatial and Frequency domains.Advantages and disadvantages of spatial and frequency domain embedding. LSB based embedding algorithm for data hiding.

Laboratory Work:

Introduction to image processing toolbox.Frequently used commands for image manipulation (IMSHOW, IMREAD, IMWRITE, RAND, RANDN, RANDPERM etc.), Image encryption using MATLAB.Implementation of LSB and ISB algorithms, Frequency domain data hiding in MATLAB.

Books Recommended:

1. Shuman and Thomson, Introduction to Multimedia, Tata Mcgrah Hill 2007.
2. Gonzalez and Woods, "Digital Image Processing", 2 Ed, Pearson Education, 2002.
3. N. J. Fliege, Multirate Digital Signal Processing: Multirate Systems - Filter Banks – Wavelets, Wielypublishers ,1999
4. Lu, S.: Multimedia security: Stegnography and digital watermarking techniques for protection of intellectual property, Idea Group Publishing, USA. (2005).

Course No. ELE-15407DCE/ELE-15419GE **Mobile communication**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Cellular System Fundamentals

Overview of Wireless Communication; Frequency Reuse and Cellular Concept; Co-Channel and Adjacent Channel Interferences; Cell Sectoring and Cell Splitting; Handoff Strategies; Channel Assignment Techniques

Unit II: Propagation Modeling

Propagation Path Loss; Shadowing; Path Loss Models; Multipath Fading; Narrowband Fading Models: Correlation and Power Spectral Density, Envelope and Power Distribution, Level Crossing Rate (LCR) and Average Fade Duration (AFD); Wideband Channel Models: Power Delay Profile, Coherence Bandwidth, Doppler Power Spectrum and Channel Coherence Time

Unit III: Modulation and Multiple Access Techniques

Performance of Digital Modulation over Wireless Channel; Diversity Techniques; Orthogonal Frequency Division Multiplexing (OFDM); Multiple Access Techniques: Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Hybrid Techniques, OFDMA

Unit IV: Mobile Systems and Standards

Global System for Mobile Communications (GSM); CDMA Cellular System (IS-95); Evolution of Second-Generation (2G) Systems; Third-Generation (3G) Systems; Beyond 3G Systems.Wireless Local Loop; Mobile IP; Wireless Local Area Network (WLAN) Technology; IEEE 802.11 WLAN Standards; Ad Hoc Networking and Wireless Personal Area Networks.

Laboratory Work:

Implementation of Multiplexing Techniques, Calculation of Path Loss, Co-relation, Power Spectral Density, Study of various Channel Models, Study of GSM and CDMA Cellular Systems**.**

Books Recommended:

1. Wireless Communication; Principles and Practice; T.S.Rappaport
2. Principles of Mobile Communication, G.LStuber Kluwer Academic, 1996.
3. Wireless and Digital Communications; Dr. KamiloFeher (PHI)
4. Mobile Communication Hand Book; 2nd Ed.; IEEE Press
5. Mobile Communication Engineering – Theory & Applications; TMH

Course No. ELE-15408DCE/ELE-15420GE **CMOS VLSI and Nano Electronics –IV (Nanotechnology and Nano electronics)**

Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit-I: Nanotechnology and Nano-Electronics

Introduction to Nanotechnology: size dependant physical properties, Melting point, solid state phase transformations, excitons, band-gap variations-quantum confinement, effect of strain on band-gap in epitaxial quantum dots. The p-n junction and the bipolar transistor; metal semiconductor and metal-insulator, Semiconductor junctions; field-effect transistors, MOSFETs,

Unit-II: Physics of Nanostructures

The Physics of Low-Dimensional Semiconductors: Square quantum well of finite depth, Parabolic and triangular quantum wells, Quantum wires, Quantum dots, Strained layers, Band structure in quantum wells, Semiconductor Quantum Nanostructures and Super-lattices: MOSFET structures, Heterojunctions, Quantum wells, Super-lattices, Electric Field Transport in Nanostructures: Parallel transport, Perpendicular transport, Quantum transport in nanostructures, Transport in Magnetic Fields and the Quantum Hall Effect

Unit-III: Electronic Devices Based on Nanostructures

HEMTs, MODFET, Hetero-junction bipolar transistors, Resonant tunnel effect, Hot Electron Transistors, Resonant Tunneling Transistor, Single Electron Transistor, Quantum Dots and Quantum Cellular Automata

Unit-IV: Optoelectronic Devices Based on Nanostructures

Heterostructure semiconductor lasers ,Quantum well semiconductor lasers ,Vertical cavity surface emitting lasers (VCSELs), Strained quantum well lasers, Quantum dot lasers, Quantum well and super lattice photo detectors, Quantum well modulators, Optical luminescence and fluorescence from direct band gap semiconductor nanoparticles, surface-trap passivation in core-shell nanoparticles

Laboratory Work:

The laboratory work shall include minimum 10 practicals across four units using suitable hardware/software platform.

Books Recommended:

1. Hari Singh Nalwa, Encyclopedia of Nanotechnology
2. Bharat Bhusan, Handbook of Nanotechnology, Springer
3. A. A. Balandin, K. L. Wang, Handbook of Semiconductor Nanostructures and Nanodevices
4. Cao, Guozhong, Nanostructures and Nanomaterials - Synthesis, Properties and Applications.
5. J. M. Martínez-Duart, R.J. Martín-Palma and F. Agulló-Rueda, Nanotechnology for Microelectronics and Optoelectronics, Elsevier B.V.

Course No. ELE-15409DCE/ELE-15421GE **Fundamentals of RF Circuit Design**
Paper type: DCE/GE **Credits: 2L+0T+2P**

UNIT I: Introduction to RF Design

Importance of RF Design, RF Behaviour of Passive Components, Chip Components and Circuit Board Considerations, General Transmission Line Equation, Micro Strip Transmission Lines, Single and Multi-Port Networks: Interconnecting Networks, Network Property and Application, Scattering Parameters.

UNIT II: Active RF Component and Modelling

RF Diode, Bipolar Junction Transistor, RF Field Effect Transistors, High Electron Mobility Transistor, Diode Models, Transistor Models, Characteristics of Amplifiers, Amplifiers Power Relation, Stability Considerations, Constant Gain, Noise Figure Circles, Constant VSWR Circles, Broad Band, High Power and Multistage Amplifiers.

UNIT III: RF Filter and Oscillator Design

Overview of RF Filter design, Matching and Biasing Networks. Basic blocks in RF systems and their VLSI implementation, Low noise, Amplifier design in various technologies, Power Amplifier design, Design issues in integrated RF filters. Basic Oscillator Model, High Frequency Oscillator Configuration.

UNIT IV: RF Mixer, VCO and PLL

Basic Characteristics of Mixers. Design of Mixers at GHz frequency range, various mixers- working and implementation. Oscillators- Basic topologies VCO and definition of phase noise, Noise power and trade off. Resonator VCO. designs, Radio frequency Synthesizers- PLL, Various RF Synthesizer architectures and frequency dividers

Laboratory Work:

The laboratory work shall include minimum 10 practicalsacross four units using suitable hardware/software platform.

Books Recommended:

1. Reinhold Ludwig, PavelBretchko, RF Circuit Design, Pearson Education Asia, 2001.
2. B Razavi, Design of Analog CMOS Integrated Circuit, McGraw Hill, 2000.
3. R. Jacob Baker, H.W. Li, D.E. Boyce, CMOS Circuit Design, layout and Simulation, PHI 1998.
4. Y.P. Tsividis, Mixed Analog and Digital Devices and Technology, TMH 1996
5. Thomas H. Lee, Design of CMOS RF Integrated Circuits, Cambridge University Press 1998.

Course No. ELE-15410DCE/ELE-15422GE **Bio-Medical Instrumentation**
Paper type: DCE/GE **Credits: 2L+0T+2P**

UNIT I: Electro-Physiology and Bio-Potential Recording

The origin of Biopotentials; biopotential 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 analyzer, Blood flow meter, cardiac output, hearing aids, respiratory measurement, oximeter, Blood pressure, Temperature, pulse, Blood cell counters.

UNIT III: Assist Devices, Bio-Telemetry and Recent Trends

Cardiac pacemakers, DC Defibrillator, physiotherapy, diathermy, nerve stimulator, artificial kidney machine. Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.

UNIT IV: Medical Imaging

Medical imaging, X-rays, laser applications, ultrasound scanner, echo-Cardiography, CT Scan MRI/NMR, cine angiogram, colour Doppler systems, Holter monitoring, endoscopy.

Laboratory Work:

Measurement of blood pressure, study of ECG and EEG lead systems, study of ECG and EEG graphs, temperature measurement, Respiratory measurement.

Books Recommended:

1. Leislie Cromwell, Biomedical instrumentation and measurement, Prentice Hall of India, New 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, John Wiley and Sons, New York, 1997.

Course No. ELE-15411DCE/ELE-15423GE **Digital Image Processing**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Digital Image Fundamentals

Digital image fundamentals: representation - elements of visual perception - simple image formation model - Image sampling and quantization - basic relationships between pixels – imaging geometry. Review of matrix theory results: Row and column ordering. Review of Image transforms: 2D-DFT, FFT

Unit II: Image Enhancement

Image enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters. Frequency domain methods: low pass filtering, high pass filtering,

Unit III: Image Restoration

Image restoration: Degradation model - Diagonalization of circulant and Block circulant matrices - Algebraic approaches - Inverse filtering - Wiener filter - Constrained Least squares restoration - Interactive restoration - Geometric transformations.

Unit IV: Image Compression

Image compression: fundamentals- redundancy: coding, inter pixel, psychovisual, fidelity criteria, Models, Elements of information theory, Error free compression- variable length, bit plane, lossless predictive, Lossy compression- lossy predictive, transform coding. Fundamentals of JPEG and MPEG. Image Compression using MATLAB

Laboratory Work:

Introduction to Image processing Toolbox. Frequently used commands in image processing. Algebraicoperations on image data. Image filtering and restoration using MATLAB.Image compression using MATLAB.

Books Recommended:

1. Gonzalez and Woods, “Digital Image Processing”, 2 Ed, Pearson Education, 2002.
2. Anil K. Jain “Fundamentals of Digital Image Processing”, Pearson Education, 2003.
3. Mark Nelson, Jean-Loup Gailly “The Data compression Book” 2 Ed, bpb Publications.
4. Pratt William K.,”Digital Image Processing”, John Wiley & sons
5. M.Sonka,V. Hlavac, R. Boyle, “Image Processing, Analysis and Machine Vision”, Vikas Publishing House

Course No. ELE-15412DCE/ELE-15424GE **Parallel Computation and Architecture**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1

Introduction: scope and issues of parallel computing, taxonomy of Parallel Architectures, Control Mechanism, Address-space Organization, Interconnection Networks, Processors Granularity, SIMD Architecture: Overview of SIMD Architecture. Design and Performance Issues, MIMD Architecture: Shared Memory Architecture, Uniform and Non-uniform Memory Access Multi Processors, Parallel Vector Processors (PVP), Symmetric Multiple Processors (SMP), CC-NUMA, NUMA and COMA Architectures, Distributed Memory Architecture: Cluster Architecture -Design and other Issues MPP Architecture.

Unit II

Basics of Interconnection Networks: Interconnection Environments, Network Components, Network Characteristics, Network Performance Metrics, Network Topologies and Properties: Topologies and Functional Properties, Routing Schemes and Functions, Networking Topologies, Buses, Crossbar and Multistage Switches: Multiprocessor Buses, Crossbar Switches, Multistage Interconnection Networks, Comparison of Switched Networks, Gigabit Network Technologies: Fiber Channel and FDDI Rings, Fast Ethernet and Gigabit Ethernet, Myrinet for SAN/LAN Construction.

Unit III

Paradigms and Programmability: Algorithmic Paradigms, Programmability issues Parallel Programming Examples, Parallel Programming Models: Implicit Parallelism, Explicit Parallel Models, Other Parallel, Programming Models, Shared Memory Programming: The POSIX Threads (Pthreads) Model, The Open MP Standard, Message-Passing Programming: The Message Passing Paradigm, Message Passing Interface (MPI), Parallel Virtual Machine (PVM), Data Parallel Programming: The Data Parallel Model, The Fortran 90 Approach, Ottler Data Parallel Approaches.

Unit IV

Performance Metrics for Parallel Systems: Run Time, Speedup, Efficiency Cost, Scalability and Speedup Analysis: Amdahl's Law: Fixed Problem Size, Gustafson‟s Law: Fixed Time, Sun and Ni's Law: Memory Bounding, ISO performance Models, Sources of Parallel Overheads: Inter-processor Communication, Load Imbalance Extra Computation, System and Application Benchmarks: Micro Benchmarks, Parallel Computing Benchmarks. Business and TPC Benchmarks, SPEC Benchmark Family.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. Kai Hwang and ZhiweiXu, "Scalable Parallel Computing", 1997, McGraw Hill New York.
2. Vipin Kumar, et. al "Introduction to Parallel Computing, Design and Analysis of Algorithms", 1994, Redwood City, CA, Benjmann/ Cummings.
3. Barry Wilkinson and Michael Allen, "Parallel Programming", 1999, Pearson Education Asia.
4. AI Geist, Adam Beguelin, Jack Dongarra, Weicheng Jiang, Robert Manchek and VaidySunderam,
5. "PVM: Parallel Virtual Machine -A Users' Guide and Tutorial for Networked Parallel Computing", 1994, MIT Press.

Course No. ELE-15413DCE/ELE-15425GE **Cyber Security and Forensics**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Introduction to Security Threats

Intruders and Hackers, Insider threats, Cybercrimes. Network Threats: Active/ Passive – Interference – Interception –
Impersonation – Worms –Virus – Spam's – Ad ware - Spy ware – Trojans and covert channels – Backdoors – Bots – IP, Spoofing - ARP spoofing - Session Hijacking - Sabotage-Internal treats Environmental threats - Threats to Server security. SQL command injection, Buffer overflow attacks, phishing, and cross-site scripting (XSS), Code injection, Time-of-check-to-time-of-use race conditions, Sybil attack, Distributed Denial of Service and other network attacks. Systems Security, Botnets, and Spoofing, Pharming Attacks, TCP / IP – Checksums – IP Spoofing port scanning, DNS Spoofing, SYN attacks, Smurf, attacks, UDP flooding.

Unit II: Web Security

Intrusion Detection and Prevention, Web security requirements, XML, SOAP, WSDL and UDDI, WS-Security, SAML, Ws-Trust, WS-Security Policy, Secure Sockets Layer (SSL), Transport Layer Security (TLS), and Secure Electronic Transaction (SET), HTTPS, Secure Shell (SSH), IP Security: IP Security overview, Architecture, Authentication, Encapsulating security payload, Combining security associations, Key management.

Unit III: E-mail Security

Pretty Good Privacy: Notation, Operational Description, Cryptographic Keys and Key Rings, Public-Key Management, S/MIME: RFC 5322, Multipurpose Internet Mail Extensions, S/MIME Functionality, S/MIME Messages, S/MIME Certificate Processing, Enhanced Security Services, Domain Keys Identified Mail: Internet Mail Architecture, E-mail Threats, DKIM Strategy, DKIM Functional Flow.

Unit IV: Forensics

Forensic Types: Disk Forensics, Network Forensics, Mobile Device Forensics, Live Forensics, Memory Forensics, Multimedia Forensics, Internet Forensics, Cyber Crime Investigations and Digital Forensics, Cyber Laws and Security Policies, Cybercrime, Forensic process, Legal process and Law enforcement, ACPO guidelines, Digital evidence, Incident response, Searching and analysis tools, Investigative tools (Open Source and Proprietary), Email & Browsers, Intrusion detection, Attack trace-back, Packet inspection, Log analysis, Hashing issues, Anti-forensics (encryption and stealth techniques), Cloud computing. Disk Forensics, Using Forensic Software such as FTK, Encase etc.

Laboratory Work:

The laboratory work shall be based on unit I through unit IV and shall use hardware study as well as experiments using simulations.

Books Recommended:

1. Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group.
2. AnkitFadia "Ethical Hacking" 2nd Edition Macmillan India Ltd.
3. Computer Forensics: Investigating Network Intrusions and Cyber Crime (Ec-Council Press Series: Computer Forensics).
4. John W. Rittinghouse, William M. Hancock, "Cyber security Operations Handbook", ElsevierPub.

Course No. ELE-15414DCE/ELE-15426GE **Broadband Wireless Networks**
Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit I: Broadband Networks

Review of Broadband communication networks DSL, ADSL, HDSL, SDSL, VDSL, Introduction to Broadband Wireless, Evolution of broadband Wireless

Unit II: Generations of Broadband Networks

Narrowband, First Generation, Second Generation, Emergence of Standard Based Technology, Mobile Broadband Wireless: Market Drivers and Applications, WiMAX and Other Broadband Wireless Technologies

Unit III: 3G Standards

Brief of 3G cellular systems, WiFi Systems, WiMAX versus 3G and WiFi, Other comparable systems, Spectrum options for broadband wireless, Business and technical challenges of broadband wireless and WiMAX

Unit IV: Beyond 3G – Multicarrier Systems

Overview of WiMAX: IEEE 802.16 and WiMAX, Salient features of WiMAX, WiMAX Physical and MAC layer Overview, OFDM Basics, OFDM in WiMAX, Advanced features for performance improvement, WiMAX Reference Network Architecture, Handoff Mechanism, Different types of Services, QoS Architecture.

Laboratory Work:

Study of broad band networks using network and R.F. Communication tools

Books Recommended:

1. Jeffrey G. Andrews, ArunabhaGhosh and RiasMuhamed, “Fundamentals of WiMAX : understanding broadband wireless networking”, Pearson Education, 2007.
2. Mobile WiMAX : toward broadband wireless metropolitan area networks / editors, Yan Zhang and Hsiao-Hwa Chen, Auerbach Publications, 2007.

Course No. ELE-15415DCE/ELE-15427GE **Embedded System Design**
Paper type: DCE/GE **Credits: 2L+0T+2P**

UNIT–I: Embedded systems and processor
Introduction to embedded systems, components of an embedded system, types of embedded system, levels of embedded system, Embedded System applications, Embedded system design considerations, Embedded Processors: Microprocessors, Microcontrollers, DSP and ASICs, Comparative Assessmentof Embedded Processors. Embedded memory devices and Embedded I/O. Embedded high and low level programming.

UNIT-II: Microcontrollers
Microcontrollers for embedded systems, classes of microcontrollers, types of microcontrollers, introduction to microcontroller platforms: ARM,ATMEL/AVR,PIC,ARDUINO,Raspberry and 8051. Choosing a Microcontroller for an embedded application.

UNIT-III: 8051 Architecture
8051 Microcontroller hardware, internal Architecture, input/output pin and port architecture, bare inimum system with external circuits, other members of 8051. Instructions and Programming : Addressing modes :accessing memory using various addressing mode, Jump, Loop and call instructions,time delay generation and calculation, Single bit instructions and programming, I/O port programming: I/O programming, bit manipulation.

UNIT – IV: 8051 Timers,Counters, Serial Communication , Interrupts and their Programming
Timer and counter architecture in 8051,programming 8051 timers, counter programming, pulsefrequency and pulse width measurements. Serial communication in 8051:Basics of serial communication, 8051 connection toRS232, 8051 serial communication programming. Interrupts programming: Interrupts of 8051,programming timer interrupts, programming external hardware interrupts, and programming serial communication interrupts.

Laboratory Work:

Interfacing memory with 8051, Programmable peripheral interface (PPI)-8255, programming 8255, 8255 interfacing with 8051. Interfacing Key board. Interfacing LED/ LCD, Interfacing A/D & D/A converters, Interfacing DC motor, Relay, Solenoid, Steppermotor, Servomotor.

Books Recommended:

1. Raj Kumar, “Embedded Systems: Architecture, Programming and Design”, Tata McGraw Hill, Third Reprint, (2003).
2. John Catsoulis, O’Reilly, “Designing Embedded Hardware”, First Indian Reprint, (2003).
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, The 8051 Microcontroller, and Embedded Systems, Prentice Hall 2000.
4. Kenneth J. Ayala., “The 8051 Microcontroller Architecture Programming and Applications”, Penram International Publishing (India). 1996.

Course No. ELE-15416DCE/ELE-15428GE **Modeling and Simulation of Wireless Communication Systems**

Paper type: DCE/GE **Credits: 2L+0T+2P**

Unit 1: Modeling and Simulation Approach

Review of stochastic process and their properties. Methods of performance evaluation-simulation approach- Advantages and limitations. System model steps and its types involved in simulation study. Basic concepts of modeling – modeling of systems, devices, random process and hypothetical systems. Error sources in simulation. Validation, simulation environment and software issues.Role of simulation in communication system and random process. Steps involved in simulation study.

Unit 2: Generation and Parameter Estimation

Monte Carlo simulation, properties, random number Generation, Generating independent and correlated random sequences. Testing of random number generators.

Parameter estimation:

Estimating mean, variance, confidence interval, Estimating the Average Level of a Waveform, Estimating the Average power of a waveform, Power Spectral Density of a process, Delay and Phase

Unit-3: Modeling Of Communication Systems

Information sources, source coding, base band modulation, channel coding, RF and optical modulation, filtering, multiplexing, detection/demodulation- carrier and timing recovery for BPSK and QPSK.Modeling considerations for PLL.

Unit-4: Communication Channel Models

Fading and multipath channels- statistical characterization of multipath channels and time-varying channels with Doppler effects, models for multipath fading channels. Finite state channel models – channels with and without memory. Methodology for simulating communication systems operating over fading channels.

Laboratory Work:

Random Process Modeling and Simulation using matlab, Power Spectral Density of a process, Delay and Phase, study of filtering,dtetection/modulation using matlab, Modelling of PLL, Study of Doppler shifts, Matlab implementation of fading channels (Rayleigh, Rician and Clarkes Model)

Books Recommended:

1. "Principles of Communication Systems Simulation 2004, ISBN 0-13-494790-8. S. Shanmugan, T. S. Rappaport, K. L. Kosbar, Prentice Hall,
2. Simulating Wireless Communication Systems: PractPrentice Hall, 2004, ISBN: 0-13-022268-2

Course No. ELE-15429OE **Automobile Electronics**
Paper type: OE **Credits: 1L+0T+2P**

Batteries and Accessories; Principle and construction of lead acid battery, characteristics of battery, rating capacity and efficiency of batteries, various tests on batteries, maintenance and charging. Lighting system: insulated and earth return system, details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.

Starting and Charging System; Condition at starting, behavior of starter during starting, series motor and its characteristics, principle and construction of starter motor, working of different starter drive units, care and maintenances of starter motor, starter switches.
Generation of direct current, shunt generator characteristics, armature reaction, third brush regulation, cutout. Voltage and current regulators, compensated voltage regulator, alternators principle and constructional aspects and bridge rectifiers, new developments.

Fundamentals of Automotive Electronics; Current trends in automotive electronic engine management system, Electro magnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system.

Sensors and Activators; Types of sensors: sensor for speed, throttle position, exhaust oxygen level, manifold pressure, crankshaft position, coolant temperature, exhaust temperature, air mass flow for engine application. Solenoids, stepper motors, relay.

Lab Work
Visits to some Automobile Workshop for practical training.

Books Recommended:

1. A.P. Young and L. Griffiths, Automotive Electrical Equipment, ELBS & New Press, 1999.
2. William B. Riddens “Understanding Automotive Electronics”, 5th edition - Butter worth Heinemann Woburn, 1998.

Course No. ELE-15430OE **Electronics for Hobbyists**
Paper type: OE **Credits: 2L+0T+2P**

Note: *The Teacher shall demonstrate and involve the students on practical training on each topic*

Passive components: Different types of: resistors, inductors, capacitors, potentiometers, Transformer, step down/step-up, auto transformer, Wattage/Specifications/Color Coding of passive components.

Electronic Workshop Tools: Bread board, Copper clad laminate sheet, Solder iron, solder-stand, solder-wire, flux, flexible wire, hookup wire, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, desolder pump, De-solder wick, drilling machine.

Diodes, Introduction, Zener diode, Varactor diode, LED, IN4001 to 07, IN4148; 2N5402, 2N5408, BY127, BJT, FET.

Voltage Sources: Concept of Voltage and Current, AC/DC Voltage, AC Power supply, DC battery (Pencil cell :1.5V, AAA,AA Type, +9V, Rechargeable Cell, Mobile battery, DC power supply.

Measuring Instruments: (Introduction) Voltmeters, Ammeters, Watt meters, Multimeter, LCR-Q meter, Power Supply, CRO, DSO, Function Generator, Frequency counter.

Transistors & ICs: Introduction, Transistors BC107, BC177, BC547/548, SL100, SK100, AC127/128, BF194, TIP122, Photo transistor - voltage regulator IC78XX, 79XX, LM317 - Packages of various SMD components: Resistor, Capacitor, Inductor, Op-Amp, Timer, Logic Gates and Digital Circuits, 74XX ICs.

Sensors and displays: LDR, Thermosensors, photosensors, Solar Cell, Photocell, Optocoulpler, Seven Segment Display, LCD Display.

Electronic circuit Drawing, Series and Parallel network using Resistors, Capacitors, Circuit diagram for: Forward/reverse biased PN Junction diode - Half wave, Full wave and Bridge Rectifier using diode.

Electronic circuits on bread board: Simple circuit fabrication on Bread-Board.

Electronic circuit on general purpose PCB: Simple Circuits on general purpose PCB, Soldering/De-soldering, Tracing of circuit on PCB, Fabrication of PCB, troubleshooting of circuits on PCB.

Hobby Circuits, Fabricating DC Adapter, Battery Charger, Stabilizer, Alarm Circuits using sensors etc.

Books Recommended:

1. Basic Electronics - For Tommorrow's Inventors; by Nick Dossis. Thames and Kosmos Publishers.
2. Getting Started in Electronics by Forrest. M. Mims (www.circuitstoday.com)
3. Make Electronics Learning by Discovery by Charles Platt (www.circuitstoday.com)