Course Structure and Syllabus

under

Choice Based Credit System(CBCS) Scheme

for

M. Sc. Programme in Electronics

(Academic Session 2017 and onwards)

Approved by BOS, held on 23-07-2017

P. G. Department of Electronics and Instrumentation Technology

University of Kashmir, Hazratbal, Srinagar-6, J&K

Course Structure

Course: *M. Sc. (Electronics) SEMESTER - I*											
Course Code	**Course Title**	**Category**	**Credits**				**Marks**				
			L	**T**	**P**	**Total**	**A-1**	**A-2**	**End Term**		**Total**
									Th.	**Lab**	
ELE-17101C	Circuit Analysis and Synthesis	Core	2	0	2	3	25	NA	25	25	75
ELE-17102C	Antennas and Wave Propagation	Core	2	0	2	3	25	NA	25	25	75
ELE-17103C	Linear Integrated Circuits and Applications (LICA)	Core	2	0	2	3	25	NA	25	25	75
ELE-17104C	Digital Electronics and C-Programming Lab	Core	2	0	2	3	25	NA	25	25	75
ELE-17105DCE	Engineering Mathematics	DCE	4	0	0	4	25	25	50	0	100
ELE-17106DCE	CMOS VLSI and Nano-Electronics –I(MOSFET Theory)	DCE	3	0	2	4	25	25	25	25	100
ELE-17107DCE	Signals and Systems	DCE	3	0	2	4	25	25	25	25	100
ELE-17108DCE	Electronics Engineering Materials and Components	DCE	3	0	2	4	25	25	25	25	100
ELE-17109DCE	Statistical Communication Theory	DCE	3	0	2	4	25	25	25	25	100
ELE-17110DCE	Opto-Electronic Devices	DCE	3	0	2	4	25	25	25	25	100
ELE-17111DCE	Data and Computer Communication	DCE	3	0	2	4	25	25	25	25	100
ELE-17112GE	Foundations of Engineering Mathematics	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17113GE	Fundamentals of Signals and Systems	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17114GE	Fundamentals of Data Communication	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17115GE	Programming and Problem Solving Techniques	GE	1	0	2	2	NA	NA	25	25	50
ELE-17116GE	Computing and Informatics -I	OE	1	0	2	2	NA	NA	25	25	50
ELE-17117GE	Electronic Devices & Circuits-I	OE	1	0	2	2	NA	NA	25	25	50

Course: *M. Sc. (Electronics) SEMESTER - II*											
Course Code	**Course Title**	**Category**	**Credits**				**Marks**				
			L	**T**	**P**	**Total**	**A-1**	**A-2**	**End Term**		**Total**
									Th.	**Lab**	
ELE-17201C	Analog Communication Systems	Core	2	0	2	3	25	NA	25	25	75
ELE-17202C	Microprocessor Architecture and Programming	Core	2	0	2	3	25	NA	25	25	75
ELE-17203C	Power Electronic Circuits and Systems	Core	2	0	2	3	25	NA	25	25	75
ELE-17204C	Microwave Engineering	Core	2	0	2	3	25	NA	25	25	75
ELE-17205DCE	VLSI Technology	DCE	4	0	0	4	25	25	50	0	100
ELE-17206DCE	CMOS VLSI and Nano-Electronics –II (Digital IC Design)	DCE	3	0	2	4	25	25	25	25	100
ELE-17207DCE	Optical Communication and Networks	DCE	3	0	2	4	25	25	25	25	100
ELE-17208DCE	Design and Analysis of Active Filters	DCE	3	0	2	4	25	25	25	25	100
ELE-17209DCE	Simulation and Modeling using MATLAB	DCE	3	0	2	4	25	25	25	25	100
ELE-17210DCE	Wireless Adhoc and Sensor Networks	DCE	3	0	2	4	25	25	25	25	100
ELE-17211DCE	Communication Hardware Design	DCE	3	0	2	4	25	25	25	25	100
ELE-17212GE	Optical Fibre Communication	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17213GE	System Simulation using MATLAB	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17214GE	Data Structures	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17215GE	Wireless Sensor Networks	GE	1	0	2	2	NA	NA	25	25	50
ELE-17216GE	Computing and Informatics -II	OE	1	0	2	2	NA	NA	25	25	50
ELE-17217GE	Electronic Devices & Circuits-II	OE	1	0	2	2	NA	NA	25	25	50

Course: *M. Sc. (Electronics) SEMESTER - III*											
Course Code	**Course Title**	**Category**	**Credits**				**Marks**				
			L	**T**	**P**	**Total**	**A-1**	**A-2**	**End Term**		**Total**
									Th.	**Lab**	
ELE-17301C	Physics of Semiconductor Devices	Core	2	0	2	3	25	NA	25	25	75
ELE-17302C	Control System Engineering	Core	2	0	2	3	25	NA	25	25	75
ELE-17303C	Digital Signal Processing	Core	2	0	2	3	25	NA	25	25	75
ELE-17304C	Computer Networks	Core	2	0	2	3	25	NA	25	25	75
ELE-17305DCE	Microcontroller Architecture and Programming	DCE	3	0	2	4	25	25	25	25	100
ELE-17306DCE	CMOS VLSI and Nano-Electronics –III (Analog and Mixed IC Design)	DCE	3	0	2	4	25	25	25	25	100
ELE-17307DCE	Digital System Design using HDL	DCE	3	0	2	4	25	25	25	25	100
ELE-17308DCE	Speech and Audio Processing	DCE	3	0	2	4	25	25	25	25	100
ELE-17309DCE	Advanced Communication Systems	DCE	3	0	2	4	25	25	25	25	100
ELE-17310DCE	RF Engineering	DCE	3	0	2	4	25	25	25	25	100
ELE-17311DCE	Soft Computing and Neural Networks	DCE	4	0	0	4	25	25	50	0	100
ELE-17312DCE	Cryptography and Information Security	DCE	3	0	2	4	25	25	25	25	100
ELE-17313DCE	Advanced Microprocessors	DCE	3	0	2	4	25	25	25	25	100
ELE-17314GE	Embedded Systems	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17315GE	Modern Communication Systems	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17316GE	Fundamentals of Fuzzy Logic	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17317GE	Fundamentals of Information Security	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17318OE	Computing and Informatics -III	OE	1	0	2	2	NA	NA	25	25	50
ELE-17319OE	Electronic Devices & Circuits-III	OE	1	0	2	2	NA	NA	25	25	50

Course: *M. Sc. (Electronics) SEMESTER - IV*											
Course Code	**Course Title**	**Category**	**Credits**				**Marks**				
			L	**T**	**P**	**Total**	**A-1**	**A-2**	**End Term**		**Total**
									Th.	**Lab**	
ELE-17401C	Digital Communication and Information Theory	Core	2	0	2	3	25	NA	25	25	75
ELE-17402C	Electronic Instrumentation	Core	2	0	2	3	25	NA	25	25	75
ELE-17403C	Industrial Training and Seminar Work	Core	0	4	0	3	NA	NA	0	75	75
ELE-17404C	Project Work	Core	0	0	6	3	NA	NA	0	75	75
ELE-17405DCE	Computer Organization and Architecture	DCE	3	0	2	4	25	25	25	25	100
ELE-17406DCE	CMOS VLSI and Nano-Electronics –IV (Nanotechnology & Nano-electronics)	DCE	3	0	2	4	25	25	25	25	100
ELE-17407DCE	Wireless Cellular Communication	DCE	3	0	2	4	25	25	25	25	100
ELE-17408DCE	Multimedia Technology and Security	DCE	3	0	2	4	25	25	25	25	100
ELE-17409DCE	Fundamentals of RF Circuit Design	DCE	3	0	2	4	25	25	25	25	100
ELE-17410DCE	Biomedical Instrumentation	DCE	3	0	2	4	25	25	25	25	100
ELE-17411DCE	Digital Image Processing	DCE	3	0	2	4	25	25	25	25	100
ELE-17412DCE	Cyber Security and Forensics	DCE	3	0	2	4	25	25	25	25	100
ELE-17413DCE	Broadband Wireless Networks	DCE	3	0	2	4	25	25	25	25	100
ELE-17414GE	Foundations of Computer Organization	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17415GE	Mobile Communication	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17416GE	Fundamentals of Biomedical Instrumentation	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17417GE	Principles of Digital Image Processing	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17418GE	Internet of Things (IOT)	GE	2	0	0	2	NA	NA	50	NA	50
ELE-17419OE	Computing and Informatics -IV	OE	1	0	2	2	NA	NA	25	25	50
ELE-17420OE	Electronic Devices & Circuits-IV	OE	1	0	2	2	NA	NA	25	25	50

Semester - I

ELE-17101C: Circuit Analysis and Synthesis **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

Unit I: Graph Theory, Network Equations and Two Port Parameters

Definition of Node, Branch, Graph, Sub-Graph, Path, Loop, Tree, Link and Twig, Network Matrices, Incidence Matrix, Loop Matrix, Loop, Cut -Set Matrix, Cut Set, Mesh Equations, Nodal equations, Source Transformations, 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 II: Network Functions, Responses and Synthesis

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, Formulation of state equations for Electrical Networks and their solutions. 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 IIform, Cauer-I Form, Cauer-II Form),* RC Impedance Function, RL impedance , RC AdmittanceFunctions.

Unit III: 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.

Semester - I

ELE-17102C: Antennas and Wave Propagation **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

Unit I: Maxwell's Equations and Electromagnetic Waves

Maxwell's Equations in differential and integral form. Equations of continuity for time varying fields, inconsistency of Amperes law, Boundary condition, Boundary Conditions at media interface (Dielectric and Conducting interface).Homogenous unbounded medium, Wave equation for time harmonic fields, solution of the wave equation, uniform plane wave, wave polarization, 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.

Unit II: Antenna Radiation Mechanism and Structures

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. Folded dipole antennas, modification of folded dioples, loop antennas, far- field patterns of circular loop antennas, introduction to microstrip antennas.

Unit III: 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 or HFSS.

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.

Semester - I

ELE-17103C: Linear Integrated Circuits and Applications (LICA) **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

Unit I: Operational Amplifier Characteristics Applications

Differential Amplifier, Current Mirrors, Active Loads, Non- ideal parameters of OP- AMPs, Frequency response of OP- Amps, Compensation, Pole – Zero compensation, Dominant pole compensation, Linear Applications of Op-amps: Amplification (Inverting Amplifier, Non-inverting Amplifier, Instrumentation Amplifier),Integration and Differentiation; Electronic analog computation, Active filters, Sample and hold systems, Analog multiplexer, Logarithmic and Exponential amplifiers, Digital-to-Analog (Weighted Resistor, R-2R Ladder Network) and Analog-to-Digital Converters (Flash, Successive Approximation).

Unit II: 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, 555 timer: Applications as Astable and Monostable Multivibrator, Phase locked loop (PLL): Applications as Frequency Synthesizer, FM demodulator, Voltage regulators: Fixed voltage regulators, Adjustable voltage regulators, switching regulators.

Unit III: 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.

Semester - I

ELE-17104C: Digital Electronics and C-Programming Lab **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

Unit I: Experiments on Digital Electronics-I

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.

6, a) To design a 4:1 multiplexer and 1:4 de-multiplexer circuits using basic/universal logic gates.
b) To implement a 4/5 variable Boolean function using a suitable MUX.
7. a) To design a 2^n to n line encoder using basic universal logic gates.
b) To design a control signal generator for 2^n :1 MUX and 1: 2^n DEMUX using decoder.
8. a) Design a BCD to 7 segment decoder using IC‟s (7447).
b) To design a circuit that can encode a particular sequence and decode the same sequence.
c) To design a ROM that can store a particular sequence.

Unit II: Experiments on Digital Electronics-I

1. To implement a 4/5 variable Boolean function using ROM and decoders.
2. (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
(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.
3. (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.
4. (a) To design a modulo-n Asynchronous and synchronous counter using JK/T-Flip Flop IC‟s.
(b) To design up-down synchronous counter with direction control that can count a particular sequence.
(c) To design Jhonson& Ring counter.

Unit III: Programming with C Language-I

1. (a) Write a program to evaluate the sine using 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

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

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 resistance of the capacitors connected in: I). Series II) Parallel.
c) Equivalent resistance 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 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. Writea 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"

Semester - I

ELE-17105C: Engineering Mathematics **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
4	0	0	3	25	25	50	0	100

Unit I: Fourier Series

Periodic Functions, Fourier Series: Determination of Fourier Coefficients, Fourier Series of periodic functions, even and odd functions, Fourier Series for arbitrary period, Half Range Series , Half-wave expansion, Fourier Integral Theorem, Fourier Sine and Cosine integrals.

Unit II:Fourier Transform

Dirichlet's Condition, Properties of Fourier Transforms, Fourier Transform and Dirac delta function, Application of Fourier Transformation in Electronics.

Unit III: 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 IV: 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.

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

Semester - I

ELE-17106DCE: CMOS VLSI and Nano-Electronics –I (MOSFET Theory) **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

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: Laboratory Work

The laboratory work shall include minimum of 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.

Semester - I

ELE-17107DCE: Signals and Systems **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Introduction to Signals, Systems and Transform Techniques

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

Unit II: Analysis Using Transforms

Review of Laplace Transform; Hilbert Transform System Analysis Using Fourier and Laplace Transforms of I & II Order Systems; Transfer Function; Z-Transform and Its Properties Discrete Time System Analysis Using Z-Transform.

Unit III: Random Signals

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

Unit IV: 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. 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.

Semester - I

ELE-17108DCE: Electronics Engineering Materials and Components **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Electrical and Magnetic Properties of Materials

Classification of electrical materials; Fundamentals of Atomic Structure and Chemical Bonding; Structure and properties of conductors, semi-conductors and insulators, 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 II:Electronic Components

Passive components; Resistors, capacitors, inductors and their types; color coding; ferrites, Quartz crystal and ceramic resonators, electromagnetic and electromechanical components.

Unit III: 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).

Unit IV: 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 Boylston& Louis Nashelsky. Prentice Hall.
2. Elements of Materials Science & Engineering. By: L.H. Van Vlack. Addison-Wesley Publishing Company, New York.

Semester - I

ELE-17109DCE: Statistical Communication Theory **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Random Variables and Random Process

Discrete Time Random Processes: Random Variables, Uncorrelated and Orthogonal Random Variables, Linear Mean Square Estimation. Gaussian Random Variables, Parameter Estimation: Bias and Consistency, Random Processes, Stationary Processes.

Unit II:Filtering Process

Filtering Random Processes: 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 III: Multirate Filtering

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

Unit IV: 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. David MiddletonWiley, 08-May-1996 - Technology & Engineering- 1152 pages

Semester - I

ELE-17110DCE: Opto-Electronic Devices **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Light Sources and Detectors

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, Introduction to Solar Cells, Solar Cells, Luminescence and their uses, Optical Sources.

Unit II:Lasers

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

Unit III: 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.

Unit IV: 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**.**

Semester - I

ELE-17111DCE: Data and Computer Communication **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Introduction

Introduction, Network Models, Data and Signals, Shanon’s Theorem and its Applications, Composite Signals, Encoding and Modulation, Multiplexing, and Introduction to Spread Spectrum Modulation, Guided Media and Unguided Media, Switching Techniques, Circuit Switching and Packet Switching and Message Passing.

Unit II:Error Detection and Correction

Types of errors, Redundancy, Detection versus Correction, Coding, error detection, Cyclic Redundancy Check, Cyclic Code Encoder Using Polynomials, Checksum Method, Hamming Code and Linear Block Code Technique.

Unit III: 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.

Unit IV: 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.

Semester - I

ELE-17112GE: Foundations of Engineering Mathematics **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

Unit I: 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.

Unit II:Fourier Series and Transformation

Fourier Series : Determination of Fourier Coefficients, Fourier Series for arbitrary period, Fourier Transforms: Properties of Fourier Transforms, , Application of Fourier Transformation.

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. Fourier Transformation and Laplace Transformations, Schaum Series Book ,TMHCourse

Semester - I

ELE-17113GE: Fundamentals of Signals and Systems **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

Unit I: Introduction

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

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

Semester - I

ELE-17114GE: Fundamentals of Data Communication **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

Unit I: 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: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.

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.

Semester - I

ELE-17115GE: Programming and Problem Solving Techniques **Course Category: GE**

Hours Per Week			Credits	Maximum Marks			Examination
Lecture	Tutorial	Practical		End Term	Internal	Total	Hours
1	0	2	2	40	10	50	

Unit I: Introduction to Problem Solving Concepts

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, Evaluate a Polynomial.

Unit II: Introduction to C Programming

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- Relational Operators, Logical Connectives, Switch Statement, Structured Programming, Arrays, Operation on Arrays; Functions and their Applications, Standard Library of C functions and Pointer Arithmetic.

Books Recommended:

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

Semester - I

ELE-17116OE: Computing and Informatics - I **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
1	0	2	2	NA	NA	25	25	50

Unit I: Introduction to Problem Solving Concepts

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. Operating systems. Introduction to operating systems;' types of operating systems and their functions, popular operating systems- Linux, UNIX and Windows.

Unit II: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.

Books Recommended:

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.

Semester - I

ELE-17117OE: Electronic Devices & Circuits - I **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
1	0	2	2	NA	NA	25	25	50

Unit I: Fundamental of Passive Components

Voltage, current, resistance, Ohm's Law, Resistor: Classification of resistors, Series and parallel connection. Colour code and application. Specifications & use. Capacitor: Capacitance & capacitive reactance. Classification of capacitors, dielectric constants, materials used, Series and parallel connection. Inductor: Inductance, self and mutual inductance, Resonance, Series and parallel connection.

Unit II: Signal Laws, Representations and Transformations

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), Instantaneous values, R.M.S. values, phase-cycle. Transformers, step-up and step down, turns ratio and wire guages, efficiency. Concept of generators & motors.

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.
- Analytical study of step-up and step-down transformers

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).

Semester - II

ELE-17201C: Analog Communication Systems **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

Unit I: Amplitude Modulation and Demodulation

Introduction to Signals and its classification**,** 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, Generation and Demodulation of DSB- SC signals, Advantages of SSB transmission, Generation of SSB; Vestigial Side-Band Modulation (VSB). SSB and VSB demodulation, independent sideband transmission and reception.

Unit II: FM Modulation, Reception and Noise

Concept of Angle Modulation: Mathematical theory, 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, FM Detector using PLL, Noise in Communication System, Time-domain representation of Narrow band Noise, Filtered White Noise, 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.

Unit III: 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 place such as 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.

Semester - II

ELE-17202C: Microprocessor Architecture and Programming **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

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

Introduction to Microprocessors, 8086 Microprocessor, Architecture of 8086 Microprocessor, Functions of BIU and EU, Addressing Modes of 8086 microprocessor, Memory Segmentation in 8086 Microprocessor based systems. Introduction to Programming, Assembler, Linker, Debugger, Instruction set of 8086 Microprocessor, Data transfer instructions, Arithmetic and Logical instructions, Branch Instructions, Processor control instruction, String operation instructions.

Unit II:Interrupts, Timing and Peripheral Devices

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, Architecture and operation of 8284A Clock Generator, Buffering and Latching of 8086 Microprocessor, Bus timings, Timing Diagrams, Wait States, Minimum and Maximum Mode 8086 System, 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 frequently used Peripheral chips.

Unit III: 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.

Semester - II

ELE-17203C: Power Electronic Circuits and Systems **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

Unit I: Introduction to Power Devices and Converters

Review of switching characteristics of *Power diodes, BJT's),* Characteristics of an ideal switch, Types of electronic switches. Thyristor construction and characteristics, Methods of turning ON, Turn-off, effect of high di/dt and dv/dt , Snubber circuits, Gate triggering circuits, Device specifications and ratings, DIAC, TRIAC , Controlled rectifiers, AC voltage controllers, Principle of ON- OFF control, Principle of phase control, Single phase bi-directional controllers with resistive loads, Natural commutation, Impulse commutation, complementary commutation, external pulse commutation, Load side and line side commutation, Series and Parallel combination of SCRs.

Unit II:Regulators, Inverters and Cyclo-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 and Full Bridge converter. 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.

Unit III: 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 .

Semester - II

ELE-17204C: Microwave Engineering **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

Unit I: Microwave Transmission Lines and Wave Guides

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, Fundamentals of Microwave Waveguides, Rectangular Waveguides, TE & TM modes in Rectangular magnitudes, S- Matrix.

Unit II:Microwave Devices

Microwave tubes, Klystrons: Multicavity Klystron and Reflex Klystron, Gunn Oscillator, Introduction to the Strip Lines: Micro Strip and Parallel Lines.

Unit III: 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 NannapaneniNarayanaRao
5. Electromagnetic Field theory by RishabhAnand

Semester - II

ELE-17205DCE: VLSI Technology **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
4	0	0	4	25	25	50	NA	100

Unit I: Crystal Growth and Epitaxy

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.

Unit II:Diffusion Technology

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 III: 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 IV: 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.

Semester - II

ELE-17206DCE: CMOS VLSI and Nano-Electronics –II (Digital IC Design) **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

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: Optical Networks

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 Introduction to PLA, PAL, CPLD,FPGA.

Unit IV: 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

R. Jacob Baker, CMOS Circuit Design, Layout, and Simulation, IEEE Press, 1997

Semester - II

ELE-17207DCE: Optical Communication and Networks **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Optical Fibres and Links

Introduction to Optical Communication Systems; Optical fibers, light propagation through fibers, mode theory, attenuation, dispersion, characteristics of single mode fibers sources and detectors; LED's and lasers, Point to point links, power links, error control, coherent detection, differential quadrature phase shift keying (QPSK).

Unit II: WDM

Overview of WDM, Passive optical couplers, isolators and circulators, fiber grating filters, phase array based devices, network concepts, network topologies, WDM examples.

Unit III: 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

Unit IV: 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.

Semester - II

ELE-17208DCE: Design and Analysis of Active Filters **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

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 Amplifiers, Sensitivity and Active filter Synthesis

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, 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 III: 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.

Unit IV: 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.

Semester - II

ELE-17209DCE: Simulation and Modeling using MATLAB **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

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.

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.

Semester - II

ELE-17210DCE: Wireless Adhoc and Sensor Networks **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: 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 (Transport Protocols and Security)

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, TCP over 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. Secure Routing in Ad hoc Wireless Networks

Unit III: 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.

Unit IV: 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.

Semester - II

ELE-17211DCE: Communication Hardware Design **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

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.

To perform 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.

Semester - II

ELE-17213GE: System Simulation using MATLAB **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
1	0	2	2	NA	NA	25	25	50

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, Matrixand Array Operations, Control Structures; Loops and Branch Control Structures, MATLAB Editor, Creating M-Files, Function, Subprograms, Types of Functions, Two- Dimensional Plots, MultiplePlots, Subplots, Specialized Two-Dimensional Plots, Three-Dimensional Plots.

Unit II: Data and Image Visualization in MATLAB

Image Data Matrices, Image Formats, Image Files, Image Utilities, Reading and Displaying Image, Image Compression, Image Denoising, Image Filtering, Introduction to Simulink: Starting Simulink, Simulink Modeling, Solvers, Data Import/Export, State-Space Modeling and Simulation.

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.

Semester - II

ELE-17214GE: Data Structures **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
1	0	2	2	NA	NA	25	25	50

Unit I: 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: 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.

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

Semester - II

ELE-17215GE: Wireless Sensor Networks **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

Unit I: Introduction to Adhoc Wireless Networks

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, Introduction, Issues in Ad hoc wireless networks, Ad hoc wireless Internet, MAC protocols, Issues in Designing a MAC Protocol for Ad hoc Wireless Networks.

Unit II: 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.

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.

Semester - II

ELE-17216OE: Computing and Informatics -II **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
1	0	2	2	NA	NA	25	25	50

Unit I: Introduction

Introduction to office automation tools (MSWord, PowerPoint, Excel), Create and edit the document, profiling tools, formatting documents, using templates, wizards and charts and objects, custom styles and pagination. Spreadsheet creation, addressing, formula editing, sorting and filtering, toolbars. Introduction to PowerPoint presentation, templates, layouts and formatting.

Unit II:Laboratory Work

Working with Documents, Formatting Documents, Setting Page style, Creating Tables, Mail merge, Templates. Working with spreadsheets, formatting, insertion, deletion and organization of worksheets. Creating a presentation, formatting a Presentation, Adding Effects to the Presentation, Printing Handouts

Books Recommended:

1. Archana Kumar "Computer Basics with Office Automation" 1st Edition I. K. International Publishing House.
2. RohitKhurana "Learning Ms-Word and Ms-Excel" APH Publishing Corporation
3. AnitalGoel"Computer Fundamentals" Pearson

Semester - II

ELE-17217OE: Electronic Devices & Circuits-II **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
1	0	2	2	NA	NA	25	25	50

Unit I: Measuring Instruments and Power Supply

Measurement: Meter, Ammeter, Voltmeter, Ohmmeter, Multimeter, Introduction to Cathode Ray Oscilloscope (CRO) and Function Generator.

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. Typical Public Address system.

Unit II: Transducers

Transducer: Sensors and actuators; Properties of a sensor; Resistive, capacitive and inductive sensors, Pressure Sensor; Temperature Sensor; Photo Sensor; Humidity Sensor, Gas Sensor; Applications of sensors.

Lab Work:

- Amplitude, Time period, frequency, phase measurements using CRO.
- Testing the characteristics of resistor, capacitor, inductor, diode on CRO.
- Testing of 7805/12/15 IC
- Testing of 7905/12/15 IC
- Testing of Temperature sensor.
- Testing of Photo sensor.

Books Recommended:

1. Instrumentation and Measurements by A. K. Sahney
2. Electronic Instrumentation by Bell.

Semester - III

ELE-17301C: Physics of Semiconductor Devices **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

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.

Semester - III

ELE-17302C: Control System Engineering **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

Unit I: Control Systems , System Representation and Time Domain Analysis

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,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 II:Stability and Frequency Analysis

State equations, advantages of state space techniques, State space representation of electrical networks, state transition matrix, state transition equations, 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 III: 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.

Books Recommended:

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.

Semester - III

ELE-17303C: Digital Signal Processing **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

Unit I: Discrete Time Signals and Systems, DFT

Review of Signals and Discrete Time Systems, Properties of Systems, Difference Equations: FIRsystems, 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, Introduction, Frequency Domain Sampling, Properties of 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 II:Digital Filter Design and Introduction to Z –Transform

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,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, Z transform and its Properties.

Unit III: 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.

Semester - III

ELE-17304C: Computer Networks **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

Unit I: Introduction to Computer Networks and Protocols

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, guided and unguided media, errors in transmission, Encoding techniques, CSMA, CSMA/CD, CSMA/CA protocols. Error detection (Parity, CRC), Sliding Window, Stop and Wait protocols, switching (circuit and packet switching).

Unit II:NetworkLayer and Transport Layer

(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, Subnetting and supernetting, Network Address Translation. 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, Introduction to Network Security.

Unit III: 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

Semester - III

ELE-17305DCE: Microcontroller Architecture and Programming **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
4	0	0	4	25	25	50	NA	100

Unit I: Architecture and Instruction Set

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,Addressing Modes and

Instruction Set.

Unit II: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, 8051connection to RS232, 8051 serial communication programming. Interrupts programming: Interrupts of8051; programming timer interrupts, programming external hardware interrupts, and programming serialcommunication interrupts.

Unit III: 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 steppermotor.Introduction to PIC series of Microcontrollers. Architecture and programming of 8-bit and 16-bitPIC microcontrollers.

Unit IV: 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, J. GillispieMazidi,The 8051 Microcontroller & 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.

Semester - III

ELE-17306DCE: CMOS VLSI and Nano-Electronics –III (Analog and Mixed IC Design) — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

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 Amplifiers, Gate-Drain Connected Loads, Current Source Loads, Common-Source Amplifier, The Cascode Amplifier, The Common-Gate Amplifier, The Source Follower (Common-Drain Amplifier), The Push-Pull Amplifier, Differential Amplifiers.

Unit II: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 III: 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.

Unit IV: Laboratory Work

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.

Semester - III

ELE-17307DCE: Digital System Design using HDL **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

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, 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.

Unit IV: 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, Shift registers, 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.

Semester - III

ELE-17308DCE: Speech and Audio Processing **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Fundamentals of Speech and Prediction

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, 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.

Unit II: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 III: 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, VQHMM based speech

recognition. Speech Enhancement, Adaptive Echo Cancellation.

Unit IV: 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 watermarkingusing 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

Semester - III

ELE-17309DCE: Advanced Communication Systems **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Modern Radar System and Satellites

Fundamentals of Surveillance Radar and Design: Bandwidth considerations, prf, Un-ambiguious range and velocity, Pulse length and Sampling, Radar Cross-section and Clutter, Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design Of Down Links, Domestic Satellite Systems Using Small Earth Stations.

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, Erlangformula and signalling.

Unit III: Multiple Access Techniques

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

Unit IV: Laboratory Work:

To develop a simple switching model using Matlab, to study various multiplexing techniques usedtelecommunication networking, to study stored program based space division switch, to under fading insatellite 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", Allied Publishers (second edition).
3. J Marvin.K.Simon, Sami. M. Hinedi and William. C. Lindsey, "Digital Communication Techniques", PHI.

Semester - III

ELE-17310DCE: RF Engineering **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: RF Passive Components and Transmission Line Analysis

High frequency Resistors, Capacitors and Inductors – Transmission Line Analysis line equation –Microstripe 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 and Lab Work

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, Hands on training using Network optimization and planning tool. Field visit at any Cell site, Study ofvarious 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.

Semester - III

ELE-17311DCE: Soft Computing and Neural Networks — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	0	50	100

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 FuzzySets, Fuzzy Relations, Operation on Fuzzy relations, Composition of Relations, Extension Principle forFuzzy 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, decompositionof compound rules, aggregation of fuzzy rules, Graphical techniques of inferences, Types of fuzzy rulebased 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. Backpropagation (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;

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 ,Addison Wesley.

Semester - III

ELE-17312DCE: Cryptography and Information Security **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Fundamentals of Information Security

Need for information security, Active and passive attacks, Introduction to Cryptography, Transposition and substitution ciphers, One time pad, Stream and Block ciphers, additive and multiplicative ciphers, Data scrambling and descrambling Cryptanalysis of classical ciphers. Introduction to modular arithmetic. Differential and linear cryptanalysis.

Unit II:Cryptographic Algorithms

Introduction to Data encryption standard, Security of DES, Advanced Encryption standard (AES), Private and public keys. Need of Pseudorandom Code Generators in Cryptographic algorithms. PN sequence generator, Geffe generator, Stop and Go generator.

Unit III: Information Hiding for covert communications

Need of information hiding, 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.

Unit IV: Laboratory Work

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

Books Recommended:

1. W. Stallings, "Cryptography and Network Security: Principles and Practice", PrenticeHall, New Jersey, 1999.
2. B. Schneier , "Applied Cryptography", John Willey & Sons, Inc., 2nd edition, 1996.
3. Lu, S.: Multimedia security: Stenography and digital watermarking techniques for protection of intellectual property, Idea Group Publishing, USA. (2005).

Semester - III

ELE-17313DCE: Advanced Microprocessors **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: 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:Advanced Intel Processors

Intel 80386 Microprocessor, 80386 Architecture and system connection – Real operating mode – 386 protected mode operation – segmentation and virtual memory – segment privilege levels and protection, 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.

Unit III: Advanced and Special Purpose Processors

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

Unit IV: Laboratory Work

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

Semester - III

ELE-17314GE: Embedded Systems **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

Unit I: Introduction to Embedded Systems

Definition of Embedded Systems, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Embedded System Models, application areas, purpose of embedded systems, characteristics and quality attributes of embedded systems.

Unit II:Typical Embedded Systems

Core of embedded systems, General Purpose and domain specific processors, Memory of embedded systems, embedded system life cycle, types of embedded operating systems, process management (concept, scheduling and scheduling algorithms).

Books Recommended:

1. Introduction to Embedded Systems, A Cyber Physical approach, Edward A.Lee and SenjitSeshia.
2. Embedded Systems Design: An Introduction to Processes, Tools and Techniques by Arnold S. Berger, CMP.
3. Real Time System Design and Analysis by Philips A. Laplante.
4. Real Time Concepts for Embedded Systems, Qing Li, Elsevier, 2011.

Semester - III

ELE-17315GE: Modern Communication Systems **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

Unit I: Modern Radar AND Satellite Communication

Fundamentals of Surveillance Radar and Design: Bandwidth considerations, Tracking Radar Tracking and Search Radars, Radar Guidance, Importance of Mono Pulse Radar, Satellite Communication Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Domestic Satellite Systems Using Small Earth Stations.

Unit II: Telecommunication Switching Techniques

Time division switching: Time switching, space switching, Traffic engineering: Hybrid switching, Two/Four wire transmission, Erlang formula and signaling Multiple Access Techniques Multiple Access Techniques, Frequency Division Multiple Access (FDMA), TDMA, CDMA, Estimating Channel Requirements, Practical Demand Access Systems, Random Access.

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.

Semester - III

ELE-17316GE: Fundamentals of Fuzzy Logic **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

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.

Unit II: Fuzzy Logic and Rule based Systems

Overview of classical logic, Multi-valued logic, Fuzzy sets and probability theory, reasoning, Fuzzy rule based Systems: Structure of Fuzzy rules, decomposition and aggregation of compound rules. Composition of fuzzy and crisp relations.

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, PHI
3. Timothy J. Ross "Fuzzy Logic with Engineering Applications,"Mcgraw Hill,1995
4. Fakhreddine O Karray and Clarance De Silva, "Soft Computing and Intelligent SyatemsDesign,Theory,Tools and Applications", Pearson Education, India,2009

Semester - III

ELE-17317GE: Fundamentals of Information Security **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
1	0	2	2	NA	NA	25	25	50

Unit I: Information security

Need for information security, Active and passive attacks, Introduction to Cryptography, Transposition and substitution ciphers, One time pad, Stream and Block ciphers, Cryptanalysis. Data scrambling and descrambling Cryptanalysis of classical ciphers. Introduction to modular arithmetic. Differential and linear cryptanalysis.

Unit II: Cryptographic Algorithms and Information Hiding

Introduction to Data encryption standard, Security of DES, Advanced Encryption standard (AES), Private and public keys. Need of Pseudorandom Code Generators in Cryptographic algorithms. PN sequence generator, Information Hiding, Need of information hiding, Requirements of a Data Hiding System, Hiding Capacity, Robustness and Imperceptibility, Steganography and watermarking.

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

Semester - III

ELE-17318OE: Computing and Informatics -III **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
1	0	2	2	NA	NA	25	25	50

Unit I: Introduction

Introduction to algorithms and flow charts, Introduction to programming, types and categories of programming languages. Introduction to C programming language, declarations, data types, expressions, control statements, loops arrays, and functions.

Unit II:Lab Work

Writing C programs using basic programming elements including control statements, arrays, function

Books Recommended:

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.

Semester - III

ELE-17319OE: Electronic Devices & Circuits-III **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
1	0	2	2	NA	NA	25	25	50

Unit I: Semiconductors

Conductors, insulators, Semiconductors, Semi-conductor: Intrinsic & Extrinsic Semiconductors. Temperature co-efficient. Definition of P and N types of semiconductor, PN Junction, Junction-Barrier potential.

Unit II: Diodes

Diode, Rectifiers: Half wave-Full wave bridge. Zener Diode, Light Emitting Diode (LED), Photodiode.

Lab Work:

- Finding the I-V characteristics of diode.
- Designing Half wave and full wave rectifiers.
- Testing of Zener Diode.
- Testing of LED.
- Testing of Photodiode.

Books Recommended:

1. Boylested, Electronic Devices and Circuit Theory.
2. Sidra and Smith, Microelectronic Circuits.

Semester - IV

ELE-17401C: Digital Communication and Information Theory — Course Category: CORE

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

Unit I: Information Theory and Waveform Coding

Introduction to Information Theory, Measure of information, Information content of Messages, Information sources, Markoff Model for Information sources, Information Content of a DiscreateMemoryless Channel, Entropy and Information rate of Markoff sources, Joint Entropy and Conditional Entropy, Channel Capacity, Shannon"s Theorem, Shannon- Hartley Theorem, Bandwidth S/N Trade–off, Source Encoding, Coding Efficiency, Shannon-Fano Coding, Huffman Coding, 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 II: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 III: Wide Band Digital Communications and Laboratory Work

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 CommunicationSystem, Direct-Sequence Spread Spectrum (DSSS): Processing Gain, Performance and Generation andDetection, Frequency Hopping Spread-Spectrum (FHSS): Generation and Detection, Types, Introductionto Digital Cellular Communication Systems: Architecture of GSM.Performing atleast 10 Practicals across all the units using Matlab and Hardware.

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.

Semester - IV

ELE-17402C: Electronic Instrumentation — Course Category: CORE

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	2	3	25	NA	25	25	75

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. 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 II:Oscilloscopes, Analyzers and Analytical Instruments

Dual trace Oscilloscope, Dual beam Oscilloscope, Sampling Oscilloscope, Analog and Digital Storage Oscilloscope, Harmonic distortion analyzer, Wave analyzer, Frequency selective and Heterodyne waveanalyzer, Spectrum Analyzer,

Spectrum Analyzer characteristics, Bio-medical Instruments- ECG, Blood Pressure measurements, Spectrophotometers, Electron Microscope, X-ray diffractometer, Instrumentation Amplifiers and Radio Telemetry.

Unit III: 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, IEE, 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.

Semester - IV

ELE-17403C: Industrial Training and Seminar Work **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
0	4	0	3	NA	NA	NA	75	75

Unit I: Seminar Work (1 Credit)

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.

Unit II & III: Industrial Training (2 Credits)

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.

Semester - IV

ELE-17404C: Project Work **Course Category: CORE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
0	0	6	3	NA	NA	NA	75	75

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. Themajor theme of the project shall be to develop a prototype solution for a commercially needfulapplication.Each Project Group shall work under the supervision of Project Guide allocated within/outside theDepartment. The project Reports prepared by the students, as well as the working prototype shall beevaluated by an external Examiner.

Semester - IV

ELE-17405DCE: Computer Organisation and Architecture **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: 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, 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, Instruction Set Architecture and I/O Organisation

Memory Hierarchy, types and Characteristics, Primary Memory- Types, Working, Chip Organization, Expansion, Cache Memory- Mapping Schemes, Replacement Policies, Introduction to Virtual Memory, Overlays, Paging, Segmentation, RAID,Instructions and Instruction Set, Addressing Modes. CPU Registers – Organization, Programmer Visible, Status/Control, Accumulator, and general purpose registers, Stack based CPU, Micro-operations and RTL – Register 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.

Unit III: 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. Introduction to Pipelining and Parallel Processing.

Unit IV: 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.

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

Semester - IV

ELE-17406DCE: CMOS VLSI and Nano-Electronics –IV (Nanotechnology & Nano-electronics) — **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

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 inepitaxial quantum dots. The p-n junction and the bipolar transistor; metal semiconductor and metalinsulator,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 theQuantum Hall Effect

Unit III: Electronic and Optoelectronic Devices Based on Nanostructures

HEMTs, MODFET, Hot Electron Transistors, Resonant Tunneling Transistor, Single Electron Transistor, Quantum Dots and Quantum Cellular Automata. Heterostructure semiconductor lasers ,Quantum well semiconductor lasers, Quantum dot lasers, Quantum well and super lattice photo detectors, Quantum well modulators, Optical luminescence and fluorescence from direct band gap semiconductor nanoparticles.

Unit IV: 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.

Semester - IV

ELE-17407DCE: Wireless Cellular Communication **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

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; ChannelAssignment Techniques.

Unit II:Modulation and Multiple Access Techniques

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

Unit III: Mobile Systems and Standards

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

Unit IV: 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

Semester - IV

ELE-17408DCE: Multimedia Technology and Security **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

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, Image and Video Formation, Video Formation Model, Sampling and Quantization, Image/Video filteringPoint Processing and Mesh Processing.

Unit II:Multimedia 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. 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 III: 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.

Unit IV: 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).

Semester - IV

ELE-17409DCE: Fundamentals of RF Circuit Design **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Introduction to RF Design and Modelling

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. 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.

Unit II: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 III: RF Communication Devices

Basic Characteristics of Mixers. 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.

Unit IV: Laboratory Work

The laboratory work shall include minimum 10 practicals across 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.

Semester - IV

ELE-17410DCE: Biomedical Instrumentation **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Electro-Physiology, Bio-Potential Recording, BioChemical and Non-Electrical Parameter Measurement

The origin of Biopotentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics. 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 II: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 III: Medical Imaging

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

Unit IV: 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.

Semester - IV

ELE-17411DCE: Digital Image Processing **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

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 Compression

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

Unit IV: Laboratory Work

Introduction to Image processing Toolbox. Frequently used commands in image processing. Algebraic operations 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", VikasPublishing House

Semester - IV

ELE-17412DCE: Cyber Security and Forensics **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Introduction to Security Threats

Intruders and Hackers, Insider threats, Cybercrimes. Network Threats: Active/ Passive, Worms, Virus, Spam's, Ad ware, Spy ware, Trojans and covert channels.Backdoors, Bots. Spoofing. Internal treats Environmental threats, phishing, and cross-site scripting (XSS), Code injection, Sybil attack, Distributed Denial of Service and other network attacks. Systems Security, Pharming Attacks, IP Spoofing port scanning, DNS Spoofing, SYNattacks, Smurf, attacks, UDP flooding.

Unit II:Web and Email Security

Intrusion Detection and Prevention, Web security requirements, XML, SOAP, WSDL and UDDI, WS Security, SAML, 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, Multipurpose Internet Mail Extensions, S/MIME Functionality, S/MIME Messages, Enhanced Security Services, Domain Keys Identified Mail: Internet Mail Architecture, E-mail Threat.

Unit III: 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, Investigative tools (Open Source and Proprietary), Email & Browsers, Intrusion detection, Attack trace-back, Packet inspection, Log analysis, Hashing issues, Cloud computing., Using Forensic Software such as FTK, Encase etc.

Unit IV: 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.

Semester - IV

ELE-17413DCE: Broadband Wireless Networks **Course Category: DCE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
3	0	2	4	25	25	25	25	100

Unit I: Broadband Networks and Generations

Review of Broadband communication networks DSL, ADSL, HDSL, SDSL, VDSL, Introduction to Broadband Wireless, Evolution of broadband Wireless, Emergence of Standard Based Technology, Mobile Broadband Wireless: Market Drivers and Applications, WiMAX and Other Broadband Wireless Technologies.

Unit II: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 andWiMAX.

Unit III: Beyond 3G – Multicarrier Systems

Overview of WiMAX: IEEE 802.16 and WiMAX, Salient features of WiMAX, WiMAX Physical and MAC layerOverview, OFDM Basics, OFDM in WiMAX, Advanced features for performanceimprovement, WiMAX Reference Network Architecture, Handoff Mechanism, Different types ofServices, QoS Architecture.

Unit IV: 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.

Semester - IV

ELE-17414GE: Foundations of Computer Organization **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

Unit I: 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: 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. Introduction to Pipelining and Parallel Processing.

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

Semester - IV

ELE-17415GE: Mobile Communication **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

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 . Multiple Access Techniques: Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Code Division Multiple Access (CDMA), Hybrid Techniques, OFDMA.

Unit II: 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.

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

Semester - IV

ELE-17416GE: Fundamentals of Bio Medical Instrumentation **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

Unit I: Electro-Physiology, Bio-Potential Recording, Bio-Chemical and Non Electrical Parameter Measurement

The origin of Biopotentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics, PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter,photometer,Blood flow meter, hearing aids, oximeter, Blood pressure, Temperature, pulse, Blood cell counters.

Unit II: 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.

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, JWS, New York, 1997.

Semester - IV

ELE-17417GE: Principles of Digital Image Processing **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

Unit I: Digital Image Fundamentals

Digital image fundamentals: representation - elements of visual perception - simple image formationmodel - Image

sampling and quantization - basic relationships between pixels – imaging geometry. Review of matrix theory results: Row and column ordering. Image enhancement: Spatial domain methods: point processing - intensity transformations, histogram processing, image subtraction, image averaging; Spatial filtering- smoothing filters, sharpening filters.

Unit II: 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

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

Semester - IV

ELE-17418GE: Internet of Things (IOT) **Course Category: GE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
2	0	0	2	NA	NA	50	NA	50

Unit I: Introduction

Introduction to concepts behind the Internet of Things, Review of technologies enabling IoT- Sensors, Networks, Standards, Augmented intelligence and Augmented behaviour, Applications of internet of things, IoT Communication Pattern and Layering concepts, Cellular IoT, IoT cloud.

Unit II:IoT Architectures, Models and Protocols

Overview of various IoT architectures (European FP7, WSO2, IVM, CISCO, IoT-A, RAMI4.0, IIRA),IEEE P2413 reference architecture model, Functions of application, network, adaptation, MAC and PHY layers, IoT protocol stack verses traditional protocol stack, Introduction to various IOT protocols (CoAP, 6LoWPAN, MQTT, RPL, IEEE 802.15.4, DTLS, ROLL).

Books Recommended:

1. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems Dr. O. Vermesan , Dr. Peter Friess, River Publishers.
2. Interconnecting Smart Objects with IP: The Next Internet, Jean Philippe Vasseur, Adam Dunkels, MorganKuffmann.
3. Internet of Things (A Hands on approach), Vijay Madisetti, ArshdeepBahga.
4. Designing the Internet of Things, Adrian McEwen (Author), Hakim Cassimally.

Semester - IV

ELE-17419OE: Computing and Informatics -IV **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
1	0	2	2	NA	NA	25	25	50

Unit I: Introduction

Introduction to Computer Networks, LAN, WAN, MAN, Network topologies, Definition & History of Internet - Uses of Internet - Definition of Web-Addressing-URL-Different types of Internet Connections; Dial up connection, Broad band (ISDN,DSL, Cable), browsers and its types, internet browsing, searching - Search Engines - Portals - Social Networking sites- Creating an email-ID, e-mail reading, saving, printing, forwarding and deleting the mails, checking the mails, viewing and running file attachments, addressing with cc and bcc.

Unit II:Lab Work

Working with different type of browsers, E-mails, downloading and uploading of data, social networking, search engines and document types, video conferencing.

Books Recommended:

1. Hasan. A. Sadek "BIOINFORMATICS Principles and Basic Internet Applications" Traford Publishing
2. O. H. U. Heathcote "Basic Internet" 3rd Edition, Payne Gallway Publishing
3. Wendell Odorn "Computer Networking First step" Cisco Press

Semester - IV

ELE-17420OE: Electronic Devices and Circuits -IV **Course Category: OE**

Hours Per Week			Total	Maximum Marks				
Lecture	Tutorial	Practical	Credits	Assessment - I	Assessment - 2	End Term		Total
						Theory	Lab	
1	0	2	2	NA	NA	25	25	50

Unit I: Bipolar Junction Transistor (BJT)

Bipolar Junction Transistor (BJT), Types of transistors, Symbol, Biasing of transistor, transistor Configurations. ALPHA & BETA of a transistor. Introduction to JFET and MOSFET.

Unit II:Amplifiers and Oscillators

Amplification, Transistor as an amplifier. Classification of Amplifiers, Class A, B.C. Power amplifier, Impedance matching. **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,

Lab Work:

- Testing a Transistor.
- Terminal determination.
- Calculation of Alpha and Beta.
- Transistor configurations.
- Finding the I-V characteristics of BJT.
- Transistor as an amplifier.
- Finding the I-V characteristics of JFET.
- Finding the I-V characteristics of MOSFET.
- Study of various Oscillators.

Books Recommended:

1. Boylested, Electronic Devices and Circuit Theory.
2. Sidra and Smith, Microelectronic Circuits.