DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
B.E. II YEAR (4YDC) ELECTRICAL/ELEX &TC/ ELEX &INSTRUMENTATION
MA 22014 / MA 25014 / MA 27014/MA 2T14/MA 2E24
MATHEMATICS – III

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	1	3	--	1	30	70	--	--	100

COURSE OBJECTIVE

To introduce the concepts of partial differential equations, calculus of finite differences, numerical methods, Fourier series, Laplace and Fourier transform.

COURSE OUTCOMES

The outcomes of this course are:

- Identify real phenomena as models of partial derivative equations. Solve real problems by identifying them appropriately from the perspective of partial derivative equations.
- Demonstrate their understanding of the Dirichlet conditions by using them to evaluate infinite series. Calculate the Fourier transform of elementary functions from the definition.
- Select and combine the necessary Laplace transform techniques to solve second-order ordinary differential equations involving the Dirac delta (or unit impulse).
- To understand the concept of solving differentiation and integration using approximation methods.
- Able to solve algebraic and differential equations using numerical method.

COURSE CONTENTS

Unit-1 Partial Differential Equations : Formation of Partial Differential Equations, Partial Differential Equations of first order and first degree i.e., Pp+Qq=R, Linear Homogeneous Partial Differential Equations of nth order with constant coefficient, Separation of Variables, Applications to Vibration of String and Transmission Line Equation.

Unit-2 Fourier Series and Fourier Transform: Definition and Derivations, Odd and Even functions, Half-Range Series, Change of Scale. Fourier Integral, Numerical Harmonic Analysis. Fourier Transforms: Sine and Cosine Transform, Applications of Fourier Transforms to solution of Partial Differential Equations.

Unit-3 Laplace Transform : Definition, Laplace Transform of elementary and periodic functions, properties of Laplace Transform and Transforms of derivatives, Inverse Laplace Transform and its properties, Convolution Theorem, Applications of Laplace Transform to solution of linear differential equations with constant and variable coefficients, Simultaneous differential equations.

Unit-4 Calculus of Finite Differences: Difference table, Operators E and Δ, Newton's forward and backward interpolation formula, Lagrange's interpolation formula, Differentiation and Integration, Difference Equations with constant coefficients.

Unit-5 Numerical Methods: Solution of Algebraic and Transcendental equations using Bisection method, Regular-Falsi method and Newton Raphson method. Numerical solution of simultaneous equations: Gauss Elimination method, Gauss Seidel method. Numerical solution of ordinary differential equations: Taylor's, Picard's and Runge- Kutta method.

Text Books

1. Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.
2. Balagurusamy E., Numerical Methods, Tata McGraw-Hill Publishing Company Ltd. , New Delhi, 1999.

Reference books

1. Kreyszig Erwin, Advanced Engineering Mathematics, 8th edition, John Willy and sons Publications, 1999.
2. Jain, R.K. and S.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, New-Delhi, 2006.
3. Vedamurthy V.N. and Iyengar S.N., Numerical Methods, Vikas Publishing, 2008.
4. Das H. K, Higher Engineering Mathematics, S. Chand New Delhi, 2011.

Assessment

1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%)
2. End semester Theory Exam (70%)

EC25016 ELECTRONIC DEVICES

PREREQUISITE:- Mathematics-I, Physics

COURSE OUTCOMES:-

Student should be able to:

1. Relate Semiconductor physics with various types of diode.
2. Design and analyze diode based electronics circuits and subsystem.
3. Analyze BJT based electronic circuits.
4. Design various applications based on BJT.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

THEORY:

Unit 1. Introduction to semiconductor Physics: Bohr's atomic structure, E-K diagrams, Periodic Lattice, energy bands in Intrinsic and Extrinsic semiconductor carrier transport, drift and diffusion current, mobility and resistivity, Generation& recombination of carrier, Poisson &continuity equation, Ct & Cd, Switching time, Hall effect.

Unit 2. P-N junction diode and its characteristics, small signal switching models, Avalanche and Zener breakdown & its applications ,ordinary diode circuits and applications, Special diodes.

Unit 3. Charge transport in BJT, Minority carrier distribution and terminal currents, base width modulation, Ebers Moll model, I-V characteristics for CB, CE and CC configurations. Concept of load line, Transistor Biasing technique & its stability, Biasing compensation, Thermal runaway.

Unit 4. Construction & Operation of MOSFET & JFET, I-V characteristics, Channel length modulation, MOS Capacitance, C-V characteristics.

Unit 5. Integrated circuit fabrication process: Oxidation, diffusion, ion implantation, photography, etching, chemical vapor deposition, sputtering, twin tube CMOS process.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

Course Outcome: Student should be able to

1. Understand the operation of various diodes and plot its I-V characteristics.
2. Implement various diode circuits such as voltage regulator, rectifier with and without , filter, etc.
3. Understand the operation of BJT, its testing and characterization in CE, CB, CC configuration.
4. Understand the characteristics of biasing circuits for BJT.

List of Experiments:

1. To measure the V-I characteristics of Diode and verify its regions of operation.
2. To characterize Zener diode.
3. To Determine the Deflection Sensitivity of a CRO.
4. Application of Zener diode as a Voltage Regulator.
5. Comparison of Different Types of Rectifiers.
6. Comparison of Different Types of Filters.
7. To measure the regulation characteristics of Full wave Rectifier using LC and π Filter.
8. Testing of Transistor and its lead identification.
9. Characterization of transistor in CE Configuration.

10. To characterize BJT in CB Configuration.
11. Characterization of BJT in CC-(Common Collector) Configuration.
12. Characterization of fixed Bias Circuit with and without Emitter Resistor.

ASSESMENT

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Milliman & Halkias, Integrated Electronics, 2nd ed., 1997 McGraw Hill Pub.
2. Boylestad R., Electronic Devices and Circuit Theory, 7th ed., 2004 PHI.
3. Sedra & Smith, Microelectronic circuits.5th ed., 2004 Oxford university press.

REFERENCE BOOKS RECOMMENDED:-

1. Ben G. Streetman, Solid State Electronics Devices, 5th ed., 2000, PHI.
2. Bhargava, Gupta & kulshreshtha, Basic Electronics and Linear Circuits, 2nd ed., 1990, Tata McGraw Hill Education

3 R .S. Sedha, "A Text book of applied electronics", 2nd ed., 2000, S. Chand

EC 25017 Signals and systems

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Analyze different types of signals.
2. Represent continuous and discrete systems in time and frequency domain using different Transforms.
3. Define various properties of LTI systems and determine the response of an arbitrary excitation.
4. Understand Sampling and reconstruction of a signal and applications of signals and systems in communication systems.

Sub Code	Subject	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				
							TH	CW	SW	PR	Total
	Signals and systems	4	-	-	3	-	70	30	-	-	100

1. Signals and Systems

Introduction to signals and systems and their applications in engineering and science. Type of signals: periodic and aperiodic signals, continuous and discrete-time signals, continuous and discrete amplitude signals, energy and power signals, even and odd signals, deterministic and random signals. Elementary continuous-time and discrete-time signals signals: unit impulse, unit step, ramp, exponential, signum and sync functions. Operations on signals, Types of systems, continuous-time and discrete-time systems, systems with and without memory, system properties: linearity, time-invariance, causality, stability, invertibility and inverse systems.

2. Linear Time-Invariant (LTI) systems

Discrete-time LTI systems: The convolution sum, Continuous-time LTI systems: The convolution integral, impulse response and step response of LTI systems, properties of LTI systems: causality, stability and invertibility. System representation through linear constant coefficient differential and difference equations (LCCDE).

3. Fourier analysis of signals and systems

Fourier series representation of periodic signals: Trigonometric and exponential forms, properties of Fourier series, Fourier transform representation of signals and its properties, Fourier transform of standard signals, aperiodic and periodic signal transmission through LTI systems, Parseval's theorem, the impulse response and frequency response of LTI systems and their relationship, filtering, applications of Fourier analysis for communication systems.

4. Laplace and Z transform

Laplace transform, the region of convergence of Laplace transform, transfer function, poles and zeros of a continuous-time system, properties of Laplace transform, inverse Laplace transform, analysis and characterization of LTI systems using Laplace transform: Transfer function of LTI systems, causality, stability and Unilateral Laplace Transform.

Z transform, ROC of Z transform, properties of Z transform, inverse Z transform, analysis and characterization of LTI systems using Z transform: system function of discrete time LTI systems, causality, stability, Unilateral Z Transform.

5. Sampling and applications of signals and systems:

The sampling theorem, Time-domain and frequency-domain analysis of sampled signals, aliasing. Reconstruction of signals from its samples. Discrete time processing of analog signals. Applications of signals and systems in communication.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Reference/Text Book:

1. Signals and Systems : Alan. V. Oppenheim, Allan S. Willsky and S. HAmid Nawab, 2nd Edition, Prentice Hall.
2. Signals and Systems: Hwei P Hsu, Schaum's Outline Series, 2nd Edition, Tata Mc-Graw Hill Education Private Limited.
3. Signals and Systems: Tarun Rawat, Oxford Higher education.
4. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, 1998.
5. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, 1998.
6. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.

B.E.SECOND YEAR (4 YDC) ELECTRICAL ENGINEERING
SEMESTER 'A'

EE 25004- Network Theory and Analysis

Subject Code	Subject Name	L	T	P	Th. Credit	Pr. Credit	Maximum Marks				
							TH	CW	SW	Pr	Total
EE 25004	Network Analysis	4	1	2	4	1	70	30	40	60	200

Course Objective:
The objective of the course is to familiarize the students with the analysis, characterization and elementary synthesis of networks and develop a basic understanding of various components under transient and steady state conditions. This helps in designing of real life applications.
The objectives include equipping students with:

1. The fundamental concepts of current; voltage and power along with the properties of passive circuit elements as well as network theorems.
2. Designing of various types of filters, transient and steady state response of various circuits, two-port network and state space variable analysis.
3. Understanding the magnetically coupled circuits, Analysis of balanced and unbalanced polyphase circuits.
4. Knowledge of Fourier analysis of periodic waveforms and its frequency spectrum.

UNIT: 1
Lumped circuits and Kirchhoff's Laws, Circuit elements, physical components v/s circuit elements, Power and energy, Passivity. Network Topology, Loop and Nodal equations, State equations.

UNIT: 2
First and second order networks, zero state, zero input, transient and steady state response. Solution of network equations using Laplace transform, Network functions, their pole zero description.

UNIT: 3
Two port networks, various two port network parameters and their interrelationships.

UNIT: 4
Sinusoidal steady state analysis, frequency response, resonance, complex power, power factor improvement, maximum power transfer theorem, locus diagram. Superposition, Reciprocity, Thevenin's and Norton's theorem.

UNIT: 5
Magnetically coupled circuit, analysis of circuits with controlled sources, analysis of balanced and unbalanced polyphase circuits. Fourier analysis of periodic waveforms, frequency spectrum, Power and energy of complex waveforms.

EC 25018 DIGITAL SYSTEM DESIGN

PREREQUISITE: - Engineering Physics, Electronic Devices

COURSE OUTCOMES:-

Student should be able to:

1. Understand the digital circuits through basic logic gates.
2. Analyze and design computational digital circuit which can perform logical and arithmetic operation.
3. Analyze and design finite state machine and data storage elements.
4. Analyze and design digital integrated circuits.
5. Analyze and design converters which facilitate the conversion of real world analog signals to digital and vice versa.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

THEORY:

UNIT 1: Introduction to digital logic: Logic Simplification and Combinational Logic Design: logic gates and their presentation using diode & transistor, Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, SOP & POS implication, NAND-NOR implementation, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

UNIT 2 : Combinational Logic: MSI device like comparators, Multiplexers, Encoder, Decoder, Half adder and Full Adders, Subtractors, Serial and Parallel Adders, BCD Adder.

UNIT 3: Sequential Logic Design: Building blocks like S-R, D and T, JK and Master-Slave JK FF and their conversion, Edge triggered FF, Ripple and Synchronous counters, Shift registers.

UNIT 4: Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate HTL, TTL, IIL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like PLA, PAL, FPGA. Logic implementation using Programmable Devices.

UNIT 5: Applications of digital circuits: Introduction to A/D & D/A conversion & their types, sample and hold circuits, Voltage to Frequency & Frequency to Voltage conversion. Multivibrators: Bistable, Monostable, Astable, Schmitt trigger, IC555, IC565 & their applications.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam

PRACTICALS:

Course Outcome:

Students will be able to:

1. Understand various logic gates.
2. Implement different Boolean functions from universal gates
3. Implement various combinational circuits using Digital IC's.
4. Implement various sequential circuits using Digital IC's.

LIST OF EXPERIMENTS

1. To study Logic gates.
2. To verify properties of NAND & NOR gates as universal building block.
3. Simplification & implementation of a Boolean functions.
4. Implementation of basic Boolean arithmetic logic circuits.
5. Implementation of even & odd parity generator & checker. Testing of transistor
6. Conversion from binary to gray and gray to binary code.
7. To verify 2 bit magnitude comparator for all possible conditions
8. Connection of various logical functions using 8 TO 1 multiplexer.
9. Construction of a 4- bit ripple counter & study of its operation. Implementation of basic Boolean arithmetic logic circuits.
10. Design and implementation of various types of flip-flops using JK Flip-Flop.

Text/Reference Books:

1. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, “VHDL”, Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, “Digital Electronics- An introduction to theory and practice”, PHI, 2nd edition ,2006.
4. D.V. Hall, “Digital Circuits and Systems”, Tata McGraw Hill, 1989
5. Charles Roth, “Digital System Design using VHDL”, Tata McGraw Hill 2nd edition 2012.

Shri G S Institute of Technology and Science, Indore
DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES
II B.E. (4YDC)
HU 22005/24005/25005/27005: ECONOMICS FOR ENGINEERS

HOURS PER WEEK			CREDITS		MAXIMUM MARKS				
L	T	P	Th	Pr	THEORY		PRACTICAL		TOTAL MARKS
					CW	END SEM	SW	END SEM	
3	-	-	3	-	30	70	-	-	100

PRE-REQUISITES: NIL
COURSE OBJECTIVES:-

i. To develop the optimizing skills of technology-use in engineering problems
ii. To articulate economic analytical skills so as to contextualize the solutions of engineering problems.
iii. To explore the potential of students in economic perspective of engineering professional goals.
iv. To make sense of need of entrepreneurship and understand the financial reports of a business.

COURSE OUTCOMES: after completion of course, the students will be able to:
Co-1: Explain economic cyclic flow and Estimate the demand and demand elasticity for a product.
Co-2: Plan the production; choose appropriate production technology (combination of production factors); and estimate feasible range of production.
Co-3: Analyze the production-cost-profit relation and select the suitable project for investment
Co-4: Estimate price and the equilibrium for a firm/organization in different competitive market situations.
Co-5: Review, summarize and compare the financial statements of an accounting entity and able to apply financial ratio technique for financial analysis.
Co-6: identify the problems, see the opportunity, and ideate the solution to the problems

COURSE CONTENT:
UNIT 1.Nature and scope of economics, Economic cyclic flow, Central Economic problems, macro and micro economics, concept, determinants and law of demand and supply, Elasticity of demand, Equilibrium price, consumer surplus and equilibrium.

UNIT 2. Production, cost and Revenue: Production function, laws of return to variable proportion, Laws of return to scale, cost concepts, cost functions and their inter relation, Revenue Concepts and functions, break-even analysis, Time value of money and Investment analysis- NPV, IRR, ARR and payback period method.

UNIT 3. Pricing and Market: Price determination and firm's equilibrium under perfect competition and monopoly, price-output determination under monopolistic competition, kinked demand curve, collusive and non-collusive oligopoly.

UNIT 4. Entrepreneur, entrepreneurship and start-up, characteristics of an entrepreneur, forms of business organization, phases of startup, small medium and large scale enterprise, problems, opportunities, Design Thinking and Ideation. Business model.

UNIT 5. Accountancy: Accountancy and bookkeeping, GAAP, Assets, Liabilities and Capital, types of accounts, Journal, Ledger, Trial Balance and Financial Statements, Financial Ratio Analysis.

ASSESSMENT: Through End-Sem. Theory Exam, Theory sessionals, Mid-Sem Tests, and Assignments

Books & Reference Recommendation:

1. JhingalM.l., Economics of development and Planning, Vrinda Publication (40th Ed./latest).
2. Ahuja H. L., Advance economic theory, S Chand Publication, (21st Ed./Latest)
3. Riggs, Bedworth and Randhawa, Engineering Economics, Tata McGraw-Hill, (4th Ed./latest)
4. Principles of accountancy, Nirmal Jain,
5. Entrepreneurship by Rajeev Roy, 2nd edition

5. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
6. Introduction to the Constitution of India, D.D. Basu

DEPARTMENT OF APPLIED MATHEMATICS AND COMPUTATIONAL SCIENCE
B.E. II YEAR (4YDC) ELECTRICAL/ELEX &TC/ ELEX &INSTRUMENTATION
MA 22563 / MA 25563 / MA 27563/MA 2E74: MATHEMATICS-IV

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	--	1	3	--	1	30	70	--	--	100

COURSE OBJECTIVE

To introduce the concepts of complex variable, statistics, stochastic process, markov chain, reliability and graph theory.

COURSE OUTCOMES

On completion of this course, students are able

- to solve Engineering problems using complex variable techniques and line integrals of a complex valued function.
- to apply the concept of probability to find the physical significance of various distribution phenomena.
- Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability.
- Understand the concepts of reliability and maintainability.
- to apply principals and concepts of graph theory in practical situation.

COURSE CONTENTS

Unit-1 Functions of Complex Variables: Analytic function, Cauchy-Riemann Equations and Harmonic Functions, Conjugate Functions and their Applications, Complex Integrals, Cauchy's Integral Theorem and Integral Formula, Singularities, Poles, Residues, Residue Theorem, Contour Integration for simple cases, Conformal mapping and its Application to two-dimensional problems in electric field.

Unit-2 Statistics: Modern view of Probability theory, Random Variables, Distribution Function and Density Function, Random Variables of Discrete and Continuous type, Functions of two random variables, Bivariate Probability with Conditional and Marginal Probability Distribution.

Unit-3 Stochastic Process and Markov Chain: General Concepts and Definition of Stochastic Processes, Mean, Auto-correlation and Auto-Covariance, Classification of Stochastic Process and Some Problems. Probability Vectors, Stochastic Matrix, Fixed Point of a Matrix, Definition of Markov Chain, Transition Matrix and Graph, Some Theorems and Applications.

Unit-4 Reliability: Basic concepts, Failure law, Bath Tub Curve, Evaluation of Reliability of a Component from Test Data, System Reliability, Components in Series and Parallel, Redundancy, Non-Series Parallel System.

Unit-5 Graph Theory and Combinatorial Optimization: Graphs – Definitions and Basic Properties, Isomorphism, Euler Circuits and Hamiltonian Cycle, Digraphs, Trees-Properties, Spanning Trees, Planer graphs, Shortest Path Problem, Dijkstra Algorithm, Spanning Tree-Kruskal and Prim Algorithm.

Text Books

1. Ramana B V, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.
2. Das H. K, Higher Engineering Mathematics, S. Chand New Delhi, 2011.
3. Baisnab A, and Jas M, Elements of Probability and Statistics, Tata McGraw Hill Book Company, New Delhi, 1993.

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Reference books

1. Jain, R.K. and Iyengar S.K, Advanced Engineering Mathematics, Narosa Publishing House, New-Delhi , 2006 .
2. Veerarajan T, Statistics, Probability and Random Process, 2nd Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi 2003.
3. Balagurusamy E., Reliability Engineering, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2012.
4. Goodaire E.G. and Michael M. Permenter, Discrete Mathematics with Graph Theory.

Assessment

1. Internal Assessment for continuous evaluation, mid-term tests, tutorials, class performance, etc. (30%)
2. End semester Theory Exam (70%)

EC 25564 Electromagnetic Waves

PREREQUISITE: - Engineering Physics and Engineering mathematics

Course Outcomes:-

At the end of this course students will demonstrate the ability to

(1) Understand characteristics and wave propagation on HF transmission lines
(2) Carry out impedance transformations on Transmission Lines.
(3) Characterize Uniform Plane Wave.
(4) Calculate reflection and transmission of waves at media interface
(5) Analyze wave propagation on metallic waveguides in modal form

Subject Code	Subject Name	Periods / Week			Maximum Marks				Credits		
					Theory		Practical				
		L	T	P	End Sem	CW	End Sem	SW	Th	Pr	Total
	Electromagnetic waves	4	-	-	70	30	-	-	4	-	4

Unit 1: Transmission Lines:
Transmission Lines, Equations of voltage and current on Transmission lines, propagation count and characteristics impedance, reflection coefficient and VSWR, Impedance transformation on lossless and low loss transmission lines, power transfer on Transmission lines, Smith chart, admittance Smith chart, applications of Transmission lines.

Unit 2: Electromagnetic and Maxwell's Equations:
Basics of vector calculus. Basic Laws of Electrostatics, Gauss's theorem for electrostatics. Equivalence theorem, method of images. Basic laws of magneto statics, Ampere's Law, Duality, Uniqueness and reciprocity theorem. Development of Maxwell's equations.

Unit 3: Uniform Plane Waves:
Wave equation and solution, wave polarization, wave propagation in different mediums, phase and group velocities, power flow and pointing vector, surface currents and power loss in a conductor.

Unit 4: Plane Wave at Media Interface:
Boundary conditions, plane waves in arbitrary direction, reflection and refraction at dielectric interface and total internal reflection, Brewster's angle, Standing waves, conducting surface, skin depth.

Unit 5: Waveguides:
Wave propagation in parallel plate waveguides, analysis of wave guides general approach, rectangular waveguides, TE & TM modes, surface currents on the waveguide walls, Attenuation in waveguide. Field visualization using simulation software.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text/Reference Books:

1. R.K Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India.
2. Principles of Electromagnetics Matthew N.O Sadiku., 6th edition.
3. David Cheng, Field & wave Electromagnetics.
4. Microwave Engineering , Pozar ,4th edition.

EC 25565 ANALOG CIRCUIT

PREREQUISITE: - Network Theory, Electronic Devices and Engineering mathematics

COURSE OUTCOMES:-

Student should be able to:

1. Analyze and design BJT and FET based amplifier for required frequency specifications.
2. Analyze and design power efficient amplifiers.
3. Improve amplifier performance by varying various parameters and design various frequency generators.
4. Analyze and design amplifiers for various linear and non linear mathematical operations using Linear integrated circuits.
5. Analyze and design various wave form generators and active filters using linear integrated circuits.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

THEORY:

Unit 1. Review of BJT & MOSFET biasing, small signal analysis: low frequency model of BJT & MOSFET & its analysis for different configuration, Multistage amplifier.

Unit 2. High frequency analysis: High frequency model of transistor, Frequency response of amplifier, cascading of amplifier & its effect on gain & Bandwidth, Step response of amplifier. Power amplifier, compensation symmetry, configuration, RF circuit, tuned circuit

Unit 3. **Feedback Amplifiers** : General feedback theory, characteristics of negative feedback amplifiers, Effect of negative feedback on input and output resistance of amplifiers, analysis of feedback amplifiers. Oscillators: Principle of oscillation, calculation of frequency of oscillation & conditions for sustained oscillations, LC Oscillators - Colpitt's, Hartely and Crystal Oscillators, RC Oscillators: Phase shift & Wien bridge oscillators, Frequency stability criteria and controlled oscillators.Voltage .

Unit 4. **Operational Amplifiers**: Differential amplifier, its modification & transfer characteristics, Internal Architecture of op-amp, offset error in voltages & currents & their temperature drift, Op-amp parameters such as CMRR, slew rate & their measurements, Frequency response of op-amp, study of op-amp ICs like 741, 324, 308 etc. Temperature compensation techniques, current mirror in op-amp. Linear analog systems using op-amp such as - V to I and I to V converters, integrator, differentiator, Two stage and three stage instrumentation amplifiers.

Unit 5. **Non-linear Applications and Active Filters using Operational Amplifiers:** Non-Linear analog systems: Zero crossing detectors, Square wave & triangular wave generators, Comparators, Schmitt trigger, Voltage to frequency & frequency to voltage converters, Small signal rectifiers, Sample & hold circuit, Logarithmic amplifier. Active Filters**:** Introduction to active filters: active networks using OP-AMP, approximation to ideal low pass filter, Active filters: LP, HP, BP, BS, & their design guidelines.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

Students will be able to:-

1. Understand single & double stage amplifier, and find its gain and bandwidth.
2. Understand various oscillator circuits and find its frequency of oscillation.

3. Implement various op-amp. based circuits.
4. Implement various active filters.

List of Experiments:

1. To observe the characteristics of single stage R-C coupled amplifier
2. Verify the characteristics double stage R-C coupled amplifier
3. Measurement of input impedance and output impedance of single stage R.C coupled amplifier stage.
4. Study of frequency response of a single stage JFET amplifier
5. Study of double stage R-C coupled amplifier (with feedback).
6. Study of R-C phase shift oscillator
7. Study of Wien bridge oscillator
8. Study of OP-Amp as:
   a) Inverting Amplifier
   b) Non inverting Amplifier.
   c) Summing Amplifier
9. Study of integrator circuit & differentiator circuit using Op Amp
10. Study of class-C amplifier.
11. Study of Active low-pass filter of first order.
12. To study of active high-pass filter

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Sedra & Smith L., Electronics Circuits, 5th ed., 2004, McGraw Hill.
2. Gayakwad R.A., Op AMP & Linear Integrated Circuits. 4th ed., 2007, PHI.
3. Van Valkenburg M.E., Analog Filter Design, 2nd ed., 2001, Holt Rinehart & Winston

REFERENCE BOOKS RECOMMENDED:-

1. Milliman & Halkias, Integrated Electronics, 2nd ed., 1997, McGraw Hill
2. Robert Boylsted, Electronic Devices & Circuits, 2nd ed., 2000, PHI
3. Millman and Grable, Microelectronics, 2nd ed., 1987, TMH.

EC 25566 Probability and Stochastic Processes

Prerequisite: A basic course on Calculus and Linear Algebra, Signals and systems

Course Outcomes: At the end of this course students will demonstrate the ability to

1. Understand representation of random signals
2. Investigate characteristics of random processes
3. Make use of theorems related to random signals
4. To understand propagation of random signals in LTI systems.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	-	-	-	CW	END SEM	SW	END SEM	
						30	70			100

Unit 1: Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models.

Unit 2: Discrete random variables, probability mass function, probability distribution function, example random variables and distributions; Continuous random variables, probability density function, probability distribution function, example distributions.

Unit 3: Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random variable.

Unit 4: Random sequences and modes of convergence; Markov, Chebyshev and Chernoff bounds; Limit theorems; Strong and weak laws of large numbers, central limit theorem.

Unit 5: Random process and classification Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Autocorrelation, Power spectral density.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text/Reference Books:

1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education
2. A.Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill.
3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers
5. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press.

EC 25567 Analog and Digital Communication

Course Outcomes:-

Students will demonstrate the ability to

(i) Compare different Continuous Wave modulation schemes.
(ii) Study the behavior of Communication systems in presence of noise.
(iii) Investigate Pulse modulation schemes and multiplexing schemes.
(iv) Analyze different digital modulation and demodulation schemes.
(v) Evaluate error performance of digital communication systems.

Subject Code	Subject Name	Hourss / Week			Maximum Marks					Credits		
					Theory		Practical		Total			
		L	T	P	End Sem	CW	End Sem	SW		Th	Pr	Total
EC 35---	Analog and Digital Communication	3	-	2	70	30	60	40	200	3	1	4

Unit 1: Amplitude Modulation: Review of Fourier transform, its properties, probability, random variable and random process and power spectral density. Need of modulation, Generation and detection of AM, DSB-SC, SSB-SC and VSB signals. Frequency division multiplexing, Sources of noise, Gaussian and white noise, Quadrature components of noise, Noise in amplitude modulation systems.

Unit 2: Angle Modulation: Instantaneous frequency, Phase and Frequency modulation, Narrowband FM, Wideband FM, bandwidth of angle modulated signals, Generation and detection of angle modulated signals. Stereophonic FM broadcasting. Pre-emphasis and De-emphasis filters. TRF receivers, Superheterodyne radio receiver, Noise in Frequency modulation systems. Threshold effect in angle modulation,

Unit 3: Pulse modulation: Sampling process. Sampling of bandpass signals, Quantization, Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation (DPCM). Delta modulation (DM), Adaptive Delta modulation (ADM), Line codes and their PSD, Noise considerations in PCM, Time Division multiplexing.

Unit 4: Baseband Pulse Transmission and Signal space analysis: Inter symbol Interference and Nyquist criterion, Equalization Techniques, Eye patterns, Geometric representation of signals, Optimum detection of signals in noise, Optimum receivers using coherent detection for AWGN channels, Probability of Error.

Unit 5: Pass band Digital Modulation and Trade-offs: Phase Shift Keying (PSK), Frequency Shift Keying (FSK), Quadrature Amplitude Modulation (QAM), Minimum Shift Keying (MSK), their generation, detection, PSD and Probability of Error evaluations. Information, Entropy, Mutual information, Capacity of channels, Shannon’s theorem of channel capacity, Digital Modulation tradeoffs.

Text Books:-

1. Haykin S., "Communications Systems", John Wiley and Sons, 2001.

2. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002.

3. Taub H. and Schilling D.L., "Principles of Communication Systems”, Tata McGraw Hill, 2001.

Reference Books:-

4. Wozencraft J. M. and Jacobs I. M., ``Principles of Communication Engineering",John Wiley, 1965.

5. Barry J. R., Lee E. A. and Messerschmitt D. G., ``Digital Communication", Kluwer Academic Publishers, 2004.

6. Proakis J.G., ``Digital Communications", 4th Edition, McGraw Hill, 2000.

EC 25568 ELECTRONICS WORKSHOP

Prerequisite: - Engineering physics

Course outcomes:-

Student should be able to:

1. **Identify various types of electronic components and subsystems and apply them in various Electronic circuits.**
2. **Analyze electronics circuits and systems, diagnose faults and their rectification**
3. **Design, fabrication and testing of different types of electronics subsystem using analog and digital ICS.**
4. **Develop skills of writing a structured technical document and its presentation.**

Subject Code	Subject Name	Periods / Week			Maximum Marks				Credits		
					Theory		Practical				
		L	T	P	End Sem	CW	End Sem	SW	Th	Pr	Total
	Electronics Workshop	-	-	4	-	-	60	40	-	2	2

Practical:

Unit 1. Various types of resistors, capacitors, inductors, their ratings, characteristics & application of single / multistrand wires, coaxial & flat cables, BNC, TNC & N - type connectors, PCB edge connectors, octal & panel connector, relays & band switches, SPST, SPDT, DPDT & push button switches, types of batteries, selections, testing, identification practice for all components, circuit diagrams using components & practicing symbols, cost of various commercially available components.

Unit 2. Thermal resistance, heat sink & its design. Selection of solder, Soldering wire & fluxes, Techniques of soldering, Soldering practice, Soldering defects and their causes.

Unit 3. Design, fabrication & testing of following types of sub systems using discrete components & integrated circuits:

(a) Analog System : series and shunt regulator, multi stage amplifiers, oscillators including VCOs, impedance matching networks, attenuators, popular analog ICs for sub-systems

(b) Digital Circuit: Drivers for increasing fan-out, TTL-CMOS & vice-versa interfacing, applications of 555 IC, counters, 7-segment display, issues involved in product - design, interfacing 7-segment display panels, opto-coupler for isolation etc., popular digital ICs for sub-systems.

Unit 4. Circuit assembly using bread board, Types of PCB & their selection, techniques of making PCB for projects, layout of components, precaution, electrical wiring diagrams, elements of grounding & shielding, PCB layout practice, Mass manufacturing of PCBs, SMD and Through hole components.

Unit 5. Fabrication of small electronic circuit such as power supply, Oscillators etc.
Trouble-shooting: AC & DC Point testing, connection failure, continuity, short circuit and open circuit, component and its pin identification, component failure and its identification, data manual referencing for equivalent component. Technical report writing.

Assessment:- Hardware project, quiz, internal and external viva

Text Books Recommended:

1. Harper, Handbook of Electronic Components. 2nd ed., 1997
2. Goyal and Khetan, A Monograph of Electronic Design,2nded., 1983 Khanna Publ.
3. Mottershed Allen, Electronics devices & circuits,2nd ed., 2006 PHI

Reference Books Recommended:

1. Martin Roden, Gordon Carpenter and S.R.K. Iyengar, Electronic Design: From concept to reality, 4th ed. , 2002, Discovery Pub.
2. Sieldman and Kaufman, Handbook for electronics engineering technicians, 2nded., 1988 TMH.
3. Madhuri Joshi, Electronic Components and Materials, 3rded., 2004 Shroff Publication.
4. Gordon L. Carpenter, Martin S. Roden, Electronic Design: From concept to reality, 3rd edition, Discovery Pr.
5. R.S. Khandpur, Printed Circuit Board: Design, fabrication, assembly and testing, 1st edition, McGraw Hill Education.

DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

II B.E.(4YDC)

HU 22881/24881/25881/27881: Values, Humanities and Professional Ethics

HOURS PER WEEK			CREDITS		MAXIMUM MARKS				
L	T	P	Th	Pr	THEORY		PRACTICAL		TOTAL MARKS
					CW	END SEM	SW	END SEM	
-	2	-	2	-	100	-	-	-	100

PRE-REQUISITES: NIL

COURSE OBJECTIVES:-

(i) To make students understand of his/her social responsibility as an engineer.
(ii) To create an awareness on Engineering Ethics, Indian constitution and Human Values
(iii) To make students capable of doing self-exploration and recapitulation
(iv) To make students aware of the global problems

COURSE OUTCOMES: After completion of course, the students will be able to:

Co-1**:** Explain and elaborate the social institutions and Constitution of India through which the society and nation is governed.
Co-2: Describe the kinds of values and ethics and their importance
Co- 3: Contextualize the professional attitude and approaches as per needs of society and values.
Co-4: Explain and illustrate the process of Social, Political and Technological changes incontext to global changes

COURSE CONTENT:

1. Role of Humanities in Engineering education, Morals, Values and Ethics,social institutions and association, social stratification in India, social change, Universal and Situational values, coexistence of self and body and their needs and activities.

2. Constitution of India - Preamble, Rights and Duties. Directive Principles, Parliamentary and presidential democracy, The Problem of hierarchy of values and their choice, the views of Mahatma Gandhi on concept Indian nation and democracy.

3. Ethical and decision making capability and its development: Meaning of Ethical dilemma, Concept of personal and group Ethics: Balance between -rights and duties,The Problem of Sustenance of value in the process of Social, Political and Technological changes.

4. Engineering Ethics: engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger variety of moral issued - types of inquiry - moral dilemmas – moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy Models of Professional Roles.

5. Global Issues: Multinational corporations - Environmental ethics - computer ethics - weapons development – engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership.

ASSESSMENT:

Only **Sessional Work** (100 marks) on the basis of internal viva (30) Attendance (20), Quizes/Tests (30) and Presentations (20) will be awarded against the assessment done throughout the session.

Books for references

1. Little, William: An Introduction of Ethics (allied Publisher, Indian Reprint1955)
2. William, K Frankena : Ethics (Prentice Hall of India,1988)
3. Gaur R. R., Sangal R. and Bagaria G. P., Haman Values and Professional Ethics, Excel Books, New Delhi, 2010
4. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York 1996.

5. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
6. Introduction to the Constitution of India, D.D. Basu

III B.E. (4YDC)
SEMESTER-A
EC 35001: Introduction to VLSI Design

PREREQUISITE: - Basic electronics, Digital Electronics, Analog Electronics, Network Theory

COURSE OUTCOMES:-

Student should be able to:

1. Understand the VLSI Design Flow.
2. Write and simulate VHDL code for basic combinational and sequential circuits.
3. Analyze the static and dynamic characteristics of CMOS inverter.
4. Design and simulate Basic Logic gates using CMOS logic.
5. Understand the basics of synchronous Finite State Machine.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

THEORY:-

Unit 1: Review of different domains of VLSI Design, Moore's Law, Gajeski's Chart, Various design approaches: top-down, bottom-up, and mixed, PLD based design flow, synthesis, simulation, placement and routing, floor planning, verification, back annotation etc.

Unit 2: Introduction to HDLs, their features, HDL based design, features of VHDL and programming methodologies, various modelling styles in VHDL, Digital designing with HDL, test benches. programmable logic devices : PLA, PAL, PROM etc., programming strategies, circuit implementation, CPLD and FPGA architecture, case study of Xilinx, Spartan series FPGA, their features and programming.

Unit 3 : Basics of CMOS, operation of NMOS, PMOS, CMOS, MOS Capacitance, MOS Scaling, sizing, Inverter Design, static & dynamic characteristics, VTC, power dissipation, speed, area.

Unit 4: Basics of VLSI design, implementation of logic function, rise time, fall time, delay time considerations. Fan-in, Fan-out, CMOS logic structures: Domino logic, NP Zipper logic, CVSL, DVSL.

Unit 5: Finite state machine design: state machines, Mealy and Moore machines, state diagram, state table reduction techniques for state tables, transition tables, design of sequential circuits using FSM, VHDL coding for FSM.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of Experiments

1. Introduction to VHDL
2. Write and simulate the VHDL code for logic Gates.
3. Implement Half Adder using VHDL.
4. Implement Full Adder using VHDL.
5. Implement Half Subtractor and full Subtractor using VHDL.
6. Implement Full Adder by using two Half Adders.
7. Implement Ripple Carry Adder using Full Adder in VHDL.
8. Implement 2x4 and 3x8 Decoders using VHDL (Structural, Dataflow & Behavioral modelling).
9. Implement 8x3 Encoder using VHDL (Structural, Dataflow & Behavioral modelling).
10. Implement 4x1 multiplexer using VHDL (Structural, Dataflow & Behavioral modelling).

11. Implement 4x2 Priority Encoder using VHDL.
12. Implement Various Code Converters (Binary to grey, Grey to Binary, BCD to 7segment Display and BCD to excess-3 code) using VHDL.
13. Write a VHDL code for D, T and JK flipflop using behavioural style of modelling (if-then-else).
14. Write a VHDL code for 4 bit Johnson counter using behavioural style of modelling
15. Write a VHDL code for MOD-16 up-counter using behavioural style of modelling
16. Write a VHDL code for MOD-16 up-down counter using behavioural style of modelling

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Sung Mo kang- CMOS Digital Integrated Circuits, TMH
2. Sedra & Smith- Microelectronic Circuits. Oxford Press.
3. S. Brown & Z. Vranesic- Fundamentals of Digital Logic with VHDL

REFERENCE BOOKS RECOMMENDED:-

1. Weste & Eshraghain – principles of CMOS VLSI Design
2. D.L.Perry- VHDL Programming by Example
3. J. Bhasker- VHDL Primer

EC 35004: ANTENNA & WAVE PROPAGATION

PREREQUISITE:- Physics, Electromagnetic fields and Waves, Transmission lines and Wave Filters.

COURSE OUTCOME:-

Students should be able to:

1. Learn basic concepts of antenna and radiation
2. Learn various performance space parameters of antenna.
3. Learn various types of antenna array.
4. Learn various practical antennas in the broad frequency range.
5. Understand atmospheric structure and its impact on radio wave propagation.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	1	4	-	-	30	70	-	-	100

THEORY:

Unit 1: Retarded Potential, radiation from a current element, power radiated by a current element, radiation resistance, Case of half wave dipole & quarter wave dipole, mono pole, isotropic antenna, far field approximation. Equality of transmitting & receiving antennas, effective length of antenna, directional properties of antennas, traveling wave antennas,

Unit 2: Antenna Performance Parameters: Radiation intensity, directive gain & directivity, power gain & antenna gain, effective area, antenna band width, antenna beam width, antenna terminal impedance, antenna as an open circuited line. Antenna array, Smart antenna and beam forming technique. Applications based on the concept.

Unit 3: Two element arrays, technique of multiplication of patterns, antenna arrays, end fire & broad side arrays, phase array antenna, effect of earth on radiation patterns, binomial arrays. Introduction to micro strip antenna, parabolic & horn antennas and the radiation patterns.

Unit 4: Methods of excitation, folded dipole, MF & HF antenna, tower antenna, VHF & UHF antenna, GSM antennas, Loop Antenna, Loading coils in antenna matching, Rhombic antenna, Direction finding. Broad band antenna, Equiangular spiral antennas, conical equiangular spiral antenna, Design of log periodic antenna, general properties of log periodic antenna & frequency independent antenna, types of log periodic antenna.

Unit 5: Ground wave propagation, reflection from earth's surface, wave tilt, spherical earth propagation, Space wave propagation, tropospheric wave, tropospheric scattering, effect of earth surface, atmospheric effect, duct propagation. Ionospheric propagation, effective dielectric constant & conductivity, reflection & refraction in ionosphere, critical freq. & virtual heights, MUF, LUF, features of sky wave transmission, Ionospheric frequency prediction chart.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Antenna **THEORY:** Analysis and Design, 2nd ed., 2000, Wiley Publication.
2. Kraus J.D., Antennas, 2nd ed., 2000, McGraw Hill.
3. Prasad K. D., Antenna & Wave Propagation, 2nd ed., 2001, Khanna Publication.

REFERENCE BOOKS RECOMMENDED:-

1. Collin R.E., Antennas & Wave Propagation, 3rd ed., 2001, McGraw Hill.
2. Chatterjee Rajeshwari, Antenna theory and practice, 2nd ed. 1998, New Age Publ.
3. Jordan & Ballman, Electromagnetic Wave & Radiation System, 2nd ed., 2006, PHI.

EC 35005: DCO & INTRODUCTION TO MICROPROCESSORS

PREREQUISITE:- Basic electronics, Digital electronics

COURSE OUTCOME:-

Students should be able to:

1. Understand basic internal logic and design of microprocessor and its programming.
2. Design circuits based on microprocessor, microcontroller and peripheral devices.
3. Select various microprocessors based circuit components
4. Understand design of advanced microprocessors**.**

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

THEORY:

Unit 1. **8085 Architecture**: Registers, I/O devices, memory bus structures & architecture of Intel 8085. Assembly language Programming of 8085 & their timing & execution information.

Unit 2. **8085 Memory and I/O**: Memory & I/O devices interfacing, Interrupt system & its implementation (of Intel 8085).

Unit 3. **Peripheral Devices**: Introduction to Peripheral interface ICs such as 8155, 8255, 8257, 8259 and using them System design & selected applications of 8-bit microprocessors (Intel 8085). Direct Memory access Controller.

Unit 4. **Computer system & Architecture**: Uni-processor Systems, Parallel Systems, classification scheme, RISC & CISC system and their comparison. Memory systems: Hierarchy, virtual & cache memory, allocation policies & management scheme.

Unit 5. **Evolution of Microprocessors**: Introduction to different CPUs like Intel 8088/80286/80386/80486.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICAL:

List of Experiments

ASSIGNMENT FIRST

1. Write an assembly language program for the addition of two 8 bit numbers. (Use consecutive memory location technique for data and result storage)
2. Write an assembly language program for the addition of two 16 bit numbers. (Use consecutive memory location technique for data and result storage)
3. Write an assembly language program for the subtraction of two 8 bit numbers. (Use consecutive memory location technique for data and result storage)
4. Write an assembly language program for the multiplication of two 8 bit numbers. (Use consecutive memory location technique for data and result storage)
5. Write an assembly language program for the division of two 8 bit numbers. (Use consecutive memory location technique for data and result storage)
6. Write an assembly language program for copy of 10 byte stored at memory location 3000H and onwards to new memory location starting from 3500H.
7. Write an assembly language program for multiplication of a 16 bit hex number with 8 bit hex number.
8. Write an assembly language program to find largest number out of the ten 8 bit numbers.
9. Write an assembly language program to arrange in ascending order ten 8 bit numbers stored at memory location 3000H.
10. Write an assembly language program to generate time delay of 50 ms. (Only calculate time delay)

ASSIGNMENT SECOND

1. Write an assembly language program to addition of two 8 bit BCD numbers using DAA.
2. Write an assembly language program to separate out 8 bits of a 8 bit number stored at memory location 3000H using rotate and masking technique.
3. Write an assembly language program with subroutine having multiplication of two hex numbers.
4. Write an assembly language program with subroutine to find out positive, negative and zero in a given series of ten hex data stored at 3000H location.
5. Write an assembly language program to convert decimal to seven segment display.
6. Write an assembly language program with subroutine to convert ASCII to HEX.
7. Write an assembly language program with subroutine to convert HEX to ASCII.
8. Write an assembly language program to find out square root of a number by subtracting odd integer.
9. Write an assembly language program to XOR data without using XRA instruction.
10. Write an assembly language program with subroutine technique to assembly and disassembly a given 8 bit words. (Hint: Data 98H can be disassembled as 09H and 08H)
11. Write an assembly language program to add a series of five hex numbers in BCD.
12. Write an assembly language program for display of up and down counting starting from 00H to 09H & 09H to 00H with subroutine technique.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Gaonkar, Introduction to Microprocessor, 2nd ed., 2004, Prentice Hall
2. Hayes, Digital Computer Organizations, 2nd ed., 2001, TMH.
3. Sridhar and Ghosh, Computer Organizations and Architecture, 2ed ed., 2003, PHI.

REFERENCE BOOKS RECOMMENDED:-

1. Patterson H., Computer Organization and Design, 4th ed., 2005, Harcort Asia.
2. Stallings, Computer Organization and Architecture, 5th ed., 2001, PHI.
3. Uffenbeck, Microcomputers and Microprocessors, 2nd ed., 2004, PHI.

EC35006: Digital Communication

PREREQUISITE: - Engineering Mathematics and Communication Engineering.

COURSE OUTCOME:-

Students should be able to:

1. Analyze and design various digital codes.
2. Analyze and design various line codes and detectors of baseband digital signals.
3. Analyze and design the pass band digital signals to suit the requirement of bandpass channels.
4. Analyze and design efficient source codes so as to transmit the information at a rate below the capacity of channel.
5. Analyze and design channel codes so as to have minimum probability of error.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	1	4	1	-	30	70	40	60	200

THEORY:

Unit 1. Random Process and Pulse Modulation:, Sampling: Nyquist Sampling theorem, Natural and Flat-top sampling, Sampling of bandpass signals, TDM, Quantization (uniform and non-uniform), quantization noise, PCM, DPCM, ADPCM, DM, ADM. Audio and video compression.PAM, PWM, PPM, Discrete and Continous random variables, (Gaussian, Rayleigh, exponential, binomial, Poisson) their means and variances. Random Process.

Unit 2. Digital Baseband Modulation, Demodulation and Signal-space representation:. Review of random Processes, Autocorrelation and power spectral density. Line coding: Desirable characteristics of line codes, NRZ and RZ forms of unipolar, polar, bipolar and bi-phase line codes, their waveforms & PSDs, bandwidth of digital data.

Baseband demodulation techniques: Matched filter, Inter Symbol Interference, Pulse shaping (Raised cosine spectrum, duo-binary signaling), Equalization, Eye patterns. Geometric representation of signals and WGN. MAP and ML detectors. Error performance of detectors.

Unit 3. Digital Passband Modulation and Demodulation and Spread Spectrum techniques:

Band-pass modulation and demodulation techniques: BPSK, DPSK, QPSK, BFSK, M-ary PSK & FSK, MSK, QAM, Non-coherent BFSK and DPSK (Their generation, detection, waveforms, PSDs, performance of these systems in the presence of noise.) Introduction to Spread Spectrum techniques: Spread Spectrum overview, pseudo-noise sequence, Direct Sequence & Frequency Hopping Spread Spectrum.

Unit 4. Information THEORY: Concept of amount of information, entropy & its types, source encoding such as Shannon-Fano, Huffman Codes, Information rate, Channel capacity (its calculation for BSC, BEC, noiseless channels and Gaussian channel), Shannon's theorem, Bandwidth and S/N trade off.

Unit 5. Channel coding: Linear Block codes (Systematic codes, Parity check matrix, Syndrome testing), Cyclic codes, Hamming codes, BCH codes, Convolutional codes. Low Density Parity Check codes. Block codes.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICAL'S:

List of Experiments:

1. To generate sampled signal of a band limited sinusoidal signal & its reconstruction.
2. To observe and interpret two channel Time Division Multiplexing in analog domain and digital domain.
3. To generate and detect TDM-PCM signal.

4. To study different methods of data transmission and regenerate the data at receiver or repeater.
5. To verify the DM output for various amplitudes and frequencies of input signal and for various clock frequencies.
6. To regenerate a signal employing adaptive delta modulation and demodulation.
7. Observation, verification and characterization of various line coding formats and their reconditioning.
8. To verify Error detection and Error correction code.
9. Generation of Analog Pulse Modulation Waves and recovery of original signal.
10. To generate sampled signal of a band limited sinusoidal signal & its reconstruction.
11. To characterize two channel Time Division Multiplexing in analog domain & digital domain.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Haykin Simon Communication System, 4th ed., 2001, Wiley Publication,.
2. Taub& Schilling, Principles of Communication System, 2nd ed., 2000, TMH.
3. Lathi B. P., Modern Analog and Digital Communication Systems, 2nded., 1998, Oxford Univ. Press.

REFERENCE BOOKS RECOMMENDED:-

1. Schaum's Outline Series, Analog and Digital Communication, 2nd ed., 2004, TMH
2. Dr. Bernard Sklar , Digital Communication, 4th ed., 2001.Pearson edu.
3. Proakis & Salehi, Digital Communication, 2nded., 2004, McGraw Hill.
4. Haykins Simon, Digital Communication, 3rd ed., 2001, Wiley Publ.

EC 35007: ELECTRONIC MEASUREMENTS

PREREQUISITE: - Basic Electronics, Basic Electrical engineering, Network Analysis

COURSE OUTCOME:-

Students should be able to:

1. Study various types of measuring instruments & their characteristics with their applications in various electronic circuits.
2. Measure signals, diagnose fault in electronics circuits & systems and its rectification.
3. Design and analyze transducer based measurement circuits.
4. Design and analyze electronic measurement circuits and subsystems.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

THEORY:

Unit 1. Measurement and their methods, classification of measuring instruments, static and dynamic characteristics of instruments, accuracy, resolution, sensitivity, precision, linearity, dynamic range, etc, speed of response, fidelity, static &dynamic errors, S/N & SINAD ratio.Standards of resistance, voltage, current, frequency and time, shielding and grounding.AC and DC voltmeters. Strain Gauge and its applications.

Unit 2. Basics of Transducers, LVDT, Strain Gauge, Microphones, speakers, opto electronics and piezo electric transducers, their calibration and application, universal product code.

Unit 3. Principle & construction of CRO & its various controls, Digital storage oscilloscopes, Estimation of phase & frequency using CRO. Measurement of RF frequency, power , Impedance and VSWR.

Unit 4. Principle, construction & applications of Frequency meter & Q-meter and AC bridges. High frequency measurements, Measurements of insertion gain & phase.

Unit 5. Signal & waveform generators, Frequency synthesizers, Digital voltmeter, digital frequency counters & millimeters. Spectrum analyzer, RF impedance, voltage and power meter, optical power meter, vector analyzer, distortion analyzer, VSWR, insertion loss and return loss measurements. Measurement of RF Impedance, RF Voltage and RF Power.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of experiments

1. Introduction to CRO.
2. Measurement of unknown frequency using CRO.
3. Measurement of unknown phase shift using CRO.
4. Introduction to Digital Storage Oscilloscope (DSO)
5. Measurement of parameters from the device characteristic curves displayed by curve tracer.
6. Measurement using general purpose Digital Multimeter.
7. Study of Balanced Modulator as a phase meter.
8. Measurement of insertion gain of a two port network.
9. Measurement of linear displacement.
10. Measurement of displacement utilizing piezoresistive effect.
11. Measurement of linear displacement utilizing the principle of change in capacitance.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Shawney, Electrical & Electronic Measurement, 17th ed., 2005, Dhanpat Rai& Sons.
2. D. V. S. Murthy, Transducers and Sensors, 2nd ed., 2000, PHI.
3. Copper, Electronic Measurement, 5th ed., 2009, PHI.

REFERENCE BOOKS RECOMMENDED:-

1. Patranabis D., Sensors and Transducers, 2nd ed., 2001, S. Chand & Co.
2. Bhattacharya S. K., Electronics, Measurements and instrumentation, 2nd ed., 2001, Khanna Pub.
3. Terman & Petit, Electronic measurements, 3rd ed., 2005, Mc Graw Hill.

OC-III

EC 35---: INTRODUCION TO MICROPROCESSORS AND MICROCONTROLLERS

PREREQUISITE:- Digital electronics

COURSE OUTCOME:-

Students should be able to:

1. Understand design parameters of microprocessor and microcontroller based circuits.
2. Understand architecture of 16/32 bit microprocessor.
3. Design and analyze various peripherals required for microprocessor and microcontroller based circuits.
4. Design and analyze microprocessor and microcontroller based circuits.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
-	-	-	-	-	-	-	-	-	-	-

THEORY:

Unit 1. 8085 Architecture: Registers, I/O devices, memory bus structures & architecture of Intel 8085. Assembly language programming of 8085. Introduction to microprocessors (8086).

Unit 2. 8085 Memory and I/O: Memory & I/O devices interfacing, Interrupt system.

Unit 3. Overview of architecture of microcontroller 8051, SFRs, instruction set of 8051, timers and counters, serial communication in 8051.

Unit 4. Interfacing with 8051: A/D converter, external memory, LCD, and stepper motor.

Unit 5. RS-232 standard, voltage, data bits and signals associated with it, examples of RS-232C applications, null modem, USART, line drivers and other ICs related to RS232C systems

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Mazidi, 8051 Microcontroller and Embedded Systems, 2nd ed. 1998, Pearson Edu.
2. Ayala, The 8051 Microcontroller, 2nd ed. 2001,Penram Publ.
3. Rafique Zaman M., Microprocessor & Microcomputer Development System.4th ed. 2004,CRC Press
4. Gaonkar, Introduction to Microprocessor, 2nd ed., 2004, Prentice Hall.

SEMESTER-B

EC 35503: DIGITAL SIGNAL PROCESSING

PREREQUISITE:-Engineering Mathematics, Communication Engineering, Network Analysis**.**

COURSE OUTCOME:-

Students should be able to:

1. Understand time and frequency domain representation of discrete time signals and systems.
2. Find the response of a discrete time system for arbitrary inputs to design DTS.
3. Compute numerically the response of DTS for finite time inputs.
4. Design and realize digital IIR, FIR filters.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	3	-	-	30	70	-	-	100

THEORY:

Unit 1. **Discrete time signals & systems** : Introduction, types of signals, discrete time signal sequences, discrete time systems, linear shift invariant systems, Stability & causality, linear constant coefficient difference equation, frequency domain representation of discrete time systems & signals, properties of the Discrete Time Fourier transform (DTFT), Sampling and discrete time processing of continuous-time signals.

Unit 2. **Z-Transform and Transform analysis of LTI systems**: Z-transform, Inverse Z-transform, properties of Z-transform, one sided Z-transform and its applications, system function, frequency response of LTI systems, minimum phase and linear phase systems.

Unit 3. **Discrete Fourier transform(DFT),and its computation:** Discrete Fourier Series, Discrete Fourier Transform, Linear convolution using Discrete Fourier Transform, Computation of DFT, Decimation in time FFT algorithms, Decimation in frequency algorithms, FFT algorithms for N (a composite number), chirp Z-transform algorithm.

Unit 4. **Implementation of digital filters:** Signal flow graph representation, Realization of IIR & FIR systems, direct form, Transposed form, Parallel form, Cascade form, Lattice structure for IIR and FIR filters, Parameter quantization effect.

Unit 5. **Digital filter design techniques:** Design of IIR digital filters using Impulse-invariant and bilinear transformation methods, Design of FIR filter using Windowing methods, Design examples.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Oppenheim & Schafer, Discrete Time Signal Processing, 3rd ed., 2010, Pearson Education.
2. Proakis and Manolikis, Digital Signal Processing, 4th ed., 2005, Pearson Education.
3. Mitra Sanjit, Digital Signal Processing A Computer Based Approach, 3rded., 2005, TMH.

REFERENCE BOOKS RECOMMENDED:-

1. Schaum's Outline Series, Digital Signal Processing,2007, TMH.
2. Ludeman L.C., Fundamentals of DSP, 1986, John Wiley.
3. Salivahanan, Vallavaraj, Digital signal processing, 2nd ed.,2011, TMH.

CO 35506: DATA STRUCTURES & OPERATING SYSTEMS

PREREQUISITE:-Fundamentals of C Programming and basic UNIX Commands.

COURSE OUTCOME: - Students should be able to:

1. Identify linear versus nonlinear data structures, Understand common data structures and be able to implement them, choose appropriate data structures for problem solving and show how data structures map onto physical memory.
2. Compare different implementations of the same data structure, Manipulate data structures with basic operations.
3. The general structure and purpose of an operating system, the concepts of process, address space, and file, process deadlock, deadlock avoidance and recovery, Compare and contrast various CPU scheduling algorithms.
4. Understand different memory management techniques and be able to describe the advantages and disadvantages of each, Storage systems– disks and file systems and I/O subsystems.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

THEORY:

Unit 1. Data Structure: stack, queue, list, tree, definition of complexity.

Unit 2. Sorting: Theory of sorting, searching, various techniques and their comparison, matrix manipulation, sets and string.

Unit 3. Operating System: Evolution, different types, features of operating system. CPU Scheduling: Types of scheduler, process and processor scheduling, multiprogramming. Input /Output: Asynchronous operation, speed gap, programmed I/O, Interrupt driven I/O.

Unit 4. Memory: Hierarchy, management technique, partitioning, swapping, paging, segmentation, page segmented memory, comparison of techniques, virtual memory, and demand paging and replacement policies.

Unit 5. File System: User and System view of file system, disk organization, disk allocation method: contiguous, linked and Indexed, file protection, system calls, disk scheduling. Deadlock avoidance and deadlock recovery. Case Studies: Linux, Unix, MS-DOS, Window NT.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of Experiments:

Lab Assignment # 01

1. Write a program to implement singly linked list in following way:

Note: Your output menu should be following-

**********Menu**********

1. Insertion
2. Deletion
3. Traversing
4. Searching

Enter your choice: 1

Where do you want to insert:

1. At beginning
2. At a specified position
3. At end

One node inserted!!!

**********Menu**********

1. Insertion
2. Deletion
3. Traversing
4. Searching

2. Write a program to reverse a singly linked list.
3. Write a program to implement doubly linked list.
4. Write a program to merge two singly linked list in sorted order.

Lab Assignment # 02

1. Write programs to implement stack by following ways:
   a) Using Array
   b) Using Linked List.
2. Write a program to implement Queue.
3. Write a program to implement binary search tree and perform following operations on that:
   a) Traversal (inorder,preorder,postorder)
   b) Sort the data of tree in ascending order.
4. Write a program to sort the array elements in following way:

   The sorting technique always maintains a sorted sublist in the lower positions of the list. Begin by assuming that a list with one item (position 0) is already sorted. On each pass, one for each item 1 through $n-1$, the current item is checked against those in the already sorted sublist. As we look back into the already sorted sublist, we shift those items that are greater to the right. When we reach a smaller item or the end of the sublist, the current item can be inserted. (**Hint:** It works the way we sort playing cards in our hands.)

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Galvin and Silberschatz, Operating Systems and concepts, Addison Wesley.
2. Tanenbaum, Operating Systems, PHI
3. Kruze, Data Structures and Program Design, Prentice Hall

REFERENCE BOOKS RECOMMENDED:-

1. William Stallings, Operating systems, PHI
2. Bach A. S., Design of UNIX operating system, PHI.R
3. Tenanbaum, Data structures using C, Pearson Edu.

EE 35507 CONTROL SYSTEMS

PREREQUISITE: - Engineering Mathematics, Network Analysis

COURSE OUTCOME:-

Students should be able to:

1. Understand modelling of systems and their simulation.
2. Learn effect of feedback on closed loop control systems.
3. Understand frequency domain and state space analysis of a control system
4. Design and analysis of Compensation techniques**.**

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

THEORY:-

Unit 1. Modeling of Systems and Simulation: Modeling of thermal, hydraulic pneumatic processes, mechanical, electrical systems, impulse response, concept of transfer function, block diagram algebra, signal flow graph, Mason's formula. Control system Component: Error detectors, servomotors, servo-amplifiers, modulators demodulators, pneumatic controllers, hydraulic controller.

Unit 2. General Feedback **THEORY:** Mathematical feedback theory, return ratio, return difference effects of feedback on closed loop performance. Time domain analysis: Test signals, transient behaviour of closed loop systems such as position servo and process servo systems, derivative and rate feedback, control, steady state behaviour of position and process servomechanisms, steady errors, integral control, stability of Routh-Hurwitz Criterion.

Unit 3. Frequency domain analysis: Concept of frequency polar indices plot, bode plots, frequency domain performance, M_p and ω_p effects of adding poles and zeroes of frequency domain performance, conformal mapping, principle of argument. Nyquist criterion, transportation lag, relative stability, conditionally stable system constant M and constant N loci, root loci.

Unit 4. State space analysis: Open loop system. Description, state space, eigenvalues and eigenvectors, modal transformation, solution of state differential equation, method of feedback in state space closed loop system description in state space controllability and observability in the sense of feedback control, effect of feedback on eigenvalues, eigenvectors and on modal transformation, solution of closed loop state differential equation, and introduction of phase plane analysis.

Unit 5. Compensation techniques: Types of compensation, reasons of compensation, design of compensation using phase lead networks. Stability analysis: Concept of BIBO stability, Routh-Hurwitz criteria, Nyquist criterion, relative stability, positive definiteness and semi-definiteness of quadratic forms, Lyapunov stability criteria.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of Experiments

1. To determine the performance characteristics of an angular position error detector using potentiometers.
2. To determine the characteristics of a Synchro Transmitter Receiver pair and use as a torque synchro and angular error detector.
3. To find the transfer function of an A.C. Servomotor.
4. To find the transfer function of a D.C. Servomotor.
5. To control the angular position of an AC servo motor as a carrier control system.
6. Determination of the time response characteristics of a DC Servo angular position control system.
7. To perform closed loop Speed control of a D.C Servomotor.

8. To determine the performance characteristics of a DC motor speed control with PWM type power driver.
9. To determine the performance characteristics of a DC motor speed control with SCR type power driver.
10. Analysis of Proportional + Integrator + Derivative (PID) control actions for First and second order systems.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Kuo B.C. Automatic Control System.
2. Ogata K., Modern Control Engineering.
3. Nagrath I.J. and Gopal M., Control Systems Engineering.

REFERENCE BOOKS RECOMMENDED:-

1. Melsa J.L. and Schuttz D.G. Linear Control Systems.

EC 35508: TELECOMMUNICATION SWITCHING SYSTEMS

PREREQUISITE: - Communication Engineering and Digital Communication

COURSE OUTCOME:-

Students should be able to:

1. Understand components of various telecommunication networks.
2. Differentiate between analog and digital telephony and their advantages and disadvantages.
3. Design and analyze a telephone network.
4. Under applications of various signaling techniques in mobile communication.
5. Understand advanced telecommunication networks.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

THEORY:

Unit 1. An overview of telephone networks, end-systems, transmission, switching, signaling, control etc. Terminal Equipment: Working principles of telephone, DTMF (tone) signaling various signaling tones (dial, ring, ring back, engage etc. and their waveforms), facsimile system principle and its working.

Unit 2. Local telephone networks: local loop, BORSCHT functions, MDF, IDF, Local line and junction lines, line planning and layout, commercially available telephone cables. Digital transmission system hierarchy and their frame structure (DSO, DS1, T1, E1 etc.) and synchronization,

Unit 3. Switching: necessity of switching, elementary switch, control mechanism and classification, traffic engineering, Erlang formula, blocking and non-blocking switch. Trunk Networks: description of Trunk Network hierarchy, elastic buffer, trunk exchanger, RLU, co-axial and microwave networks. T, S, T-S-T switch, Close switch, call establishment procedure, Electronic stored program switching.

Unit 4. OSI reference model and TCP model. Signaling: Signaling functions, in channel and common channel signaling, signaling in digital networks and signaling system no.7.

Unit 5. An overview of ISDN architecture and protocol, various services and their QOS requirements. Introduction to Broadband ISDN. Introduction to IP telephony and related protocols.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of Experiments:

1. To understand the principle of working of Rotary Dial Telephone System.
2. To understand the principle of working of Dual Touch Tone Dial Telephone System.
3. Measurement of various types of signaling Tones employed in line Telephony.
4. Design of a Local Loop System.
5. To Verify Various Services Provided by EPABX System and their applications.
6. To Configure Manual and Automatic Telephone Exchanges for Access Control to Terminal Equipments and measure Quality of Service.
7. Interconnection of Telephone Networks employing various
8. Voice Transmission through Optical Fiber Cable using Pulse Width Modulation and its Characterization.
9. To design DTMF Decoder Circuit and Test it's functioning.
10. To Write a Report on Visit to a Telephone Exchange.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Vishwanathan T., Telecommunication Switching Systems and Networks, 2nd ed. 1999, PHI.
2. Cole Marion, Introduction to Telecommunications, 2nd ed. 2000, Pearson Edu.
3. Bellamy, Digital Telephony, 2nd ed. 2001, Wiley student Interscience.

REFERENCE BOOKS RECOMMENDED:-

1. Stalling, ISDN an Introduction, 4th ed. 2000, PHI.
2. James Martin, Telecommunication and Computers, 2nd ed. 2001,, PHI.
3. Gokhale, Introduction to Telecommunication, 2nd ed. 1998, Thomson Learning.

EC 35509: MICROWAVE DEVICES & CIRCUITS

PREREQUISITE:- EM fields and wave, Network analysis, Antenna and wave propagation

COURSE OUTCOME:-

Students should be able to :

1. Identify of various types of Microwave electronic components and systems.
2. Understand different modes of operation of various RF and Microwave circuits.
3. Design and analyze of high frequency circuits and systems.
4. Solving complex RF & Microwave communication network design problems.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	3	-	-	30	70	-	-	100

THEORY:

Unit 1. Features and applications of microwaves, Wave propagation in striplines and microstrip lines, Slot lines and fin lines, Limitations of conventional vacuum tubes, Microwave tubes like Two cavity klystron and Reflex klystron, Magnetron, TWT, Backward wave oscillator etc.

Unit 2. Solid state microwave sources, transferred electron devices, Tunnel diode Gunn diode and oscillators, IMPATT diode, TRAPATT diode, Pin diode, Varactor diode, Schottky diode, Parametric amplifiers, Crystal diode, Frequency multipliers, Microwave BJT & FET,

Unit 3. Scattering matrix, S-parameters & its applications in Network analysis, Matching Network, Detector diodes, detector mounts, detector output indicator, slotted line, measurement of power, impedance & S-parameter, measurement of frequency & VSWR.

Unit 4. Impedance transformer, Microwave filters, Power dividers and 9iodirectional couplers, E-plane Tee, H-plane tee, Matched hybrid Tee.Tensor permeability, Wave propagation in ferrite medium, Isolators, Circulators, YIG resonators, Simulation Techniques for design of **Microwave** Components.

Unit 5. Analysis and design of fin line components; Analysis and design of Dielectric resonators; Design of RF and microwave low noise and power amplifiers & oscillators using S-parameter techniques, Mixer and converter design, diode phase shifters, attenuators, Design of hybrid and monolithic, microwave and millimeter wave integrated circuits.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

Text Books Recommended :

1. Liao S., Microwave Devices & Circuits’’., 2nd ed. 2001,PHI.
2. Gupta K.C., Microwave Engg., 3rd ed.2004,Wiley Easter Pub.
3. Watson, Solid State Microwave Devices, 5th ed.2008,Wiley.
4. David M. Pozar, Microwave Engineering, 3rd edition, 2011 Willey India.

Reference Books Recommended :

1. Gandhi, Microwave Engineering & Application, 2nd ed.2005,McMillan Int. Ed.
2. Reich, Microwave Principles, 5th ed.2009,CBS Publ.
3. Collin, Foundations for microwave engineering, 4th ed. 2001,Wiley Publ.

EC 35951: SOFTWARE WORKSHOP – II

PREREQUISITE:-Software Workshop – I, Digital Electronics

COURSE OUTCOME:-

Students should be able to:

1. Understand VLSI design tools.
2. Write and debug programs using various simulation and design software for system implementation, analysis and performance evaluation
3. Develop skills to program and design embedded systems
4. Design web page using HTML.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
-	2	-	-	1	-	-	-	40	60	100

THEORY:

Unit 1. Introduction to VHDL/verilog and programming practices.

Unit 2. Solution of mathematical equation using scalars, vectors and matrices, plotting of 2D and 3D graphs using MATHCAD.

Unit 3. Developing algorithms for analysis and design of the systems for DSP, Communications, Image processing, measurement and control systems using MATLAB.

Unit 4. Design real-time acquisition and control applications with graphical development environment and developing applications for 32-bit microprocessors and FPGAs using Lab View. Application C/C++ in embedded systems. ATMEL Studio.

Unit 5. (a)Basic of HTML page making.(b)Project

PRACTICALS:

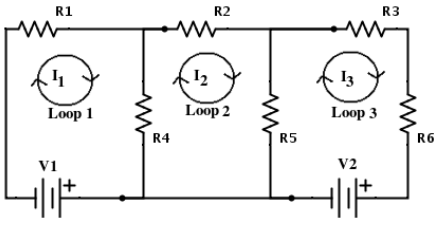
List of Experiments:

1. Create a 10x10 random matrix with the command A=rand(10). Now do the following operations.

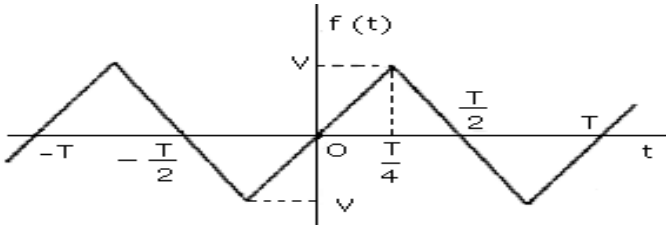
a) Multiply all elements by 100 and then round off all elements of the matrix to integers with the command A=fix(A).

b) Replace all elements of A<10 with Zeros.

2. c)Replace all elements of A>90 with infinity (int).



3. d)Extract all 30 aij 50 in a vector b, that is find all elements between 30 and 50 and put them in a vector b.
4. Find out the values of current i1, i2 ,i3 for the following given ckt using theMATLAB



5. R1=5Ω, R2=100Ω, R3=200Ω, R4=150Ω, R5=250Ω, V1=5V and V2=10V.
6. Write a program which does following operation on given signal:

a) Addition, Multiplication and Convolution of two signal
b) Folding, Shifting and Scaling operation on a given signal

7. Write a program which generate triangular wave using Fourier series. Also plot its line spectrum.
8. Write a program to plot an AM signal for following values of modulation index (m): a) m=1, b)m<1, c)m>1. Also write a program to demodulate AM signal.
9. Write a MATLAB program which illustrate and plot PAM (ASK), PSK, and QAM signals.
10. Using Simulink create a first order High pass filter with cutoff frequency 10 kHz.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Rudrapratap, MATLAB, 2nd ed. 2001, Oxford University Press.
2. Das, UNIX, 4th ed. 2004, McGraw Hill.
3. Chappman, MATLAB programming, 5th ed. 2003, Thomos publications

REFERENCE BOOKS RECOMMENDED:-

1. O'reilly, Linux installation and getting started. 2nd ed. 1990,O'reilly press
2. D.M. Etter, MATLAB, 2nd ed. 2000, Pearson Pub.
3. Negus C, Redhat Linux 9 Bible, 2nd ed. 2001, Wiley Publication.

B.E. IV Year
SEMESTER-A

NEW

EC 45056: OPTICAL COMMUNICATIONS

PREREQUISITE:-Engineering Physics, Communication Engineering

COURSE OUTCOME:-

Students should be able to:

1. Understand Optical Fiber Communication System and its parameters.
2. Analyze of transmission characteristics of optical fiber and their effects.
3. Understand the construction and operation of various optical sources and detectors.
4. Design and performance analysis of optical receivers.
5. Understand the techniques of optical fiber joints and their connectorization and brief introduction of optical fiber networks

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

THEORY:

Unit 1. Overview of optical fibre communications forms of communication systems, elements of an optical fibre transmission link, optical fibre systems. Optical fibres : Structure & wave guiding fundamentals, basic optical laws, optical fibre modes & configuration mode, theory for circular wave guides, graded index fibre structure.

Unit 2. Signal degradation in Optical Fibre : Overview of fibre materials, signal distortion in optical wave guides, pulse broadening in graded index wave guides, mode coupling, optical fibre measurements.

Unit 3. Optical sources and detectors: LEDs, LASER diodes, light sources linearity, modal and reflection noise. Physical principles of photo diodes, photo detector noise, detector response time, Avalanche multiplication noise, photo diode materials.

Unit 4. Optical modulation & receiver operation : Analog & digital modulation, fundamental receiver operation, digital receiver performance calculation, preamplifier design, analog receivers, heterodyne receiver .Transmission link analysis, Point to point links, Introduction to coherent optical communication & applications of optical fibers

Unit 5. Power launching, coupling in fiber & optical networks: Source of fibre power launching, lensing scheme for coupling improvement, fibre to fibre joints, and splicing techniques, Optical fibre connectors. WDM, Introduction to optical amplifiers (EDFA, SOA), SONET and SDH.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICAL'S:

List of Experiments

1. To familiarize with the optical communication kit and its specifications and interfaces.
2. To establish data link communication employing intensity modulation and demodulation.
3. To generate frequency and pulse width modulation and demodulation in optical communication.
4. To measure various losses in optical communication
5. To measure the effect of bending on attenuation in optical fiber.
6. To measure the optical parameters.
7. To characterize LED as optical source.
8. To characterize Laser Diode.
9. To establish PC to PC communication using RS232 interface via optical fiber link.

10. Preparation of fiber optic cable termination.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Senior J.M., Optical Fibre Communications: Principles & Practice, 2nd ed. 2001, PHI.
2. Agrawal Govind P., Fibre Optic Communication Systems, 5th ed. 2001, John Wiley & Sons, students ed.
3. Black Uyless, Optical Networks and 3rd Genration Transport Systems, 3rd ed. 1998, Pearson.

REFERENCE BOOKS RECOMMENDED:-

1. Keiser G, Optical Fibre Communication, 5th ed. 2006, McGraw Hill.
2. Mynbanv and Scheiner, Fibre Optic Communication Technology, 2n^{d} ed 2010, Pearson Edu.
3. Djfar K Mynbaev & Scheiner, Fibre Optic Communication Technology, 5th ed. 2005, Pearson.

EC 45005: DATA COMMUNICATION & COMPUTER NETWORKS

PREREQUISITE: - Communication Engineering, Microprocessor & microcontrollers

COURSE OUTCOME: - Students should be able to:

1. Understand different modes of data communication and analyze of computer network structure & architecture.
2. Understand the basics of computer network architecture and application of various physical layer standards.
3. Understand the design issues of various MAC layer protocols for deployment of Ethernet/IEEE Standards.
4. Develop the concepts of design issues of routing algorithms and transport layer protocols.
5. Understand design issues of advanced computer network architecture.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

THEORY:

Unit 1. Review of Channel capacity & series v/s parallel communication, Asynchronous & Synchronous communication system & their comparison. Basics of Data Communication: Basic terms & concepts related to data transmission, characteristics, Capacity, speed & delay of transmission.

Unit 2. Introduction to Computer Network structure & architecture, services. Introduction to computer network architecture, types of networks, different LAN and WAN topologies, Network Hardware and Software Components: Transmission media, access devices like NIC, repeaters, switches, routers, protocols ,device drivers and communication software "

Unit 3. Data Link Layer: Framing, flow control, error control. Elementary data link protocols: Stop and Wait, Sliding Window protocols (Go Back to N, Selective Repeat ARQ), Medium Access Protocols: Pure Aloha, Slotted Aloha and CSMA-/CD, Local Area Network architecture using thick, thin and UTP cables. Local Area Networks Types: IEEE 802.x standards – Ethernet, Fast Ethernet, Gigabit Ethernet, Switched Ethernet, Token Ring protocols, FDDI protocols and X.25 technology.

Unit 4. Network Layer: Packet switched network, Design issues, routing algorithms, bridge & gateways, IPv4 and IPv6. Design issues of transport & session layer : Introduction to TCP / IP protocol, Design issues of presentation & application layer, Internet addressing schemes & various Internet services, routers.

Unit 5. Protocols & protocol conversion: Importance of IP in Internet, IP over X. 25 & other Protocols, fast Ethernet, Gigabit Ethernet, switched Ethernet, Switched Ethernet back bones, UBS LANs. Wireless LANs, IEEE 802.11 standards.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of Experiments:

1. Study and Comparison of Various Network Topologies, Their Advantages, Disadvantages and Applications.
2. Study of Various Networking Devices, Their Advantages, Disadvantages and Applications & Case Study of Optical Fiber.
3. To Configure a Machine on WINDOW Platform.
4. To Configure a Machine on LINUSX Platform.
5. To Study How to Transfer Data From One Machine to Another Using FTP i.e. File Transfer Protocol.

6. Installation of Ubuntu (Open Source SW LINUX) on a Machine.
7. Configuration of TELNET Service on a LINUX Machine.
8. Configuration of NFS Service on LINUX Machine
9. To Study SAMBA SERVER.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Stalling W., Data and Computer Communication,7th ed. 2006, PHI.
2. Comer, Internetworking with TCP/IP Vol. 1, 4th ed. 2002, PHI.
3. Forouzan B., Data Communication and Networking,4th ed. 2011, TMH.

REFERENCE BOOKS RECOMMENDED:-

1. Schwester W.L., Data Communication, 2nd ed. 2001, McGraw Hill.
2. Blake, Data Communication and distributed networks,2nd ed. 2004 PHI.
3. Radia Pearlman, Interconnections, bridges, routers, switches and internetworking protocols, 2nd ed. 2005, Pearson Education.

EC 45007: MOBILE COMMUNICATION SYSTEMS

PREREQUISITE:-Communication Engineering, Digital Communication, Telecommunication Switching Systems

COURSE OUTCOME:-

Students should be able to:

1. Understand design parameters of cellular systems.
2. Understand concepts of various speech coders /decoders and modulator/demodulator used in GSM system.
3. Understand GSM and CDMA standards.
4. Learn fading channel characterization and mitigation techniques, so as to evaluate and enhance the performance of wireless communication system.
5. Understand various wireless MAC layer protocols.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	4	-	-	30	70	-	-	100

THEORY:

Unit 1. Introduction to wireless, radio communication, the cellular concept, system design fundamentals, frequency reuse, reused distance, cluster size, channel assignment strategies, hand off strategies, co-channel interference and system capacity, Spectrum management.

Unit 2. Basic properties of speech: Speech coding for wireless system such as time domain and frequency domain coder, vocoders , popular speech codes in GSM. Modulation techniques for mobile communication, their generation, detection and performance of spectral and power efficiency.

Unit 3. GSM architecture and interface, Radio link features in GSM, GSM logical channels and frame structure. Basics of CDMA systems. Standardized wireless system and Basics of WCDMA/UMTS systems.

Unit 4. Radio channel characterization: multi-path propagation, , exponential power delay profile, propagation effects, scattering, ground reflection, fading, lognormal fading and shadowing, coherence bandwidth, Doppler spread. Physical layer techniques like diversity, adaptive equalization, rake receiver. Introduction to Orthogonal Frequency Division Multiplexing and MC-CDMA.

Unit 5. MAC protocol: hidden and exposed terminal, near and far terminal problems, IEEE 802.11 system architecture, protocol architecture, physical layer, MAC layer, CSMA/CA, introduction to WLL and hiper LAN

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Rappaport T.S., Wireless Communications: Principles and Practice, 2nd ed., 2004 PHI.
2. Schiller J., Mobile communication, 2nd ed., 2000, Addison Wesley.
3. Andreas F. Molisch Wireless Communications, 2nd ed., 2001, Wiley Pub.

REFERENCE BOOKS RECOMMENDED:-

1. Wilkis and Garg, Principles of GSM Technology, 2nd ed. 2004, PHI.
2. Fehar K., Wireless Digital Communication, 2nd ed. 2001, PHI.
3. Ramji Prasad and Richard Van Nee, OFDM Wireless Multimedia Communication, 2nd ed. 1998, Artech House.

EC 45008: MICROPROCESSORS AND MICROCONTROLLER

PREREQUISITE:- Digital electronics and DCO& Introduction to Microprocessors

COURSE OUTCOME:-

Students should be able to:

1. Understand design parameters of microprocessor and microcontroller based circuits.
2. Understand architecture of 16/32 bit microprocessor.
3. Design and analyze various peripherals required for microprocessor and microcontroller based circuits.
4. Design and analyze microprocessor and microcontroller based circuits.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-					
						30	70	40	60	200

THEORY:

Unit 1. Review of bus structures, logic levels & their loading rules. Introduction to Microcontroller Atmega 8.

Unit 2. Introduction to 16/32 bit microprocessors (8086, 8088, 68000 etc.), Architecture of 8086, instruction set and interrupt handling. Priority controller, dynamic RAM refresh controller.

Unit 3. RS-232 standard, voltage, data bits and signals associated with it, examples of RS-232C applications, null modem, USART, line drivers and other ICs related to RS232C systems

Unit 4. Overview of architecture of microcontroller 8051, SFRs, instruction set of 8051, timers and counters, serial communication in 8051.

Unit 5. Interfacing with 8051 and 8086: A/D, D/A converter, external memory, LCD, keyboard and stepper motor.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of Experiments

1. Write an assembly language programs to add, subtract, multiply & divide two 8 bit nos. stored in register R0 & R1 of register bank 0 ,store the results of various operations in different registers of register bank 2.
2. Write an assembly language programs convert given 8 bit binary no. in accumulator to 3 digit BCD, store 100 R2, 10 digit in R1 & 1s digit in R0 of register bank 1.
3. Write an assembly language programs to unpack a packed BCD no. in accumulator & save the result in R0 & R1 of register bank 2.
4. Write an assembly language programs to move a block of 50 bytes from internal RAM of 8051 to external RAM.
5. Write an assembly language programs to count no. of 1s & 0s in a given 8 bit no. in a register. Assume data is at location 3000H of external data memory. Store the counts of 0s & 1s in register R0 & R1 respectively.
6. Write an assembly language programs to find smallest no. in a given array. Array is stored at location starting from address 3000H.
7. Write an assembly language programs to implement a Boolean logic Y=(A+B).C Use bit addressable area of internal RAM .A,B & C are Boolean variables
8. Write an assembly language programs to provide a delay of 1 sec.
9. Write an assembly language programs to transfer a message serially at baud 8 bit data & I stop bit, do this continuously.
10. Write an assembly language programs to generate a square wave of 8O% duty cycle on bit 3 of port 1.
11. Write an assembly language programs to swap lower & upper nibble of any 8 bit data stored in a register without using SWAP instruction.

12. Write an assembly language programs to find square root of a no. using subtraction of successive odd integers.
13. Write an assembly language programs to calculate value of function. Where is an 8 bit binary number?

14. Write an assembly language programs assuming that INT 1 pin of 8051 is connected to a switch that is normally high. Whenever it goes low it should turns on an LED connected to P1.3 which is normally off. It should stay ON for few secs an then go down.
15. Write an assembly language programs to receive a byte serially & check whether the byte is a valid byte or not .If it is a valid byte write 'C' on serial window else write 'E'.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Mazidi, 8051 Microcontroller and Embedded Systems, 2nd ed. 1998, Pearson Edu.
2. Ayala, The 8051 Microcontroller, 2nd ed. 2001, Penram Publ.
3. Rafique Zaman M., Microprocessor & Microcomputer Development System.4th ed. 2004, CRC Press

REFERENCE BOOKS RECOMMENDED:-

1. Rey Bhurchandi, Advanced Microprocessor Architecture, 2nd ed. 2001, TMH.
2. Bray, The Intel Microprocessors: Architecture, Programming and Interfacing, 2nd ed., 2003, PHI.
3. Gibson and Liu, Microcontroller Systems 8086/8088 Family, 5th ed. 2008, PHI.

ELECTIVE - I

CO : ARTIFICIAL INTELLIGENCE

PREREQUISITE:- Nil

COURSE OUTCOME:-

1. Compare artificial intelligence with human intelligence and improving traditional information processing by designing state space for real world problems.
2. Understanding the working of various searching algorithm for artificial intelligence and implementing efficient ones.
3. Learn to represent knowledge through different represent techniques and application of searching on knowledge base to derive inferences.
4. To understand the basic concept of fuzzy logic and neural network with its application in real world.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	4	-	-	30	70	-	-	100

THEORY:

Unit 1. Artificial & Natural Intelligence, Definition and Terminologies, Declarative programming, Production Systems, Heuristics, Problem Characteristics.

Unit 2. Search techniques: Best-first, Depth-first & Breadth-first search, Branch and Bound, AND / OR graphs, Game playing, General Problem Solverand Constraints Satisfaction.

Unit 3. Structured Knowledge Representation, Knowledge representation issues, Predicate Logic, Resolution, Representing Knowledge using Rules, Frames, Scripts, Conceptualdependency, Semantic nets.

Unit 4. Reasoning under Uncertainty; Non-monotonic reasoning, Modal logic, Temporal Logic, Bayesian Logic, Certainty factors, Dempster-Shafer reasoning.

Unit 5. Advanced issues in AI: Natural Language Processing, Parallel and Distributed AI, Learning Expert Systems, Neural networks, Case Based and Modal based reasoning, Perception.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Rich E., Artificial Intelligence, McGraw-Hill International.
2. Charnaik E. & D. Mc Dermott, Introduction to AI, Addison - Wesley.
3. Neil C. Rowe, AI through PROLOG, Prentice Hall, International Editions.

REFERENCE BOOKS RECOMMENDED:-

1. Schalkoff, Artificial Intelligence: An Engineer's Approach, McGraw-Hill.
2. Keith Weiskamp & Terry Hengl. AI Programming with Turbo PROLOG, John Wiley & Sons.
3. Zurada, Artificial Neural Network, Galgotia Publ.

ELECTIVE - I

EI 45223/4523: VLSI TECHNOLOGY

PREREQUISITE:- Introduction to VLSI Design, Digital Electronics

COURSE OUTCOME:-

CO1: To describe crystal growth and wafer preparation methods.
CO2: To discuss layering in terms of chip fabrication.
CO3: Illustration of various patterning methods.
CO4: Gain knowledge about layout design rules, stick diagrams etc.
CO5: Illustration of subsystem design and memories.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	4	-	-	CW	END SEM	SW	END SEM	
						30	70	-	-	100

THEORY:

Unit 1. Crystal Growth and wafer preparation: Wafer terminology, different crystalline orientations, CZ method, CMOS IC Design flow, Crystal Defects, Fabrication process of FETs, MOSFETs, and BIMOS etc.

Unit 2. Layering: Epitaxial growth methods, oxidation, Kinetics of oxidation, thin film fabrication, Metallization, Physical Vapor Deposition and Sputtering.

Unit 3. Patterning: Lithography, Optical Lithography, Electron Lithography, X- Ray Lithography, Ion Lithography. Photo masking steps, Resists. Doping: Diffusion; Diffusion models, Ion Implantation; Implantation Equipment, Channeling.

Unit 4. VLSI process techniques and Integration: Floor planning, layout, Design rules, stick diagrams, Test generation, Logic Simulation, Introduction to EDA tools. Contamination control: Clean rooms, HEPA, ULPA Filters and Class numbers.

Unit 5. Subsystem Design: Data-paths; adder, Shift resisters, ALU, Memory; NVRWM, Flash memories, 6-Transistor RAMs. Latch up in CMOS circuits.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:-

1. S.K. Gandhi, VLSI Fabrication Principles, Wiley.
2. S.M. Sze, VLSI Technology, II edition, McGraw Hill.
3. P. Van Zandt, Microchip Fabrication, A practical Guide to Semiconductor Processing, Third edition, McGraw Hill.

REFERENCE BOOKS RECOMMENDED:-

1. James D Plummer, Silicon VLSI Technology Fundamentals Practice & Modeling Pearson Education Limited
2. Singh R.K., VLSI Technology Design & Basics of Microelectronics, S. Kataria & Sons

ELECTIVE - I

EC : ADVANCED TOPICS IN COMMUNICATION

PREREQUISITE:- Data Communication, Analog and Digital communication, Digital signal processing.

COURSE OUTCOMES:-

Student should be able to:

1. Understand basic parameters of satellite communication systems
2. Understand Multiple Access Techniques used in wireless communication systems.
3. Understand Hardware design concepts of satellite communication systems.
4. Understand, source and error encoding and decoding schemes.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	4	-	-	30	70	-	-	100

THEORY:

Unit 1. Review of characteristics of satellite communication System. Various frequency bands used in satellite communication, LEO, MEO and Geo stationary satellite systems.

Unit 2. Multiple access techniques - TDMA, FDMA, CDMA, DAMA, Single Channel per carrier (SCPC) systems and their typical applications.

Unit 3. Transponders in satellite communication System, their bandwidth, down converters, satellite tracking. Different types of antennas used in satellite systems, tracking of a satellite.

Unit 4. Sampling & reconstruction of band limited signals. Quantization - Uniform, non-uniform logarithmic, entropy coded, adaptive quantization.

Unit 5. Image compression techniques such as discrete - cosine, JPEG, MPEG Standards. Different types of Error correcting codes, Block codes, convolution codes, their encoders & decoders.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Pratt, *Satellite Communication*, 2nd ed., 2006 Wiley Eastern.
2. Proakis, Digital Communication, 4th ed., 2012 McGraw Hill
3. Dr. Bernard Sklar, Digital Communication, 2nd ed., 2009 Pearson Edu.

REFERENCE BOOKS RECOMMENDED:-

1. Jayant and Noll, *Digital Transmission of Information*, 1984, Prentice Hall
2. Spilker, *Digital Communication bySatellite*, 1977 PHI.
3. Shu Lin, *Error Correcting Codes*, 1970PHI.

ELECTIVE - I

EC : PERFORMANCE EVALUATION OF NETWORKS

PREREQUISITE:- Telecommunication Switching Systems

COURSE OUTCOMES:-

Student should be able to:

1. Understand applications of basic concepts of probability theory in communication networks.
2. Understand switching techniques and layered architecture in communication networks.
3. Model queues used in communication networks.
4. Understand various MAC Protocols in Networks.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	4	-	-	30	70	-	-	100

THEORY:

Unit 1. Review of probability, joint & conditional probability, independent events, Bayes rules & Bernouli trials, Introduction to random variables & their moments, random process.

Unit 2. An overview of circuit switching, packet switching & layered communication architectures.

Unit 3. Introduction to queuing systems & their notation, structure, classification of stochastic processes, discrete & continuous time Markov chains, transition probability & steady state probability, birth & death process, M/M/1 queue & memory less property associated with it.

Unit 4. Poisson process, Little's formula, state dependent queues.

Unit 5. X.25 protocol, performance analysis of stop-and-wait protocol, Go-back N protocol & HDLC protocol. Network of queues, open & closed queuing networks.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Trivedi K.S., *Probability & Statistics with Reliability, Queuing & Computer Science Applications*, 2nd ed., 2002, John Wiley and Sons.
2. Schwartz M., *Telecommunication Networks, Protocols, Modeling & Analysis*, 1997 Addison Wesley.
3. Kleinrock L., *Queuing Systems Vol. 1*, 1996 John Wiley & Sons.

REFERENCE BOOKS RECOMMENDED:-

1. Chung, *Elementary Probability Theory*,4th ed., Springer
2. Peeble, *Probability and Random Variables*, 4th ed., 2002, TMH.
3. Raj Jain, *The Art of Computer Systems Performance Analysis*, 1991, John Wiley & Sons.

ELECTIVE - I

EC : Broadband Communication

PREREQUISITE:- Telecommunication Switching Systems

COURSE OUTCOME:-

Student will be able to:

1. Understand basics concepts of broadband network.
2. Understand layered architecture, signaling and services in broadband network.
3. Understand basic concepts of ATM technology.
4. Understand access techniques in broadband network.
5. Design issues in broadband networks.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	4	-	-					
						30	70	-	-	100

THEORY:

Unit 1. Basics of Broadband communication network: Overview of broadband technologies, and evolution of Broadband. Fiber distributed data interface (FDDI)- Concepts, Standards, Protocol Architecture, Network Topology; Distribute Queue dual bus- Features. Concepts, Protocol and Working; Frame relay- Standards, field Format, Architecture and Features; Advanced frame relay, Switched multi-megabit data service (SMDS)- Standards, Architecture, Protocol and Features; Advanced SMDS; ATM- Protocol and Working; SONET/SDH- Standards. Protocol and Working.

Unit 2. Broadband architecture: BISDN lower layers- Reference Model, Architectures, Functions and Protocol; BISDN higher layers- Management, User Plane and Control or Signaling; Broadband service aspects, Interactive Services, Distribution Services, Network aspects, user network interface aspects; Broadband Access Architecture.

Unit 3. Broadband ATM switching & transmission: ATM based switching, principles, requirements, switching building blocks, matrix & cell processing in a switch; ATM Traffic Management, Congestion Control and Traffic Engineering, Broadband Transmission network, functional components & their functions, Network Architecture, Broadband Intelligent Network.

Unit 4. Broadband Access Technologies – Introduction to Wi-Fi and WiMax, IEEE 802.16standard its architecture and layered structure, different scheduling services, MAC protocols.

Unit 5. Broadband Backbone Network design – Introduction to Next Generation Network,basics of smart antenna, concepts of MCPC and SCPC, Broadband circuit for optical fiber communication, Introduction to 4G Broadband technologies.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Balaji Kumar, *"Broadband communications"*, 2nd ed., 2001, McGraw Hill
2. William J. Byeda. *"Data communications: From basics to Broadband"*, 2011, Pearson Edu.
3. R. Bates *"Broadband Telecommunication handbook"*2002, MGH

REFERENCE BOOKS RECOMMENDED:-

1. Robert Newman. *"Broadband communications,* 2002, PHI
2. Johnson I. , Oya S. , Sam R. , Advances in Broadband Communication and networks, 2nd ed., 2008, River publications.
3. Cajetan M., Matthew N., 2007, Chapman and Hall/CRC.

Elective I

BM45---: Digital Image Processing

PREREQUISITE:- Signal and Systems, Digital Signal Processing,

COURSE OUTCOMES:-

CO1: Study of fundamentals of image processing and image perception.
CO2: Introduction to image enhancement spatial domain techniques.
CO3: Introduction to image restoration: noise degradation model.
CO4: Introduction to different image transforms.
CO5: Concepts of image analysis, feature extraction etc.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	3	-	-	30	70			100

Unit. 1 Fundamentals of Image Processing and Image Perception

Two-dimensional systems - linear systems and shift invariance. Fourier transform - Z - transform - Block matrices, Toeplitz and Kronecker product. Luminance, brightness and contrast. Color representation, color matching and reproduction, color vision model. Image sampling and quantization. Two dimensional sampling theory, reconstructions of images from its samples. Image acquisition.

Unit. 2 Image Enhancement Spatial Domain Techniques

Image negative, contrast stretching, gray level and bit plane slicing, power law transformation, histogram equalization and histogram specification, local enhancement techniques, image subtraction, averaging and logical operations. Spatial filtering: low pass, high pass and derivative filters, median filtering. Frequency domain filters: low pass, high pass and butterworth filters.

Unit. 3 Image Restoration

Noise degradation model, estimation of degradation model. Restoration in presence of noise-spatial filtering, frequency domain filtering, inverse filter and least mean square error(wiener) filtering.

Unit. 4 Image Transforms

2-D FFT and its properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Haar transform, Slant transform, K L transform

Unit. 5 Image Analysis

Feature extraction, spatial features, amplitude and histogram features, transform features, edge detection: gradient, Compass Laplace, Sobel, Prewitt operators, stochastic gradients. Line and spot detection. Boundary extraction: connectivity and contour following.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS

1. Jain Anil K,*Fundamentals of Digital Image Processing* , Prentice Hall, 1996.
2. B. Chanda, D. Majumder,*Digital Image Processing and Analysis*, PHI, 2011.

REFERENCES

1. Gonzalez Rafel C, Wintz Paul , *Digital Image Processing*, Addison Wesley, 1987.
2. Pratt William K , *Digital Image Processing*, John Wiley and Sons, 2006

EE 45203/4503: INDUSTRIAL AND POWER ELECTRONICS

PREREQUISITE: Basic and Analog Electronics, Basic Electrical Engineering

COURSE OUTCOME:-

Students should be able to learn

1. To provide students a deep insight in to the operational behaviour of practical power switching devices with respect to their static and dynamic characteristics
2. To learn the working principle of classified topologies of Thyristor based AC/DC, AC/AC, DC/DC and DC/AC converters.
3. To design and analyze the operation of above converters considering their applications.
4. To understand design of firing circuits for Thyristor based line commutated converters.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	4	2	-	30	70	40	60	200

THEORY:

Unit 1. Static power devices: Thyristor family, two transistor analogy of SCR, construction, characteristics, parameters, turn on and turn off methods, firing circuits, isolation and amplifier circuits, synchronization circuits.

Unit 2. Converters: AC to DC converters, single phase rectifier circuits with different load, various quadrant operation, basic principle and power circuits of dual converter and cyclo converter.

Unit 3. DC to DC converter: Basic principle of chopper circuits, various chopper circuits and their working, step up chopper, performance analysis.

Unit 4. Inverters: CSI and VSI inverters, single phase inverters, principle of operation, voltage and frequency control techniques.

Unit 5. Industrial Application of Power Electronics, SMPS, UPS, AC and DC drives, Power Supplies.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of Experiments

1. Verification of steady state characteristics of different static switches.
2. Phase control of TRIAC using DIAC and RC circuit in light dimming circuit.
3. Firing pulse generation using UJT based relaxation oscillator.
4. Firing pulse generation for SCR using TCA 785 IC.
5. Performance evaluation of single phase uncontrolled converter for R, RL load.
6. Performance evaluation of single phase controlled converter for R, RL load.
7. Performance Analysis of step down chopper
8. Performance evaluation of current commutation circuit for SCR
9. Performance evaluation of voltage commutation circuit for SCR.
10. Effect of duty cycle on the output voltage of buck-boost converter.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

Semiconductor Power Electronics, C.M. Pauddar, Jain Brothers
Power Electronics, M.H. Rashid,Pearson Education Limited
Power Electronics, Ned Mohan,John Wiley & Sons Inc Sea Pvt. Ltd.

REFERENCE BOOKS RECOMMENDED:-

Power Electronics, P.C. Sen, Tata Mcgraw Hill Publishing Co Ltd

SEMESTER-B

ELECTIVE-II

EC 45678/4578 : WIRELESS NETWORKS

PREREQUISITES:- Communication systems, Digital Communication, Telecommunication switching system, Computer Networks, Mobile and Wireless Communication

COURSE OUTCOMES:-

1. Review concepts of wireless and mobile communication
2. Understand LTE and OFDM technologies for mobile telephony and interpret the effects of MIMO on OFDM.
3. Understand the basic concepts of wireless sensor network and describe its protocols
4. Understand the layering model for mobile networking and compare transport layer protocols for mobile and traditional networks
5. Understand the technology and standards of IoT, ZigBee and Geolocation devices.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

Unit 1 Review of Cellular Networks

Mobile telephony, GSM, CDMA, Universal Mobile Telecommunication System (UMTS). Advancement and migrations. WLAN- PHY Layer and MAC Layer-IEEE 802.11, HIPERLAN, Wireless ATM

Unit 2 LTE systems

LTE & LTE-A, E-UTRAN architecture-Mobility and resource management, services, UTRAN-Architecture , HSDPA, HSUPA. Introduction to OFDM and various types of MIMO systems

Unit 3 Wireless Sensor Networks

Wireless sensor Network- Architecture, Applications, Technology for sensor nodes & networks, operating environment, MAC, Routing and Transport protocols for WSN

Unit 4 Wireless routing Protocols

Mobile network layer-Mobile IP, Data forwarding procedure in Mobile IP (IPv4 and IPv6), Mobility management, Mobile transport layer- Traditional TCP and mobile TCP, Indirect TCP

Unit 5 Internet of things (IoT) and GPS systems

IoT architecture, Main design principles and needed capabilities, IoT Devices and gateways, IoT Local and wide area networking, IEEE 802.15 WPAN, Bluetooth-pico net, scatter net, Protocol stack, Interface between 802.11 and Bluetooth. Geolocation service techniques and standards. Introduction to GPS-aided GEO augmented navigation (GAGAN), E.911, ZigBee, UWB and RFID.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of Experiments

1. Configure wireless access point in packet tracer
2. Configure wireless LAN access in packet tracer
3. Configure smart devices in packet tracer
4. Configure IOT based network in packet tracer

5. Perform the IOT based smart campus simulation in packet tracer
6. Configure wireless sensor network in NS2
7. Perform simulation for Cluster head selection in NS2/MATLAB
8. Perform the MIMO simulation on MATLAB for 5G/LTE networks
9. Model, simulate, and test IEEE 802.11ax signals and systems in MATLAB
10. Capture wireless network packets using wireshark tool and analyze them.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

Text Books:

1. Kaveh Pahlavan, Prashant Krishnamoorthy – *Principle of wireless networks- A united approach*- Pearson Education, 2002
2. Vijay K. Garg – *Wireless communication and networking* – Morgan-Kaufmann series in networking- Elsevier publication
3. Feng Zhao and Leonidas Guibas – *Wireless Sensor Networks, An information processing approach* - Morgan Kaufmann publication

Reference Books:

1. Kazem Sohraby, Daniel Minoli and Taieb Znati- *Wireless Sensor Networks: Technology, Protocols and Applications* -Wiley publication
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "*From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*", 1st Edition, Academic Press, 2014.
3. Ramji Prasad "*OFDM for wireless communication*"
4. Steve Rackley "*Wireless Networking Technology*"

ELECTIVE – II

EC : MODELLING AND SIMULATION

PREREQUISITE:-

COURSE OUTCOMES:-

Student should be able to:

1. Understand applications of basic concepts of probability theory in communication systems.
2. Understand modeling, simulation and testing of stochastic process.
3. Understand simulation of single server queuing system.
4. Understand techniques of random number generation.
5. Understand selection of various parameters for modeling and simulation.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

THEORY:

Unit 1. Review of basic probability and statistics, Random variables and their properties like mean, variance and their correlations.

Unit 2. Simulation output data and Stochastic Processes, Confidence intervals and hypothesis tests for the Mean Law of Large numbers. Systems, models and simulation, discrete event simulation and its components, time advance mechanism.

Unit 3. Simulation of single server queuing system: Problem statement, program organization and logic, determining events and variables, simulation output and discussion.

Unit 4. Random number Generators: Linear congruential generators and other types of generators, emperical and theoritical tests of random number generators.

Unit 5. Selection of input probability distributions. Parameterization of continuous distributions, continuous, discrete and emperical distributions, techniques for assessing sample independence.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICAL'S:

List of Experiments

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Law and Kelten, *Simulation, Modelling and Analysis 3rd* ed., 2000, MGH.
2. Bank and Carson, *Modelling and simulation*, 2nd ed., 2000 PHI.
3. Schwartz M., *Telecommunication Networks, Protocols Modelling and Analysis*, 1997, Addison Wesley.

REFERENCE BOOKS RECOMMENDED:-

1. Leigh J. R., *Modelling and simulation*, 1983, Peter Peregrims.
2. Garcia & Garcia, *Network Modelling, Simulation and Analysis*, 1990, Marcel Dekker Inc.
3. K. C. Raveendranathan, *CommunicationSystem Modelling and Simullation*, 2011, University Press

Elective-II

EC 45659/4559: SATELLITE AND RADAR COMMUNICATION SYSTEMS

PREREQUISITE:- Communication engineering, Antenna and wave propagation

COURSE OUTCOME:-

Students should be able to:

1. Understand basic concepts of Satellite communication and its sub systems.
2. Understand design strategies of s Satellite links and multiple access techniques
3. Understand basic concepts of GPS and its applications.
4. Understand basic concept of Small satellites and its applications.
5. Understand basic concept of RADAR and its applications.

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	
						30	70	40	60	200

Theory :

Unit 1. **Basics of Satellite Subsystems**: Geo-stationary and other Satellite orbits and its location from earth, Satellite Communication Subsystems, Transponders.

Unit 2. **Satellite Channel and link design**: Major Frequency allocation, Design of Downlink & Uplink, Earth Station, Multiple access Techniques including DAMA, SCPC.

Unit 3. **Satellite Navigation & Global Positioning Systems**: Introduction to GPS Positioning principles, GPS receivers and codes, Satellite Signal Acquisition, GPS Signal Level & timing accuracy, differential GPS, VSAT.

Unit 4. **Design of small satellites:Small satellite power budget, applications of small satellites, small satellite bus, power subsystems, structural subsystems, satellite launch vehicle."**

Unit 5. **Radar Systems**: Historical review of Radar, Range equation and its analysis, Different Display Systems like PPI, E- Scope etc. CW & FM Radar: MTI and Pulse-Doppler radar, Radar Scanning & tracking, Application of Radar such as Navigation Systems etc, and their applications.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICAL'S:

List of Experiments:

1. To determine Characteristics of a vacuum tube microwave device.
2. To analyze the different mode of propagation in rectangular waveguide.
3. To understand mechanism of maximum power transfer through the wave guide.
4. To study the power losses through the conductor/ wave guide.
5. To study characteristics of microwave device.
6. To study reflection and scattering behavior of conductor.
7. To study reflection and scattering of power in waveguide.
8. To understand the wave propagation through the ports.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

Text Books Recommended :

1. Timothy Pratt & Charles Bostain, Satellite Communication, 2nd ed. 2001, Wiley.
2. I.J.Bahal and P. Bhatia, Micro strip Antenna, 3rd ed. 2004, New ed, Artech house Inc.
3. Tapan & Sarkar, Smart Antenna. IEEE Press/ CRC Press. 4th ed. 2003.

Reference Books Recommended :

1. Manual of Satellite Communication, 3rd ed.,2008,Tata McGraw Hill.
2. M.I. Skolnik, Introduction to Radar System,3rd ed.,2001,TMH.
3. D. Roddy, Satellite Communication, 4th ed.2001

ELECTIVE – III

EC45701: RF AND MOCROWAVE CIRCUIT DESIGN

PREREQUISITEs: EM fields and waves, Network analysis, Antenna and wave propagation

COURSE OUTCOMES:-

Students should be able to do the following.

1. Selection of RF and Microwave solid state device for a given circuit,
2. Design of various types of solid state amplifiers, oscillators, mixers
3. High frequency passive circuit design
4. Broad band circuit design

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

THEORY :

Unit 1 : RF and Microwave device characterization : Review of VSWR, return loss and S-parameters, Variation of S paremeters with frequency and their representation on Smith chart, Smith chart applications in impedance matching, selection of active and passive components at RF and microwave frequencies, heat sink, packing and mountings

Unit 2 :RF and Microwave amplifiers : RF and Microwave amplifier design with BJT and FET using scattering paremeters, feedback in amplifiers and stability, low-noise and power amplifier design, Gunn and IMPATT diode micorwave amplifiers, broadband amplifiers, third order intermodulation distortaion, measurement of gain and noise figure

Unit 3 :RF and Microwave oscillators : Design of RF and Microwave oscillators using BJT, FET and Microwave devices, crystal oscillators, Frequency multifliers, frequency synthesis using PLL Frequency stability of oscillators and their measurements.

Unit 4 :Mixers and convertors : Mixer characteristics, Miser design, Single ended diode and FET mixers, balanced mixers, up and down convertors

Unit 5 : Passive circuit designs : impedance matching circuits, broad band transformers, directional couplers, circulators, power splitters and combiners, tuners, isolators, resonant cavities, dummy loads, antenna matching circuits.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICAL'S:

List of Experiments

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS :

1. Pozar M., Microwave and RF design for wireless systems, John wiley
2. Watson, Solid state microwave devices, Wiley publications
3. To be filled

REFERENCE BOOKS :

1. Collin, Foundations of Microwave Engg. Wiley publ.
2. To be filled by looking at chapters

ELECTIVE – II

EC__: EMBEDDED SYSTEMS DESIGN

PREREQUISITE:-

COURSE OUTCOMES:-

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	Tu	T	P	Tu	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

Unit-I: Introduction to embedded system, embedded system architecture, classifications of embedded systems, challenges and design issues in embedded systems, fundamentals of embedded processor and microcontrollers, CISC vs. RISC, fundamentals of Vonneuman/Harvard architectures, types of microcontrollers. Selection of a microcontroller for an application.

Unit-II: ATMEGA 8 bit microcontroller architecture Introduction to ATMEGA microcontrollers, their architecture and features, memory mapping, assembly language programming, addressing modes, instruction set.

Unit-III: I/O Programming: ATMEGA I/O ports, I/O bit manipulation programming, timers/counters, programming to generate delay and wave form generation, I/O programming, LEDs, 7segment led's, LCD and motor interfacing.

Unit IV: Serial Communication protocols: Introduction to RS232C, I2C and SPI. Interfacing of GSM, GPS, and Bluetooth modules with microcontroller.

Unit-V: Real Time Operating Systems: Basic concepts of RTOs, semaphore, interrupt routines, inter task communication, and process I/O. Introduction to DSP processors.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICAL'S:

List of Experiments

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS:

(1) Dhananjay V. Gadre, *Programming and Customizing the AVR Microcontroller*, TMH
(2) Shibu KV, *Introduction to Embedded Systems*, MGH

REFERENCE BOOKS:

1. Krishna, *Real Time Systems*, MGH

2. Fedric Leens, *An introduction to I2C and SPI protocols.* IEEE Instrumentation and Measurement Magzine 12(1):8 - 13 · March 2009

3. Byron Francis, *Aurdino: The Complete Beginner's Guide*

Elective-III

IT 45702 MACHINE LEARNING

PREREQUISITE:-

COURSE OUTCOMES: Upon Completion of the course, the students should be able to

1. Develop an appreciation for what is the complexity in learning from data.
2. Understand a wide range of learning algorithms.
3. Understand how to select a variety of learning algorithms to data.
4. Recognize how to execute and evaluate learning algorithms and model selection.

Unit 1: Introduction

overview of machine learning- Different forms of learning- Generative, learning- Gaussian parameter estimation- maximum likelihood estimation- MAP, estimation- Bayesian estimation- bias and variance of estimators- missing and noisy, features- nonparametric density estimation- applications- software tools.

Unit 2: Classification Methods

Nearest neighbour- Decision trees- Linear Discriminant Analysis - Logistic regression-Perceptrons-large margin classification- Kernel methods- Support Vector Machines. Classification and Regression Trees.

Graphical and sequential models- Bayesian networks- conditional independence.

Unit 3: Clustering Methods

Partitioned based Clustering - K-means- K-medoids; Hierarchical Clustering - Agglomerative- Divisive-Distance measures; Density based Clustering - DBScan; Spectral clustering.

Unit 4: Neural networks

Perceptron algorithm- multilayer perceptron's- back propagation nonlinear regression- multiclass discrimination- training procedures- localized network structure- dimensionality reduction interpretation.

Unit 5: Reinforcement Learning

Single State Case: K-Armed Bandit, Elements of Reinforcement Learning, Model-Based Learning-Value Iteration and Policy Iteration, Temporal Difference Learning-Exploration Strategies, Generalization.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICAL'S:

List of Experiments

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

Text and Reference Books

1. T. Hastie, R. Tibshirani and J. Friedman, "Elements of Statistical Learning", Springer, 2009.
2. E. Alpaydin, "Machine Learning", MIT Press, 2010.
3. K. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
4. C. Bishop, "Pattern Recognition and Machine Learning, Springer", 2006.
5. Shai Shalev-Shwartz, Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.
6. John Mueller and Luca Massaron, "Machine Learning For Dummies", John Wiley & Sons, 2016.