B.E. II YEAR
MA 25014 : MATHEMATICS – III

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	1	-	70	30	-	-	100	4	-	4

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, Δ and ∇, Newton's forward 513
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 and design BJT based electronic circuits.
4. Design various applications based on JFET and MOSFET.
5. Acquire the knowledge of fabrication methods of integrated circuits and characteristics of various devices.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	2	70	30	40	60	200	3	1	4

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. Represent mathematically and analyze different types of signals and systems.
2. Define various properties of LTI systems and determine the response of an arbitrary excitation.
3. Analyze continuous and discrete systems in time and frequency domain using Fourier transforms.
4. Apply the knowledge of Laplace Transform and z-Transforms to analyze LTI systems.
5. Apply sampling and reconstruct a signal and understand applications of signals and systems.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	-	70	30	0	0	100	3	-	3

UNIT 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: 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.

UNIT 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).

UNIT 3: Fourier analysis of signals and systems:

Fourier series representation of periodic signals: Trigonometric and exponential forms, properties of Fourier series, Continuous-time and Discrete-Time Fourier transform representation of signals and their properties, Fourier transforms 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, Magnitude and Phase response, Time and frequency domain aspects of systems, filtering.

UNIT 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, system behavior, 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, system behavior, causality, stability, Unilateral Z Transform.

UNIT 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: ideal interpolator, zero-order hold, first-order hold. Applications of signals and systems.

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

TEXT BOOKS RECOMMENDED:

1. Signals and Systems : Alan. V. Oppenheim, Allan S. Willsky and S. Hamid Nawab, 2nd Edition, Prentice Hall.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. Signals and Systems: Tarun Rawat, Oxford Higher education.

REFERENCE BOOKS RECOMMENDED:

1. Signals and Systems: Hwei P Hsu, Schaum's Outline Series, 2nd Edition, Tata Mc-Graw Hill Education Private Limited.
2. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, 1998.
3. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, 1998.

EE 25004: NETWORK THEORY & ANALYSIS

PREREQUISITE: - Engg. Mathematics, Physics

COURSE OUTCOMES:-

Student should be able to:

1. Understand the sources and components used in electrical networks.
2. Analyze the electrical networks.
3. Design the two port network.
4. Analyze the electrical networks using various theorems
5. Enhance the mathematical knowledge of circuit analysis and to solve engg. problems.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	2	70	30	40	60	200	3	1	4

THEORY:

Unit 1. Lumped circuits and Kirchoff'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 State 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.

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

PRACTICALS:

List of Experiments

1. To determine the equivalent networks by application of Thevenin's Theorem.
2. To determine the equivalent networks by application of Norton's Theorem.
3. Study of Transient in RC circuits.
4. Study of series and parallel resonance phenomena.
5. To verify the voltage and current relations in star and delta connected systems.
6. To verify open circuit parameter and short circuit parameter for two port network.
7. Verification of superposition theorem.
8. Verification of reciprocity theorem.
9. Verification of maximum power transfer theorem.

ASSESMENT:

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

TEXT BOOKS RECOMMENDED:-

1. Van Valkenberg ,Network Analysis,3rd ed.,2006, PHI
2. Desoer and Kuh ,Basic circuit theory, 2nd ed., 2009, MGH
3. Scott ,elements of Linear circuits Vol.I and II, 2nd ed., 2000, Addison-Wesley Pub

REFERENCE BOOKS RECOMMENDED:-

1. William Hyat, Engineering Network Analysis, 8th ed., 2012, Tata MGH

EC25018: DIGITAL SYSTEM DESIGN

PREREQUISITE: - Engineering Physics, Electronic Devices

COURSE OUTCOMES:-

Student should be able to:

1. Solve the logical expressions through Boolean algebra and k-map.
2. Implement variety of logical devices using combinational circuits concepts.
3. Analyze sequential circuits like Registers and Counters using flip-flops.
4. Classify different logic families, semiconductor memories and PLD devices.
5. Design converters which facilitate the conversion of real world analog signals to digital and vice versa.

Hours/ Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	2	70	30	40	60	200	3	1	4

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 OUTCOMES:-

Student should be able to:

1. Learn the basics of logic gates and.
2. Implement the logic functions and construct basic combinational circuits.
3. Design & verify the functionalities of code converter circuits, parity generator & checker & Magnitude Comparator.
4. Analyze the logic functions using multiplexers.
5. Apply the sequential logic to design basic logic circuits.

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.
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.
10. Design and implementation of various types of flip-flops using JK Flip-Flop.
11. Design of 3-bit synchronous counter & study of its operation.

Text Books:

1. M. Morris Mano, "Digital Logic And Computer Design", Pearson, 3rd Edition, 2001.
2. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition, 2006.

Reference Books:

1. Samuel C Lee, "Digital Circuits and Logic Design", Prentice Hall, 1976.
2. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989.
3. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

HU 22005/24005/25005/27005: ECONOMICS FOR ENGINEERS

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	-	70	30	-	-	100	3	-	3

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