Course Title	MATHEMATICS-IV				B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1521301	BS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs		

Course Objectives:

- To train the students in getting a thorough understanding of the fundamentals of special functions.
- To prepare students for lifelong learning and successful careers using analytic function, conformal mapping, complex integration and residues

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Define** Beta and gamma functions and solve definite integrals, **Define** analytic function, singularities, poles and residues.
CO 2	**Solve** Bessel and Legendre's equations in terms of polynomials.
CO 3	**Determine** the differentiation of complex functions used in engineering problems.
CO 4	**Discuss** the various special transformations and integration of Complex functions.
CO 5	**Analyze** real definite integrals in definite regions.

UNIT I

Special Functions: Beta function - Gamma function - Relation between Beta and Gamma functions and their properties. – Evaluation of improper integrals – Power series method.

UNIT II

Bessel functions – Solution of Bessel equation - Recurrence formulae for Jn(x) - Generating function for Jn(x) - Jacobi series – Orthogonality of Bessel functions - Legendre polynomials – Solution of Legendre's equation – Legendre Polynomials - Rodrigue's formula -Generating function for Pn(x) - Recurrence formulae for Pn(x) - Orthogonality of Legendre polynomials.

UNIT III

Functions of a complex variable – Limit – Continuity -Differentiability - Analytic function – Properties – Cauchy – Riemann equations in cartesian and polar coordinates - Harmonic and Conjugate harmonic functions. - Construction of analytic function using Milne - Thomson method. Applications to flow problems.

UNIT IV

Conformal Mapping: Some standard transforms – translation, rotation, magnification, inversion and reflection. Bilinear transformation –invariant points. Special conformal transformations w = ez , z2 , sinz and cosz. Complex integration: Line integral - Evaluation along a path and by indefinite integration - Cauchy's theorem - Cauchy's integral formula - Generalized integral formula.

UNIT V

Singular point – Isolated singular point – Simple pole, Pole of order m - Essential singularity. Residues: Evaluation of residues by formula. Cauchy's residue theorem - Evaluation of the

real definite integrals of the type (i) Integration around the unit circle ∫ f(cosq, sinq)dq p (ii) integration around a small semi circle ∫ f(x)dx.

Text Books:

1. Dr. B.S Grewal, Higher Engineering Mathematics, Khanna Publishers-42 edition.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Willey Publications, 9th edition- 2013.
3. Greenberg Michael D, Advanced Engineering Mathematics, Cengage Publishers.
4. Neil Opeter V, Advanced Engineering Mathematics.

Reference Books:

1. B.V.Ramana, Higher Engineering Mathematics, Mc.Graw Hill Education (India) Private Limited.
2. N. Bali, M Goyal, Advanced Engineering Mathematics by Firewall Media 7th edition.
3. E. Rukmangadachari & E. Keshava Reddy, Engineering Mathematics, Volume – III, Pearson Publisher.
4. Greenspan Harvey P Benney David J Turner James E, Calculus an introduction to applied Mathematics.

Course Title	ELECTROMAGNETIC FIELDS				B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1504302	PN	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs		

Course Objectives:

- Get foundational education in static electromagnetic fields, and time varying electromagnetic waves.
- Get the knowledge of Maxwell's equations.
- Analyze and solve the problems of electric and magnetic fields that vary with three dimensional spatial co-ordinates as well as with time

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Use vector algebra, and vector calculus.
CO 2	Calculate the Electromagnetic fields due to various sources
CO 3	Understand the various currents, dielectrics and capacitors
CO 4	Understand theorems relating electromagnetic fields and potentials
CO 5	Apply Boundary conditions to obtain fields in various conditions

UNIT-I

Electrostatic Fields: Vector Algebra, Co-ordinate systems, Vector Calculus, Coulomb's law, Electric field intensity, Field due to different charge distributions, Line charge, Surface charge and volume charge distributions. Electric flux and Flux density, Gauss law and its applications.

UNIT-II

Energy and Potential: Divergence theorem. Maxwell's equations for electrostatics in integral and point forms. Energy expended in moving a point charge in an electric field, Line integral, Potential difference and potential, Potential field of a point charge and system of charges, Potential gradient, Dipole, Energy density in the electrostatic field.

UNIT-III

Conductors, Dielectrics and Capacitances: Current and current density, Convection and conduction currents, Continuity of current, metallic conductors, nature of dielectric materials, Capacitance-Parallel plate, Coaxial and Spherical Capacitors, Poisson's and Laplace equations-examples.

UNIT-IV

Magneto static Fields: Biot-savart's law, Ampere's law and applications, Magnetic flux density, Maxwell's two equations for magneto static fields, magnetic scalar and vector potentials, Forces due to Magnetic fields, Ampere's force law, inductances and magnetic energy, illustrative problems.

UNIT-V

Maxwell's Equations: Faraday's law and transformer emf, Inconsistency of ampere's law and displacement current density, Maxwell's equations in different final forms and word statements, conditions at boundary surface Dielectric-Dielectric and Dielectric-conductor interfaces, illustrative problems.

Text Books:

1. Hayt W.H., Engineering Electromagnetics, 7th Edition, TMH, 2006.
2. Matthew N.O. Sadiku, Elements of Electromagnetics, 4th Edition, Oxford University Press, 2008.
3. Jordan and Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition, Pearson Ed. 2000.
4. Joseph A. Edminister, "Electromagnetics", Schaum's Outline, McGraw-Hill, 2nd edition, 1994.

Reference Books:

1. G.S.N. Raju, "Electromagnetic Field Theory and Transmission Lines", 1st Edition, Pearson Ed. 2013.
2. John D. Kraus, "Electromagnetics", 3rd Edition, Mc Graw-Hill, 1988.
3. Nanapeneni Narayana Rao, "Elements of Engineering Electromagnetics", 6th Edition, Pearson Ed. 2009
4. Clayton Paul , Syed Nasar and Keith Whites, "Introduction to Electromagnetic Fields", McGraw-Hill Education.

Course Title	ELECTRONIC DEVICES AND CIRCUITS				B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1504303	PJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs		

Course Objectives:

- To understand electronic devices, including diodes, bipolar junction transistors and FET.
- To understand basic circuits of the electronic devices.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe the operation of various Diodes, transistors and their applications
CO 2	Analyze rectifiers with and without filters
CO 3	Compare BJT and FET circuits under different configurations
CO 4	Illustrate the Biasing of BJT and FET.
CO 5	Use various special semiconductor devices indifferent applications.

UNIT-I

Semiconductors: Intrinsic and extrinsic semiconductors, mobility and conductivity, Fermi level and carrier concentration of semi-conductors, Drift and diffusion currents, continuity equation, Hall effect. PN junction diode: Construction and operation of PN Junction diode, V-I Characteristics, Temperature Dependence, Static and dynamic resistance, Transition and Diffusion Capacitance, Zener diode and photo diode.

UNIT-II

Rectifiers: Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics.

UNIT-III

Bipolar Junction Transistors: NPN and PNP junction Transistors, Current components, CB, CE and CC Configurations and their Input and Output Characteristics, Comparison of CE, CC and CB, Saturation, Cutoff and Active Region, α, β and γ Parameters and the relation between them.

UNIT-IV

Field Effect Transistor (FET): JFET and its characteristics, Pinch off Voltage, Drain Saturation Current, MOSFET–Enhancement and Depletion Modes, Small signal models of FET, Biasing of FETs.

UNIT-V

Transistor Biasing Circuits: Various Biasing Circuits, Thermal Runaway, Stabilization and compensation, Thermal Stability, Transistor as an Amplifier. Special Semiconductor Devices: Tunnel Diode, LED, Schottky Barrier Diode, Varactor Diode, Photo transistor, Uni-Junction transistor (UJT), SCR, LDR.

Text Books:

1. Jacob Millman and C. Halkias, “Electronic devices and circuits”, McGraw Hill.
2. Jacob Millman and C. Halkias, “Integrated Electronics Analog Digital Circuits”, McGraw Hill.
3. R.L. Boylestad, “Electronic Devices and Circuit Theory”, Prentice Hall Publications.
4. N.Salivahanan, and N.Suresh Kumar, “Electronic Devices and Circuits”, TMH ,3rd Edition, 2012.

Reference Books:

1. David A. Bell, “Electronic Devices and Circuits”, Oxford University press , 5th Edition, 2008.
2. K. Lal Kishore, “Electronic Devices and Circuits”, BSP. 2nd Edition, 2005
3. S. Sedra and K.C. Smith, “Microelectronic Circuits”, Oxford University Press, 5th Edition
4. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education

Course Title	SIGNALS & SYSTEMS					B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1504304	PJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs			

Course Objectives:

- The objective of the course is to analyze the response of linear, time-invariant dynamic systems to standard input signals.
- To Study the different standard signals that can be applied to the various systems for the estimation of their performance.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Identify the various signals and operations on signals
CO 2	Describe the spectral characteristics of signals.
CO 3	Illustrate signal sampling and its reconstruction
CO 4	Apply convolution and correlation in signal processing.
CO 5	Analyze continuous and discrete time systems.

UNIT-I

Introduction: Definition and Classification of Signals, Elementary signals, Basic operations on signals. Fourier series representation of periodic signals: Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions. Representation of function by a set of mutually orthogonal functions, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Spectrum and its significance, Amplitude and Phase spectra.

UNIT-II

Fourier transforms: Fourier transform (FT), Fourier transform of standard signals, properties of Fourier transforms, Fourier transforms involving impulse function, Fourier transform of periodic signals, UNIT-III Discrete Time Signals: Sampling of continuous time signals, Sampling theorem, Reconstruction of signal from its samples, effect of under sampling – Aliasing. Unit impulse, step, ramp, and exponential sequences, Periodicity of Discrete-time signals, Operations on Discrete-time signals.

UNIT III

Signal transmission through LTI systems: Systems, Classification of Systems, Linear time invariant (LTI) system, Transmission of signals through LTI systems, Transfer function of a LTI system. Distortion less transmission through LTI system, Causality & Stability.

UNIT-IV

Discrete Time Systems: Definition, classification, Linear Shift Invariant(LSI) system, Stability , Causality , Linear constant coefficient difference equation , Impulse response , Discrete time Fourier transform , Properties , Transfer function , System analysis using DTFT. Convolution and correlation of signals and sequences: Graphical method of

convolution, auto correlation and Cross correlation of functions, properties of correlation function, Energy density spectrum, Power density spectrum, Relation between convolution and correlation, Applications of convolution and correlation.

UNIT-V

Laplace Transform: Definition , ROC , Properties , Inverse Laplace transform , The S-plane and BIBO stability , Transfer functions , System response to standard signals.

Text Books:

1. Simon Haykin, "Communication Systems", 2nd Edition, Wiley-Eastern,2003.
2. Oppenheim AV and Willisky, "Signals and Systems", 2nd Edition, Pearson Ed,1997.
3. B.P. Lathi, "Principles of Linear systems and signals," Oxford Univ. Press, Second Edition International version,2009.
4. Tarun Kumar Rawat, "Signals and Systems", Oxford University Press.

Reference Books:

1. Simon Haykin, Van Veen, and Wiley, "Signals & Systems", 2nd Edition,2003.
2. Luis F. Chaparro, "Signals and Systems using MATLAB," Academic Press,2011.
3. P. Ramesh Babu, R. Ananda Natarajan, "Signals and Systems", 2nd edition, SciTech Publications,2006.
4. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms,and Applications, 4 th Edition, PHI,2007.

Course Title	NETWORK THEORY					B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1502305	PN	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs			

Course Objectives:

- This course introduces the concepts of circuit analysis which includes three phase circuits, transient analysis of D.C. and A.C excitations, various Network functions and synthesis

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** the basic concepts of magnetic circuits, resonance and network functions
CO 2	**Solve** DC and AC circuits by using various theorems.
CO 3	**Analyze** RL, RC and RLC for DC and AC transient response
CO 4	**Analyze** two port networks for Z, Y, ABCD, H parameters And its relationship between them

UNIT – I

Network Theorems: Superposition Theorem, Thevinin's Theorem, Norton's Theorem, Compensation Theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millmen's theorem, Tellegen's theorems for D.C and Sinusoidal Excitations.

UNIT – II

Three Phase Circuits: Advantages of Three phase system, Phase sequence, balanced and unbalanced systems – magnitude & phasor relationship between line and phase voltages and currents in balanced Y and Δ circuits. Analysis of balanced Three phase circuits with Y and Δ connected loads –Analysis of unbalanced loads- Neutral displacement method, Y-Δ conversion and loop current method. Measurement of Three phase power by two wattmeter method, Measurement of Three phase reactive power by single wattmeter method.

UNIT – III

DC Transient Analysis: Determination of Initial Conditions – Transient response of R-L, R-C and R-L-C circuits for DC–Solution method using differential equation and Laplace transforms.

UNIT – IV

AC Transient Analysis: Transient response of R-L, R-C and R-L-C series circuits for sinusoidal excitations – Solution method using differential equation and Laplace transforms. Analysis of Electrical Circuits non-sinusoidal periodic waveforms.

UNIT – V

Two Port Parameters: One port and two port networks, driving point and transfer functions of Networks. Open circuit impedance & short circuit admittance parameters, hybrid & inverse hybrid parameters, transmission & inverse transmission parameters, Inter-relationships between parameter sets – Series, parallel & cascade connection of two ports –

condition for symmetry & reciprocity of two port Networks in terms of different parameters – Terminated two port Networks.

Text Books:

1. Theory and Problems of Electrical Circuits – Joseph A. Edminister – Schaum Series, 1st Edition – TMH.
2. Circuit Theory -A.Chakrabarti, DhanapatRai & Co publications.
3. Electrical Circuits - N.Sreenivasulu, Reem publications.
4. Network Analysis – Van Valkenburg - 3rd edition, PHI.

Reference Books:

1. Circuits & Networks – A. Sudhakar, Shayammohan. S. Pillai, 4th Edition – TMH.
2. Networks and Systems – D. Roy Chowdari – New Age International
3. Network Analysis with applications – Stanely - Pearson education 4th edition.
4. Network Analysis by G.K.Mittal, Khanna Publishers.

Course Title	ELECTRICAL MACHINES				B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1512306	PJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs		

Course Objectives:

- To learn concepts of Electrical Machines.
- To understand parameters of DC Machine and single phase motors

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the concepts of Electrical Machines.
CO 2	Perform OC and SC tests on transformers
CO 3	Model the stator and rotor designing aspects of induction motors.
CO 4	Analyze the parameters of DC Machine
CO 5	Classify the single phase motors

UNIT-I

DC Machines: Principle of operation of DC generators-EMF equation –types of generators – magnetisation and load characteristics-applications –DC motor –torque equation –types and characteristics -3 point starter –efficiency calculation-speed control.

UNIT II

Transformers: Single phase transformers-principle of operation –types-constructional features-EMF equationphasor diagram on no load and load-equivalent circuit –loss and efficiency-regulation –OC and SC tests – predetermination of efficiency and regulation.

UNIT III

Three Phase Induction Motors: Three phase induction motor-constructional features-principle of operation –types-slip-torque characteristics-efficiency calculations-starting methods.

UNIT IV

Synchronous Machines: Synchronous generators-constructional features-types-EMF equation distribution and coil span factor-regulation by synchronous impedance method-principle of operation of synchronous motor-method of starting.

UNIT V

Single Phase Motors: single phase induction motors-constructional features-shaded pole motors-capacitor motor-AC servo motor-AC tachometers-Synchros-stepper motor-characteristics and applications.

Text Books:

1. S.K.Battacharya, Electrical Machines- -TMH
2. Edward Hughes, Electrical Technology- 7th edition-Pearson Education.
3. B. L. Theraja & A. K. Theraja, A Text Book of Electrical Technology, S. Chand & Company Ltd.
4. J. B. Gupta, Electrical Machines, Kataria Publications.

Reference Books:

1. Electrical Machines by I.J. Nagarath & D. P. Kothari, TMH, 7th Edition
2. S. Bimbra, . Electrical Machines, Khanna Publishers
3. I.J. Nagarath & D.P. Kothari, Electrical Machines , TMH, 7th Edition 2005
4. R.K. Rajput, DC Machines & Transformers, Laxmi Publications

Course Title	ELECTRICAL ENGINEERING LAB				B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1512307	PN	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		--	--	3	2	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To give practical knowledge of Network Theorems and Two port Networks.
- To make students perform various tests and learn about DC motors, generators, and single phase transformers.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Verify the characteristics of Network Theorems and Twoport Networks
CO 2	Perform various tests and learn about DC motors, generators and single phase transformers.
CO 3	Design single phase transformers.

Part-A:

1. Verification of KVL and KCL.
2. Series and parallel Resonance – Resonant frequency, Bandwidth and Q –factor determination for RLC network.
3. Two port network parameters – Determination of Z and Y parameters and analytical verification.
4. Two port network parameters – Determination of ABCD and h-Parameters and analytical verification. 5. Verification of Superposition and Reciprocity theorems.
6. Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads.
7. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.

Part-B:

1. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance and critical speed.
2. Swinburne's Test on DC shunt machine (Predetermination of efficiency of a given DC machine working as motor and generator)
3. Brake test on DC shunt motor. Determination of performance characteristics.
4. Speed control of DC Shunt Motor
5. OC & SC tests on Single – Phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
6. Load test on single phase transformer.
7. Determination of voltage regulation of an alternator by synchronous impedance method.

Note: Any 10 of the above experiment are to be conducted, at least 5 from each part.

Course Title	ELECTRONIC DEVICES & CIRCUITS LAB				B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1504308	PJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		--	--	3	2	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To know the different devices- their characteristics and applications
- To study the design and analysis of amplifier circuits

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Verify the V-I Characteristics of various diodes.
CO 2	Examine the load characteristics of rectifiers.
CO 3	Verify the Input and Output characteristics of various transistors.

Electronic Workshop Practice (in 3 lab sessions):

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB s
2. Identification, Specifications and Testing of Active Devices, Diodes, BJTs, Low power JFETs, MOSFETs, Power Transistors, LEDs, LCDs, SCR, UJT.
3. Study and operation of Millimetres (Analog and Digital), Function Generator, Regulated Power Supplies
4. Study and Operation of CRO .

List of Experiments: (Any ten from the following)

1. Forward and Reverse bias characteristics of PN Junction diode
2. Zener diode characteristics and Zener diode as Voltage Regulator.
3. Input and Output characteristics of Transistor in CB Configuration.
4. Input and Output characteristics of Transistor in CE Configuration.
5. Half Wave Rectifier With and without filter.
6. Full wave Rectifier With and without filter.
7. Bridge rectifier with and without filter.
8. FET characteristics
9. VI characteristics of LED
10. Characteristics of Photo diode
11. Characteristics of Photo transistor
12. SCR Characteristics.
13. UJT Characteristics.
14. LDR Characteristics.

Note: Change at least two experiments every year.

Equipment required for Laboratories:

1. Regulated Power supplies (RPS) - 0-30v.
2. CROs - 0-20M Hz.

3. Function Generators - 0-1 M Hz.
4. Multimeters
5. Decade Resistance Boxes/Rheostats –
6. Decade Capacitance Boxes
7. Micro Ammeters (Analog or Digital)- 0-20 μA, 0-50μA, 0-100μA, 0-200μA.
8. Voltmeters (Analog or Digital) - 0-50V, 0-100V, 0-250V.
9. Electronic Components - Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs, LDRs, MOSFETs, Diodes (Ge & Si type), Germanium and Silicon transistors (NPN & PNP type)

Course Title	ANALOG COMMUNICATIONS				B. Tech. ECE IV Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1504401	PJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs		

Course Objectives:

- To analyze various transmitter and receiver functions and circuits
- To analyze different modulation and demodulation techniques.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand different blocks in communication system and how noise affects communication.
CO 2	Distinguish between different amplitude modulation and angle modulation schemes.
CO 3	Construct AM, FM Transmitters and different radio receiver circuits for various applications.
CO 4	Compare various Pulse modulation and demodulation techniques.
CO 5	Verify sampling theorem

UNIT-I

Introduction to communication systems: Modulation and its needs and types, Fundamental physical limitations, Electromagnetic Spectrum and Area of Applications. **Amplitude modulation:** Hilbert Transform and its properties, Pre-envelope and band pass signals, Full AM, DSBSC and SSB, Generation and detection methods, VSB, frequency translation, FDM, Nonlinear distortion and Inter Modulation.

UNIT-II

Angle modulation: Phase and frequency modulation, NBFM, WBFM, Multi-tone FM, Transmission band width of FM, direct and indirect generations of FM, Demodulation methods, Nonlinear effects, FM versus AM.

UNIT-III

Block diagram study of radio broadcast AM and FM transmitters: Super heterodyne receivers, choice of IF, AGC, Tracking-characteristics of radio receivers, FM stereo.

UNIT-IV

Noise: External and internal sources of noise, Noise calculations, Noise equivalent resistant, Noise figure, Noise temperature, Effect of noise in AM and FM modulation system, FM threshold effect, Pre-emphasis and de-emphasis.

UNIT-V

Sampling: Review of sampling theorem, Practical aspects of sampling; pulses of finite duration, Flat top sampling.

Pulse Analog Modulation: PAM generation and detection, PDM and PPM, Generation and detection, Spectra, Synchronization.

Text books:

1. Simon Haykin, "Communication Systems", Wileyestern,1978, 4th edition.
2. B.P. Lathi "Modern Digital and Analog communication system", Oxford University Press, 2nd Edition, 1996.
3. A. Bruce Carlson "Communication systems", Mc Graw Hill, ISE, 5thedition.
4. Simon Haykin, Micheal Mohar, "An Introduction to Analog and Digital Communications" , John Wiley, 2007.

Reference Books:

1. Dennis Roddy and John Coolen, "Electronic communications" Prentice-Hall of India Private Limited, 1981.
2. Kennedy and Davis, "Electronic communication systems", 4thEdition, Mc Graw International edition, 1992.
3. Taub and Schilling, "Principles of communication Systems", Mc Grace Hill, ISE, 1971.
4. Shanmugam K Sam, "Digital and Analog Communication Systems", John Wiely and sons.

Course Title	SWITCHING THEORY AND LOGIC DESIGN				B. Tech. ECE IV Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1504402	PJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs		

Course Objectives:

- Systems, logic gates, Combinational and sequential circuits To provide the students with an introduction to the fundamentals of Number

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Use number systems and binary codes.
CO 2	Understand the postulates, theorems and properties of Boolean algebra.
CO 3	Correlate the Boolean expression and their corresponding logic diagram.
CO 4	Design Combinational & sequential logic circuits.
CO 5	Solve Switching functions using Programmable Logic Devices.

UNIT I

Number Systems & Codes: Overview of number systems –complement representation of negative numbers- binary arithmetic, binary codes-error detecting & error correcting codes –Hamming codes.

UNIT II

Boolean Algebra and Minimization of Switching Functions: Fundamental postulates of Boolean Algebra - Basic theorems and properties –Canonical and Standard forms- Minimal SOP and POS forms ,Algebraic simplification digital logic gates –universal gates- Multilevel NAND/NOR realizations. The map method, tabulation method.

UNIT III

Combinational Logic Design: Design using conventional logic gates, Encoder, Decoder, Multiplexer, De- Multiplexer, Realization of switching functions using multiplexer, Parity bit generator, Code-converters, Hazards and hazard free realizations.

UNIT IV

Programmable Logic Devices: Basic PLD's-ROM, PROM, PLA, and PLD, Realization of Switching functions using PLD's.

UNIT V

Sequential Circuits: Synchronous and Asynchronous sequential circuits, Flip-flops-Triggering and excitation tables, Flip flop conversions, shift registers, Design of Synchronous and Asynchronous counters, Ring and Johnson counters. Serial Binary adder, Sequence detector.

Text Books:

1. ZVI Kohavi, Switching & Finite Automata theory –, TMH, 2ndEdition.
2. Morris Mano, "Digital Design", PHI, 3rd Edition,2006.
3. A. Anand Kumar, "Switching Theory & Logic Design", 2008,PHI.
4. John M. Yarbrough, "Digital Logic Applications and Design", Thomson Publications.

Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition,2009.
2. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition, 2006.
3. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill,1989
4. William I. Fletcher, "An Engineering Approach to Digital Design",PHI.

Course Title	ELECTRONIC CIRCUIT ANALYSIS					B. Tech. ECE IV Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1504403	PJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs			

Course Objectives:

- To provide knowledge about single stage amplifiers, multi-stage amplifiers, feedback amplifiers, large signal amplifiers, differential, tuned amplifiers and FET amplifiers and their analysis.
- To provide knowledge about working and design of oscillators.
- Different transistor models at high frequencies.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply the h – parameter model to amplifiers circuit design.
CO 2	Describe the various multistage amplifiers using BJT and FET.
CO 3	Design negative feedback amplifier circuits and oscillators.
CO 4	Analyze and design power amplifier circuits.
CO 5	Interpret the tuned amplifiers and tuned cascaded networks functionality.

UNIT-I

General Amplifiers: Concept of amplifier, Voltage gain, current gain, input and output resistances, conversion efficiency, frequency response, Bandwidth, Distortion, classification of amplifiers, amplifier circuits using BJT and FET and their biasing schemes.

UNIT-II

BJT Amplifiers: Hybrid model (h- parameters), small signal analysis of a single stage BJT Amplifiers, Comparison of CE, CB and CC amplifiers, Approximate model analysis, Effects of coupling and bypass capacitors on low frequency response, Hybrid-Π model at high frequencies, parameters f_α , f_β and f_T.

UNIT-III

FET Amplifiers: Small signal model, Analysis of CS, CD and CG amplifiers, High frequency response.

Multistage Amplifiers: Types of coupling, choice of amplifier configurations, overall gain and band width of n-stage amplifier, Analysis of two-stage RC coupled amplifier, Darlington and Bootstrap circuits.

UNIT-IV

Feedback Amplifiers: Feedback concept, classification, Effects of negative feedback on gain, stability, noise, distortion, bandwidth, input and output resistances. Different types of feedback circuits.

Sinusoidal oscillators: Barkhausen criterion, RC phase shift, Wein bridge, Hartley, Colpitts and Crystal Oscillators.

UNIT-V

Tuned amplifiers: Introduction, Q-factor, small signal tuned amplifiers, effect of cascading single tuned amplifiers on bandwidth, effect of cascading double tuned amplifiers on bandwidth, stagger tuned amplifier , stability of tuned amplifiers.

Power amplifiers: Classification of power amplifiers, efficiency of class-A, class-B, class-C and class- D power amplifiers, complementary symmetry push pull power amplifier.

Text Books:

1. Jacob Millman, Christos C Halkias, "Integrated Electronics", McGrawHill.
2. Allen Mottershead, "Electronic Devices and Circuits" Prentice –Hall ofIndia
3. S. Salivahanan– "ElectronicDevicesandCircuits"–TMH,3rdEdition,2012.
4. K.Lal Kishore, Electronic Devices and Circuits-, BSP, 2nd Edition, 2005.

Reference Books:

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 9th Edition,2008.
2. Donald A Neamen, "Electronic Circuits Analysis and Design", Tata McGraw-Hill, 3rd Edition,2009.
3. Sedra, Kenneth, Smith, "Microelectric circuits", Oxford University Press, 5th Edition,2011.
4. J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988

Course Title	PULSE AND DIGITAL CIRCUITS				B. Tech. ECE IV Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1504404	PJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs		

Course Objectives:

- To provide the fundamentals of linear and nonlinear wave shaping and multivibrators.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Demonstrate knowledge in constructing and analyzing linear and non-linear wave shaping circuits
CO 2	Use Logic gates and Sampling gates to develop digital systems
CO 3	Design and Develop Switching Circuits and Multivibrator Circuits
CO 4	Apply synchronization and frequency division concepts in advanced applications
CO 5	Distinguish among various logic families and Select the appropriate one for an application

UNIT I

Linear Wave shaping: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. High Pass RC network as Differentiator, Low Pass RC network as integrator, attenuators and its applications as a CRO probe, illustrative Problems

UNIT II

Non-linear Wave shaping: Diode clippers, Transistor clippers, clipping at two independent levels, Comparators, applications of voltage comparators, clamping operation, clamping circuits taking source and Diode resistances into account, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Synchronized Clamping.

UNIT III

Multivibrators: Transistor as a switch, Transistor-Switching Times, Analysis and Design of Bistable, Monostable, Astable Multivibrators and their triggering circuits. Schmitt trigger circuit using BJT.

UNIT IV

Time Base Generators: General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator, Transistor Current time base generators.

Synchronization and Frequency Division: Pulse Synchronization of relaxation Devices, Frequency division in sweep circuit, Stability of relaxation Devices, Astable relaxation circuits, Monostable relaxation circuits, Synchronization of a sweep circuit with symmetrical signals.

UNIT V

Sampling Gates: Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Four Diode Sampling Gate, Reduction of pedestal in gate circuits, Six Diode Gate, Applications of Sampling Gates.

Digital Logic Circuits: AND, OR, & NOT gates using Diodes, and Transistors, Analysis of DCTL, RTL, DTL, TTL, ECL, IIL, MOS, CMOS Logic Families, and comparison between the logic families.

Text Books:

1. J. Millman, H. Taub and Mothiki S. Prakash Rao, " Pulse, Digital and Switching Waveforms", TMH , 2nd Edition,2008.
2. Brinton B. Mitchell, "Semiconductor Pulse Circuits with Experiments" Thomson Learning (1June 1970).
3. David A. Bell, "Solid State Pulse Circuits", PHI, 4th Edition,2002.
4. Sonde, B. S., "Introduction to system Design using IC's," Wiley, 2/e,1994.

Reference Books:

1. Millman, J and Grabel A., Microelectronics, 2 nd. Edition, Mc GrawHill.
2. A. Anand Kumar, "Pulse and Digital Circuits", PHI,2005.
3. Ronald J. Tocci, "Fundamentals of Pulse and Digital Circuits", 3rd Edition,2008
4. J.Millman, H.Taub and Mothiki S. Prakash Rao, " Pulse, Digital and Switching Waveforms", TMH, 2nd Edition, 2008.

Course Title	ELECTROMAGNETIC WAVES & TRANSMISSION LINES				B.Tech. ECE IV Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1504405	PJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs		

Course Objectives:

- To give the basic education in time varying electromagnetic waves.
- To develope analytical skills for understanding propagation of electromagnetic waves in different media.
- To understand the concepts of transmission lines & their applications.
- To provide basic knowledge about guided waves and wave guides.
- To know about cavity resonators.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understand Wave propagation in loss less and conducting media
CO 2	Analyze Polarization ,Reflection and Refraction of plane waves
CO 3	Calculate different constants of Transmission line
CO 4	Design single and double stub matching
CO 5	Understand the propagation of EM waves in waveguides

UNIT-I

Waves in Lossless and Lossy Media: Wave equations for conducting and perfect dielectric media, Uniform plane waves-Definition, All relations between E&H, Sinusoidal variations, Wave propagation in loss less and conducting media, conductors& dielectrics-characterization, wave propagation in good conductors and good dielectrics.

UNIT-II

Polarization, Reflection, and Refraction: Polarization – Linear, Circular, and Elliptical polarizations. Reflection and Refraction of plane waves-Normal and Oblique incidences for both perfect conductors and dielectrics, Brewster angle, Critical angle and total internal reflection, Surface impedance, pointing vector and pointing theorem-applications, power losses in a plane conductor, illustrative problems.

UNIT-III

Transmission Lines: Types, parameters, Transmission line equations, Primary & Secondary constants, Expression for characteristic impedance, Propagation constant, Phase and group velocities, infinite line concepts, Loss less and low loss characterization, Distortion- condition for Distortion less and minimum attenuation, Loading- Types of loading, illustrative problems.

UNIT-IV

Impedance Matching: Input impedance relations, SC and OC lines, Reflection coefficient, VSWR, UHF lines as circuit elements, impedance transformations, and Smith chart, single and double stub matching, illustrative problems.

UNIT-V

Wave Guides: Microwave frequencies advantages and applications, Waves between parallel conducting planes, TE and TM waves, Rectangular wave guides, Excitation of wave guides. Wave equations, rectangular and circular waveguides for TE and TM modes, Cutoff frequency and wave length, Group and phase velocity, Wave impedance, Guide attenuation, Rectangular and cylindrical resonators, Q of the cavity resonators.

Text Books:

1. Matthew N.O. Sadiku, "Elements of Electromagnetic," Oxford Univ. Press, 4th ed., 2008.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetic," TMH, 7th ed., 2006.
3. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems "PHI, 2nd Ed., 2000.
4. G.S.N. Raju, "Electromagnetic Field Theory and Transmission Lines", Pearson India, 2006.

Reference Books:

1. John D. Krauss, "Electromagnetics", McGraw- Hill publications, 3rd ed., 1988.
2. John D. Ryder, "Networks, Lines, and Fields," PHI publications, Second Edition, 2012.
3. Schaum's out – lines, "Electromagnetics,", Tata McGraw-Hill publications, Second Edition, 2006.
4. Clayton Paul , Syed Nasar and Keith Whites, "Introduction to Electromagnetic Fields", McGraw-Hill Education.

Course Title	PROBABILITY THEORY & STOCHASTIC PROCESSES				B.Tech. ECE IV Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1504406	PJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	3	30	70	100
Mid Exam Duration: 1Hr 30 Min					End Exam Duration: 3Hrs		

Course Objectives:

- The Objective of this course is to provide the students with knowledge about the random variable, random process
- To model the random processes in the communication system such as receiver performance, interference, thermal noise, and multipath phenomenon

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Describe various distributions of random variable
CO 2	Perform Operations on Single random variables
CO 3	Understand operations and theorems on multiple random Variables
CO 4	Compute PSD of Random process
CO 5	Analyze Linear Systems with Random Inputs

UNIT-I

Probability: Axioms, Joint and conditional probability, Bayes' theorem, Bernoulli trials.

Random Variable: Concept, Distribution functions, Density functions, Conditional density functions.

UNIT -II

Operations on Single random variables: Expectation, Conditional expected value, Moments, Chebyshev, Markov's and Chernoff's inequalities, Characteristics and moment generating functions, Transformation of continuous, discrete random variable.

UNIT-III

Multiple Random Variables: Vector random variables, Joint distribution / Density functions , Conditional density / Distribution functions, Statistical independence, pdf and cdf for sum of random variables, Central limits theorem, Operations on multiple random variables, Expected value of function of random variables, Joint characteristic function, Joint by Gaussian random variables, Transformations of multiple random variables.

UNIT – IV

Random Processes : Concept, Stationarity, Independence, Time averages, Ergodicity, Correlation functions and its properties, Gaussian, Poisson, and Markov processes, Power

spectral density and its properties, Relation between power spectral density and auto-correlation, Cross power spectral density and its properties, Power spectrum for discrete time processes and sequences, Definition of white and colored noise.

UNIT-V

Linear Systems with Random Inputs: Random signal response of linear system, System evaluation using random noise, Spectral characteristics of system response, Noise bandwidth, Band pass, Band limited, and Narrow band processes, Properties of band limited processes.

Text Books:

1. P.Z. Peebles Jr., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill, 4th Edition,2001.
2. A. Papoulis and S. Unnikrishna Pillai, "Probability Random Variables and Stochastic Processes", 4th Edition, PHI,2007
3. J. Launon and V. Chandrasekhar, "Introduction to Probability Random Processes", McGraw-Hill,1997.
4. Hwei P. Hsu, Ph.D., "Theory and Problems of Probability, Random Variables, and Random Processes", Schaum's Outline Series, McGraw Hill, New York,1968.

Reference Books:

1. S.P. Eugene Xavier, "Statistical Theory of Communication", New Age Publications,2003.
2. B.P. Lathi, "Signals, Systems & Communications", B.S. Publications,2003.
3. G.R. Babu and K. Pushpa, "Probability Theory and Stochastic Processes", Premier Publishing House.
4. D. G. Childer, "Probability and Random Processes", McGraw Hill,1997.

Course Title	ELECTRONIC CIRCUIT ANALYSIS LAB				B.Tech. ECE IV Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1504407	**PJ**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		--	--	3	2	50	50	100
Mid Exam Duration: 1Hr 30 Min					**End Exam Duration: 3Hrs**		

Course Objectives:

- Working of different feedback amplifiers with frequency responses.
- Working of different Oscillators using transistors.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Design and analyze the basic operations of amplifier using BJT and FET
CO 2	Evaluate two stage amplifiers
CO 3	Realize the given performance using negative feedback amplifiers
CO 4	Design and test oscillator circuits using BJT
CO 5	Design the different power amplifier circuits

Design and Simulation in Simulation Laboratory using any Simulation Software: I
Testing in the Hardware Laboratory (Minimum of 6Experiments):

1. Common Emitter Amplifier
2. Common SourceAmplifier
3. Common collectorAmplifier
4. A Two Stage RC CoupledAmplifier.
5. Current shunt and Voltage Series FeedbackAmplifier
6. Hartleyoscillator
7. Wien Bridge Oscillator usingTransistors
8. RC Phase Shift Oscillator usingTransistors
9. Class A Power Amplifier (Transformerless)
10. Class B Complementary SymmetryAmplifier
11. High Frequency Common base (BJT) / Common gate (JFET)Amplifier.

II Testing in the Software Laboratory (6 Experiments)

1. Common Emitter Amplifier
2. Common SourceAmplifier
3. Common collectorAmplifier
4. A Two Stage RC CoupledAmplifier.
5. Current shunt and Voltage Series FeedbackAmplifier
6. Hartleyoscillator
7. Wien Bridge Oscillator usingTransistors
8. RC Phase Shift Oscillator usingTransistors
9. Class A Power Amplifier (Transformerless)
10. Class B Complementary SymmetryAmplifier
11. High Frequency Common base (BJT) / Common gate (JFET)Amplifier.

Note: Change at least two experiments every year.

Course Title	PULSE & DIGITAL CIRCUITS LAB				B.Tech. ECE IV Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1504408	**PJ**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		--	--	3	2	50	50	100
Mid Exam Duration: 1Hr 30 Min					**End Exam Duration: 3Hrs**		

Course Objectives:

- To know how to design the digital circuits andMultivibrators

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Design and analyze linear wave shaping and non-linear wave shaping circuits.
CO 2	Design sequential and combinational circuits using logic gates and flip-flops.
CO 3	Understand the switching characteristics of transistors.
CO 4	Design multivibrators and time base generators.
CO 5	Design and analyze linear wave shaping and non-linear wave shaping circuits.

List of Experiments: (Any twelve experiments)

1. Linear wave shaping.
2. Non Linear wave shaping –Clippers.
3. Non Linear wave shaping –Clampers.
4. Transistor as a switch.
5. Study of Logic Gates, Adders &Subtractors.
6. Study of Flip-Flops.
7. Synchronous and Asynchronous Counters.
8. Shift registers.
9. Sampling Gates.
10. Astable Multivibrator.
11. Monostable Multivibrator.
12. Bistable Multivibrator.
13. Schmitt Trigger.
14. UJT Relaxation Oscillator.
15. Bootstrap sweep circuit.
16. Constant Current Sweep Generator using BJT.