

ACADEMIC REGULATIONS
COURSE STRUCTURE AND DETAILED SYLLABUS
FOR
ELECTRONICS AND COMMUNICATION ENGINEERING
For B.TECH. FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2014-2015)
REGULATION: R14



J.B.INSTITUTE OF ENGINEERING & TECHNOLOGY
(Autonomous under JNTUH)

Yenkapally, Moinabad Mandal, P.O.Himayath Nagar, R.R.Dist, Hyderabad-500 075

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B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

II-YEAR I SEMESTER

Code	Subject	L	T/P/D	C
	Complex Analysis	3	1/0/0	3
C214A	Probability Theory and Stochastic Processes	4	1/0/0	4
	Environmental Studies	3	1/0/0	3
C214B	Electronic Devices and Circuits	4	0/0/0	4
C214C	Signals and Systems	3	1/0/0	3
	Electrical Circuits	3	1/0/0	3
	Basic Simulation Lab		0/3/0	2
	Electronic Devices and Circuits Lab		0/3/0	2
	Electrical Circuits Lab		0/3/0	2
	Total	20	5/9/0	26

II YEAR II SEMESTER

Code	Subject	L	T/P/D	C
C224A	Electronic Circuit Analysis	4	0/0/0	4
C224B	Pulse and Digital Circuits	4	1/0/0	4
	Principles of Electrical Engineering	3	1/0/0	3
C224C	Switching Theory and Logic Design	3	1/0/0	3
C224D	Electromagnetic Theory and Transmission Lines	4	1/0/0	4
	Electronic Circuit Analysis Lab	-	0/3/0	2
	Pulse and Digital Circuits Lab	-	0/3/0	2
	Principles of Electrical Engineering Lab	-	0/3/0	2
	Total	19	4/9/0	24

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II Year B.Tech. ECE-I Sem

L	T/P/D	C
3	1/-/-	3

MATHEMATICS – III

UNIT – I: Special Functions I

Review of Taylor's series for a real many valued functions, Series solutions to differential equations,, Gamma and Beta Functions – Their properties – evaluation of improper integrals. Bessel functions – properties – Recurrence relations – Orthogonality.

UNIT-II: Special Functions II

Legendre polynomials – Properties – Rodrigue's formula – Recurrence relations – Orthogonality. Chebycher's polynomials – properties – recurrence relations - Orthogonality

UNIT-III: Functions of a complex variable

Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann conditions, Maxima – Minima principle, Harmonic and conjugate harmonic functions – Milne – Thompson method. Elementary functions, general power Z^c principal value Logarithmic function.

UNIT-IV: Complex integration

Line integral – evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

UNIT-V: Complex power series

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity. (Distinction between the real analyticity and complex analyticity)

UNIT-VI: Contour Integration

Residue – Evaluation of residue by formula and by Laurent series - Residue theorem.

Evaluation of integrals of the type

(a) Improper real integrals $\int_{-\infty}^{\infty} f(x)dx$ (b) $\int_c^{c+2\pi} f(\cos \theta, \sin \theta)d\theta$

(c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$ (d) Integrals by indentation.

UNIT-VII: Conformal mapping

Transformation by e^z , $\text{Im}z$, z^2 , z^n (n positive integer), $\text{Sin } z$, $\text{cos } z$, $z + a/z$. Translation, rotation, inversion and bilinear transformation – fixed point – cross ratio – properties – invariance of circles and cross ratio – determination of bilinear transformation mapping 3 given points .

UNIT –VIII: Elementary Graph theory

Graphs, Representation by matrices Adjacent matrix – Incident matrix –Simple, Multiple, Regular, complete, Bipartite & Planar graphs – Hamiltonian and Eulerian Circuits- Trees Spanning tree -minimum spanning tree

TEXT BOOKS:

1. Engineering Mathematics – III by P.B. Bhaskara Rao, S.K.V.S.Rama Chary, M.Bhujanga Rao & Others.
2. Engineering Mathematics – III by C. Shankaraiah, V.G.S. Book Links.

REFERENCES:

1. Engineering Mathematics – III by T.K.V. Iyengar, B.Krishna Gandhi and Others – S.Chand.
2. Higher Engineering Mathematics by B.S. Grewal Khanna Publications.
3. Advance Engineering Mathematics by Jain & S.R.K. Iyengar, Narasa Publications.
4. Complex Variables by R.V. Churchill.
5. Advanced Engineering Mathematics by Allen Jaffrey Academic Press.

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PROBABILITY THEORY AND STOCHASTIC PROCESSES

Unit I: Introduction to Probability and Random Variable

Probability introduced through Sets and Relative Frequency, Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events. Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions and their Properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditional Event, Conditional Density, Properties

Unit II: Operation on Random Variable – Expectations

Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Variance and Skew, Joint Moments about the Origin, Central Moments, Joint Central Moments, Chebychev's Inequality, Characteristic Function, Joint Characteristic Functions, Moment Generating Function, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties.

Unit III: Transformations of Random Variables

Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables, Central Limit Theorem (Proof not expected), Unequal Distribution, Equal Distributions.

Unit IV: Stochastic Processes – Temporal Characteristics

The Stochastic Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationary and Statistical Independence, First-Order Stationary Processes, Second-Order and Wide-Sense Stationary, Nth Order and Strict-Sense Stationary, Time Averages and Ergodic, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties, Linear System Response: Mean and Mean-squared Value, Autocorrelation Function, Cross-Correlation Functions of Linear System Response, concept of Gaussian Random Processes, Poisson Random Process.

Unit V: Stochastic Processes - Spectral Characteristics and Noise

Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Spectral Density of Input and Output of a Linear System. Types of Noise: Resistive (Thermal) Noise Source, Shot noise, Extra terrestrial Noise, Arbitrary Noise Sources, White Noise, Narrowband Noise : In phase and quadrature phase components and its Properties, Modeling of Noise Sources, Average Noise Bandwidth, Effective Noise Temperature, Average Noise Figures, Average Noise Figure of cascaded networks.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, 4 ed., 2001, TMH.
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, 4 ed., TMH.
3. Principles of Communication systems – H.Taub, Donald.L.Schilling, Goutam Saha, 3 ed., 2007, TMH.

REFERENCES:

1. Theory of Probability and Stochastic Processes- Pradip Kumar Gosh, University Press
2. Probability Theory and Stochastic Processes- Mallikarjuna Reddy, Cengage Learning.
3. Probability and Random Processes with Application to Signal Processing – Henry Stark and John W. Woods, 3 ed., PE
4. Probability Methods of Signal and System Analysis - George R. Cooper, Clave D. MC Gillem, 3 ed., 1999, Oxford.
5. Statistical Theory of Communication - S.P. Eugene Xavier, 1997, New Age Publications.

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ENVIRONMENTAL STUDIES

UNIT-I : ECOSYSTEMS: Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Homeostasis / Cybernetics, Food chain concentration, Biomagnification, ecosystems value, services and carrying capacity.

UNIT-II: NATURAL RESOURCES: Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources – case studies. Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources – case studies. Land resources: land as a resource, land degradation, man induced landslides and land use / land cover mapping.

UNIT-III: BIODIVERSITY AND BIOTIC RESOURCES: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, conservation of biodiversity: In-Situ and Ex-situ conservation. Food and fodder resources, Timber and non-timber forest products.

UNIT-IV: ENVIRONMENTAL POLLUTION AND CONTROL: Classification of pollution and pollutants, causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards, Waste water treatment methods: effluent treatment plants (ETP), Sewage treatment plants (STP), common and combined effluent treatment plants (CETP). Soil Pollution: Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, coastal pollution due to sewage and marine disposal of industrial effluents. Noise Pollution: Sources, Industrial Noise- Occupational Health hazards, standards, Methods of control of Noise. Thermal Pollution: Thermal Comforts, Heat Island effect, Radiation effects. Nuclear Pollution: Nuclear power plants, nuclear radiation, disasters and impacts, genetical disorders. Solid waste: types, Collection processing and disposal of industrial and municipal solid wastes composition and characteristics of e-Waste and its management.

UNIT-V: GLOBAL ENVIRONMENTAL PROBLEMS AND GLOBAL EFFORTS : Green house effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol,

UNIT-VI: ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PLAN: Definition of Impact: classification of impacts, Positive and Negative, Reversible and irreversible, light, moderate and severe, methods of baseline data acquisition. Impacts on different components: such as human health resources, air, water, flora, fauna and society. Prediction of impacts and impact assessment methodologies. Environmental Impact Statement (EIS). Environmental Management Plan (EMP): Technological Solutions, preventive methods, Control technologies, treatment technologies: green-belt-development, rain water harvesting, Remote sensing and GIS methods.

UNIT-VII: ENVIRONMENTAL POLICY, LEGISLATION, RULES AND REGULATIONS

National Environmental Policy, Environmental Protection act, Legal aspects Air (Prevention and Control of pollution) Act- 1981, Water(Prevention and Control of pollution) Act-1974, Water pollution Cess Act-1977, Forest Conservation Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules .

UNIT: VIII -- TOWARDS SUSTAINABLE FUTURE

Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable Communities, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism (CDM).

SUGGESTED TEXT BOOKS:

1. Environmental studies , From crisis to cure by R.Rajagopalan, 2005
2. Text book of Environmental Science and Technology by M.Anji Reddy 2007
3. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning Private Ltd. New Delhi
2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.

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ELECTRIC CIRCUITS

Unit – I: Introduction to Electrical Circuits

Circuit Concept, R-L-C Parameters, Voltage and Current Sources, Independent and Dependent Sources, Source Transformation, Voltage – Current relationship for Passive Elements (for different input signals –Square, Ramp, Saw tooth and Triangular).

Unit - II:

Kirchoff's Laws, Network Reduction Techniques – Series, Parallel, Series Parallel, Star –to-Delta or Delta-to-Star Transformations, Nodal Analysis, Mesh Analysis, Supernode and Super mesh for DC Excitations.

Unit – III: Single Phase A.C. Circuits

R.M.S. and Average values and form factor for different periodic wave forms, Steady State Analysis of R, L and C (in Series, Parallel and Series Parallel Combinations) with Sinusoidal Excitation, Concept of Reactance, Impedance, Susceptance and Admittance, Phase and Phase difference, Concept of Power Factor, Real and Reactive powers, J-notation, Complex and Polar forms of representation, Complex power.

Unit – IV: Locus Diagrams & Resonance

Locus Diagrams, Series R-L, R-C, R-L-C and Parallel combination with variation of various parameters, Resonance – Series, Parallel Circuits, Concept of Band width and Q factor.

Unit – V: Magnetic Circuits

Magnetic Circuits, Faraday's law of Electromagnetic Induction, Concept of Self and Mutual Inductance, Dot convention, Coefficient of Coupling, Composite Magnetic Circuit, Analysis of Series and Parallel Magnetic Circuits.

Unit – VI: Network Topology

Definitions, Graph, Tree, Basic cutset and Basic Tie set Matrices for Planar Networks, Loop and Nodal methods for analysis of Networks with Dependent & Independent Voltage and Current Sources, Duality & Dual Networks.

Unit – VII: Network Theorems (With D.C)

Tellegen's, Superposition, Reciprocity, Thevinin's, Norton's, Maximum Power Transfer, Milliman's and Compensation theorems for D.C excitations.

Unit – VIII: Network Theorems (With A.C)

Tellegen's, Superposition, Reciprocity, Thevinin's, Norton's, Maximum Power Transfer, Milliman's and Compensation theorems for A.C excitations.

Text Books:

1. Engineering Circuit Analysis - W.H. Hayt and J. E. Kemmerly and S.M.Durbin, 6 ed., 2008, TMH.
2. Circuits & Networks – A.Sudhakar, Shyammohan S. Pillai, 3 ed., 2009, TMH.
3. Electric Circuits by A.Chakrabarthy, Dhanipat Rai & Sons.

Reference Books:

1. Network Analysis – M.E.Vanvalkenburg, 3 ed., PHI.
2. Linear Circuit Analysis- Raymond A. DeCarlo and Pen-Min-Lin, 2 ed., 2004,Oxford University Press.
3. Network Theory - N.C.Jagan & C.Lakshminarayana, 2006, BSP.
4. Electric Circuit Theory – K.Rajeswaran, 2004, PE
5. Basic Circuit Analysis – D.R. Cunnigham & J.A.Stuller, Jaico Publications.

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**ELECTRONIC DEVICES AND CIRCUITS
(COMMON FOR ECE, CSE, EEE, IT, ECM)**

Unit- I: P-N Junction Diode

Qualitative Theory of p-n Junction, p-n Junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of VI characteristic, Ideal versus Practical – Resistance levels (Static and Dynamic), Transition and Diffusion Capacitances, Diode Equivalent Circuits, Load Line Analysis, Breakdown Mechanisms in Semi Conductor Diodes, Zener Diode Characteristics.

Unit II: Special Purpose Electronic Devices

Principle of Operation and Characteristics of Tunnel Diode (with the help of Energy Band Diagram) and Varactor Diode, Principle of Operation of Schottky Barrier Diode, SCR, and Semiconductor Photo Diode. Introduction to UJT and UJT characteristics

Diode Applications: The p-n junction as a Rectifier, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Harmonic components in a Rectifier Circuit, Inductor Filters, Capacitor Filters, L- Section Filters, π - Section Filters, Comparison of Filters, Voltage Regulation using Zener Diode.

Unit- III: Bipolar Junction Transistor

The Junction Transistor, Transistor Current Components, Transistor as an Amplifier, Transistor Construction, BJT Operation, BJT Symbol, Common Base, Common Emitter and Common Collector Configurations, Limits of Operation, BJT Specifications.

Transistor Biasing and Stabilization: Operating Point, The DC and AC Load lines, Need for Biasing, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector - Emitter Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in V_{BE} and β , Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability.

Unit-IV: Small Signal Low Frequency BJT Models

BJT Hybrid Model for CE, CB and CC Configuration, simplified H- parameter model Determination of h-parameters from Transistor Characteristics, Comparison of CB, CE, and CC Amplifier Configurations, Conversion of h-parameters CE to CB, CE to CC, vice versa

Unit-V: Field Effect Transistor

The Junction Field Effect Transistor (Construction, principle of operation, symbol) – Pinch-off Voltage - Volt-Ampere characteristics, Biasing of FET, FET as Voltage Variable Resistor, Comparison of BJT and FET. The JFET Small Signal Model, Generalized FET amplifier, common source Amplifier, common Gate Amplifier and common Drain Amplifier,

MOSFET: MOSFET (Construction, principle of operation, symbol), MOSFET Characteristics in Enhancement and Depletion modes.

Text Books

1. Electronics Devices and circuits by David Bell Oxford press.
2. Millman's Electronic Devices and Circuits – J. Millman, C.C.Halkias, and Satyabrata Jit, 2ed., 1998, TMH.
3. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, 9 ed., 2006, PEI/PHI.

References

1. Integrated Electronics – J. Millman and Christos C. Halkias, 1991 ed., 2008, TMH.
2. Electronic Devices and Circuits - K. Lal Kishore, 2 ed., 2005, BSP.
3. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal, 1 ed., 2009, Wiley India Pvt. Ltd.
4. Electronic Devices and Circuits – S.Salivahanan, N.Suresh Kumar, A.Vallavaraj, 2 ed., 2008, TMH.

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SIGNALS AND SYSTEMS

Unit I : Signal Analysis and Fourier Analysis

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, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

Fourier Analysis

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum, Deriving Fourier Transform from Fourier Series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform

Unit II: Signal Transmission through Linear Systems

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI system, Filter characteristics of Linear Systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and Rise time.

Unit III : Convolution and Correlation of Signals

Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution, Convolution property of Fourier Transforms, Cross Correlation and Auto Correlation of functions, Properties of Correlation function, Energy density spectrum, Parseval's Theorem, Power density spectrum, Relation between Auto Correlation function and Energy/Power spectral density function, Relation between Convolution and Correlation, Detection of periodic signals in the presence of Noise by Correlation, Extraction of signal from noise by filtering.

Unit IV : Sampling and Laplace Transforms

Sampling theorem – Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass sampling.

Laplace Transform

Review of Laplace Transforms (L.T), Partial fraction expansion, Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Constraints on ROC for various classes of signals, Properties of L.T, Relation between L.T and F.T of a signal

Unit V : Z-Transforms

Fundamental difference between Continuous and Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal using complex exponential signal, Concept of Z-Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

Text Books:

1. Signals, Systems & Communications - B.P. Lathi, 2009, BSP
2. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2 ed.
3. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2 ed., PHI
4. Signals and Systems – A.Rama Krishna Rao – 2008, TMH.

References:

1. Introduction to Signal and System Analysis – K.Gopalan 2009, CENGAGE Learning.
2. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
3. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 ed., 2004, PE.

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0	-/3/-	2

ELECTRONIC DEVICES AND CIRCUITS LAB

PART A: (Only for Viva-voce Examination)

ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions) :

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB's
2. Identification, Specifications and Testing of Active Devices, Diodes, BJT's, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT.
3. Study and operation of
 - Multimeters (Analog and Digital)
 - Function Generator
 - Regulated Power Supplies
 - CRO.

PART B: (For Laboratory Examination – Minimum of 10 experiments)

1. Forward & Reverse Bias Characteristics of PN Junction Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Input & Output Characteristics of Transistor in CB Configuration.
4. Input & Output Characteristics of Transistor in CE Configuration.
5. Half Wave Rectifier with & without filters
6. Full Wave Rectifier with & without filters
7. FET characteristics
8. Measurement of h parameters of transistor in CB, CE, CC configurations
9. Frequency Response of CC Amplifier.
10. Frequency Response of CE Amplifier.
11. Frequency Response of Common Source FET amplifier
12. SCR characteristics.
13. UJT Characteristics

PART C:

Equipment required for Laboratories:

- | | | |
|--------------------------------------|---|--|
| 1. Regulated Power supplies (RPS) | - | 0-30 V |
| 2. CRO's | - | 0-20 MHz. |
| 3. Function Generators | - | 0-1 MHz. |
| 4. Multimeters | | |
| 5. Decade Resistance Boxes/Rheostats | | |
| 6. Decade Capacitance Boxes | | |
| 7. Ammeters (Analog or Digital) | - | 0-20 μ A, 0-50 μ A, 0-100 μ A, 0-200 μ A, 0-10 mA. |
| 8. Voltmeters (Analog or Digital) | - | 0-50V, 0-100V, 0-250V |
| 9. Electronic Components | - | Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs, MOSFETs, diodes Ge& Si type, Transistors – npn, pnp type) |

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BASIC SIMULATION LAB

List of Experiments:

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution between Signals and sequences.
6. Auto Correlation and Cross Correlation between Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Computation of unit sample, unit step and sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.
9. Gibbs Phenomenon
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using Laplace Transform.
12. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
13. Sampling Theorem Verification.
14. Removal of noise by Autocorrelation / Cross correlation.
15. Extraction of Periodic Signal masked by noise using Correlation.
16. Verification of Weiner-Khinchine Relations.
17. Checking a Random Process for Stationarity in Wide sense.

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PRINCIPLES OF ELECTRICAL ENGINEERING

Unit – I – Transient Analysis (First and Second Order Circuits)

Transient Response of RL , RC Series, RLC Circuits for DC excitations, Initial Conditions, Solution using Differential Equations approach and Laplace Transform Method.

Unit – II – Two Port Networks

Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, Conversion of one Parameter to another, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations, Image Parameters, Illustrative problems.

Unit – III – Filters

Classification of Filters, Filter Networks, Classification of Pass band and Stop band, Characteristic Impedance in the Pass and Stop Bands, Constant-k Low Pass Filter, High Pass Filter, m-derived T-Section, Band Pass filter and Band Elimination filter, Illustrative Problems.

Unit – IV – Symmetrical Attenuators

Symmetrical Attenuators – T-Type Attenuator, π -Type Attenuator, Bridged T type Attenuator, Lattice Attenuator.

Unit –V – DC Generators

Principle of Operation of DC Machines, EMF equation, Types of Generators, Magnetization and Load Characteristics of DC Generators.

Unit –VI – DC Motors

DC Motors, Types of DC Motors, Characteristics of DC Motors, Losses and Efficiency, Swinburne's Test, Speed Control of DC Shunt Motor, Flux and Armature Voltage control methods.

Unit –VII – Transformers and Their Performance

Principle of Operation of Single Phase transformer, Types, Constructional Features, Phasor Diagram on No Load and Load, Equivalent Circuit, Losses and Efficiency of Transformer and Regulation, OC and SC Tests , Predetermination of Efficiency and Regulation (Simple Problems).

Unit – VIII – Single Phase Induction Motors

Principle of Operation, Shaded Pole motors, Capacitor motors, AC Servomotor, AC Tachometers, Synchros, Stepper Motors, Characteristics.

Text Books :

- 1.Fundamentals of Electric Circuits – Charles K. Alexander, Mathew N. O. Sadiku, 3 ed., 2008, TMH.
2. Network Analysis – A Sudhakar ,Shyammohan S.Palli, 3 ed., 2009, TMH.
3. Introduction to Electrical Engineering – M.S.Naidu and S. Kamakshaiah, 2008, TMH.

Reference Books :

1. Networks, Lines and Fields – John.D.Ryder, 2 ed.,, 2008 (Reprint), PHI.
2. Engineering Circuit Analysis - W.H.Hayt and J. E Kemmerly and S.M.Durbin, 6 ed., 2008, TMH.
3. Network analysis and Synthesis – C.L Wadhwa, 3 ed., 2007, New Age International Publishers.
4. Network Analysis – N.C.Jagan and C.Lakshmi Narayana, BSP, 2006.
5. Electric Circuits – Nilsson, Riedel, 8 ed., PE.

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ELECTRONIC CIRCUIT ANALYSIS

Unit – I: Single Stage Amplifiers

Classification of Amplifiers – Distortion in Amplifiers, Analysis of CE, CC, and CB Configurations with simplified Hybrid Model, Analysis of CE amplifier with Emitter Resistance and Emitter follower, Miller's Theorem and its dual, Design of Single Stage RC Coupled Amplifier using BJT.

Multi Stage Amplifiers: Analysis of Cascaded RC Coupled BJT amplifiers, Cascode Amplifier, Darlington Pair, Different Coupling Schemes used in Amplifiers - RC Coupling , Transformer Coupling , Direct Coupling .

Unit – II: BJT Amplifiers - Frequency Response

Logarithms, Decibels, General frequency considerations, Frequency response of BJT Amplifier, Analysis at Low and High frequencies, Effect of coupling and bypass Capacitors, The Hybrid- π (π) - Common Emitter Transistor Model, CE Short Circuit Current Gain, Current Gain with Resistive Load, Single Stage CE Transistor Amplifier Response, Gain-Bandwidth Product, Emitter follower at higher frequencies.

Unit –III : MOS Amplifiers [3]

Basic concepts, MOS Small signal model, Common source amplifier with Resistive load, Diode connected Load and Current Source Load, Source follower, Common Gate stage Cascode and Folded Cascode Amplifier and their Frequency response.

Unit – IV: Feedback Amplifiers

Concepts of Feedback, Classification of Feedback Amplifiers, General characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier Characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative Problems.

Oscillators: Classification of Oscillators, Conditions for Oscillations, RC Phase Shift Oscillator, Generalized analysis of LC oscillators - Hartley, and Colpitts Oscillators, Wien-Bridge & Crystal Oscillators, Stability of Oscillators.

Unit – V : Large Signal & Tuned Amplifiers

Classification, Class A Large Signal Amplifiers, Transformer Coupled Class A Audio Power Amplifier, Efficiency of Class A Amplifier, Class B Amplifier, Efficiency of Class B Amplifier, Class-B Push-Pull Amplifier, Complementary Symmetry Class B Push-Pull Amplifier, Distortion in Power Amplifiers, Thermal Stability and Heat Sinks.

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 Amplifiers, Stability of Tuned Amplifiers.

TEXT BOOKS:

1. Integrated Electronics - Jacob Millman and Christos C Halkias, 1991 ed., 2008, TMH.
2. Electronic Devices and Circuits - S. Salivahanan, N.Suresh Kumar, A Vallavaraj, 2 ed., 2009, TMH.
3. Design of Analog CMOS Integrated Circuits – Behzad Razavi, 2008, TMH.

REFERENCES:

1. Electronic Devices and Circuit Theory - Robert L.Boylestad, Louis Nashelsky, 9 ed., 2008 PE.
2. Introductory Electronic Devices and Circuits– Robert T. Paynter, 7 ed., 2009, PEI.
3. Electronic Circuit Analysis – K. Lal Kishore, 2004, BSP.
4. Electronic Devices and Circuits, David A. Bell – 5 ed., Oxford University Press.
5. Microelectric Circuits – Sedra and Smith – 5 ed., 2009, Oxford University Press.

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PULSE AND DIGITAL CIRCUITS

Unit-I

Linear Wave Shaping : High pass and low pass RC circuits and their response for Sinusoidal, Step, Pulse, Square, & Ramp inputs, High pass RC network as Differentiator, Low pass RC circuit as an Integrator, Attenuators and its application as a CRO Probe, RL and RLC Circuits and their response for Step Input, Ringing Circuit.

Non-Linear Wave Shaping: Diode clippers, Transistor clippers, Clipping at two independent levels, Clamping Operation, Clamping circuit taking Source and Diode resistances into account, Clamping Circuit Theorem, Practical Clamping Circuits, Effect of diode characteristics on clamping voltage.

Unit-II

Switching Characteristics of Devices and Multivibrators: Diode as a Switch, Piecewise Linear Diode Characteristics, Diode Switching times, Transistor as a Switch, Break down voltages, Transistor in Saturation, Transistor-switching times.

Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

Unit-III

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, UJT as relaxation oscillator, Transistor Bootstrap Time Base Generator, Transistor Current Time Base Generators, Methods of Linearity improvement.

Unit-IV

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, Sine wave frequency division with a Sweep Circuit, A Sinusoidal Divider using Regeneration and Modulation.

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, Application of Sampling Gates.

Realization of Logic Gates Using Diodes & Transistors:

AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL and CML Logic Families and its Comparison.

Text Books:

1. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 ed., 2008, TMH.
2. Solid State Pulse circuits –David A. Bell, 4 ed., 2002 PHI.

References:

1. Pulse and Digital Circuits – A. Anand Kumar, 2005, PHI.
2. Fundamentals of Pulse and Digital Circuits- Ronald J. Tocci, 3 ed., 2008.
3. Pulse and Digital Circuits – Motheki S. Prakash Rao, 2006, TMH.
4. Wave Generation and Shaping - L. Strauss.

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SWITCHING THEORY AND LOGIC DESIGN

UNIT I

Number Systems & Codes : Philosophy of Number Systems, Complement Representation of Negative Numbers, Binary Arithmetic, Binary Codes, Error Detecting & Error Correcting Codes, Hamming codes.

UNIT II

Boolean Algebra and Switching Functions : Fundamental Postulates of Boolean Algebra, Basic theorems and Properties, Switching Functions, Canonical and Standard forms, Algebraic simplification Digital Logic Gates, Properties of XOR gates, Universal Gates, Multilevel NAND/NOR Realizations.

Minimization of Switching Functions : Map method, Prime implicants, Don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime –Implicant chart, Simplification rules.

UNIT III

Combinational Logic Design

Design using conventional logic gates, Encoder, Decoder, Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions Parity bit generator, Code-converters, Hazards and Hazard free Realizations.

Programmable Logic Devices & Threshold Logic : Basic PLD's-ROM, PROM, PLA, PAL, Realization of Switching functions using PLD's, Capabilities and Limitations of Threshold gate, Synthesis of Threshold functions, Multigate Synthesis.

UNIT IV

Sequential Circuits - I : Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples), Basic Flip-Flops, Triggering and Excitation tables, Steps in Synchronous Sequential Circuit Design, Design of modulo-N Ring & Shift counters, Serial binary adder, Sequence detector.

Sequential Circuits - II : Finite State Machine-Capabilities and Limitations, Mealy and Moore models, Minimization of Completely Specified and Incompletely Specified Sequential Machines, Partition Techniques and Merger chart methods, Concept of Minimal cover table.

UNIT V

Algorithmic State Machines : Salient features of the ASM chart, Simple examples, System design using data path and control subsystems, Control implementations, Examples of Weighing Machine and Binary multiplier.

TEXTBOOKS :

1. Switching & Finite Automata theory – Zvi Kohavi, 2 ed., TMH.
2. Digital Design – Morris Mano, 3 ed., 2006, PHI.
3. Switching Theory and Logic Design – A. Anand Kumar, 2008, PHI.

REFERENCES :

1. An Engineering Approach to Digital Design – Fletcher, PHI.
2. Fundamentals of Logic Design – Charles H. Roth, 5 ed., 2004, Thomson Publications.
3. Digital Logic Applications and Design – John M. Yarbrough, 2006, Thomson Publications.

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ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

UNIT I

Electrostatics: Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation. Poisson's and Laplace equations, parallel plate capacitance

UNIT II

Magnetostatics : Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

UNIT III

Maxwell's Equations (Time Varying Fields): 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 a Boundary Surface : Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems .

UNIT IV

EM Wave Characteristics : Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, , Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics ,polarization , Poynting Vector and Poynting Theorem , Illustrative Problems.

UNIT V

Transmission Line : Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness/Low Loss Characterization, Distortion – Condition for Distortionlessness and Minimum Attenuation, Loading - Types of Loading, Illustrative Problems.

Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR,UHF Lines as Circuit Elements : $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations, Significance of Z_{min} and Z_{max} Smith Chart – Configuration and Applications, Single and Double Stub Matching, Illustrative Problems.

TEXT BOOKS :

1. Elements of Electromagnetics – Matthew N.O. Sadiku, 4 ed., 2008, Oxford Univ.Press.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2 ed., 2000, PHI.
3. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi.

REFERENCES :

1. Engineering Electromagnetics – Nathan Ida, 2 ed., 2005, Springer (India) Pvt. Ltd., New Delhi.
2. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 7 ed., 2006, TMH.
3. Networks, Lines and Fields – John D. Ryder, 2 ed., 1999, PHI.

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ELECTRICAL ENGINEERING LAB

PART – A

1. Verification of KVL and KCL.
2. Serial and Parallel Resonance—Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
3. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
4. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.
5. Two port network parameters – ABCD and h- Parameters
6. Verification of Superposition and Reciprocity theorems.
7. Verification of maximum power transfer theorem. Verification on DC, and AC Excitation with Resistive and Reactive loads.
8. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.
9. Constant – k Low Pass Filter and High Pass Filter – Design and Test.

PART – B

1. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance.
2. Swinburne's Test on DC shunt machine (Predetermination of efficiency of a given DC Shunt machine working as motor and generator).
3. Brake test on DC shunt motor. Determination of performance characteristics.
4. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
5. Load Test on Single Phase Transformer.

Note: Any 12 of the above experiments are to be conducted

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ELECTRONIC CIRCUIT ANALYSIS LAB

List of Experiments (12 experiments to be done) :

I) Design and Simulation in Simulation Laboratory using any Simulation Software.

(Any 6 Experiments):

1. Common Emitter Amplifier
2. Common Source Amplifier
3. Two Stage RC Coupled Amplifier
4. Current shunt and Voltage Series Feedback Amplifier
5. Cascode Amplifier
6. Wien Bridge Oscillator using Transistors
7. RC Phase Shift Oscillator using Transistors
7. Class A Power Amplifier (Transformer less)
9. Class B Complementary Symmetry Amplifier
10. Common Base (BJT) / Common Gate (JFET) Amplifier.

II) Testing in the Hardware Laboratory (6 Experiments)

- A) Any Three circuits simulated in Simulation laboratory
- B) Any Three of the following
1. Class A Power Amplifier (with transformer load)
 2. Class C Power Amplifier
 3. Single Tuned Voltage Amplifier
 4. Hartley & Colpitt's Oscillators
 5. Darlington Pair
 6. MOS Amplifier

Equipments required for Laboratories:

1. For software simulation of Electronic circuits
 - i) Computer Systems with latest specifications
 - ii) Connected in LAN (Optional)
 - iii) Operating system (Windows XP)
 - iv) Suitable Simulations software
2. For Hardware simulations of Electronic Circuits
 - i) Regulated Power Supply (0-30V)
 - ii) CRO's
 - iii) Functions Generators
 - iv) Multimeters
 - v) Components

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PULSE AND DIGITAL CIRCUITS LAB

Minimum Twelve experiments to be conducted:

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 & some applications.
6. Study of Flip-Flops & some applications.
7. Sampling Gates.
8. Astable Multivibrator.
9. Monostable Multivibrator.
10. Bistable Multivibrator.
11. Schmitt Trigger.
12. UJT Relaxation Oscillator.
13. Bootstrap Sweep Circuit.

Equipment required for Laboratories:

1. Regulated Power Supply - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. Components
5. Multi Meters