JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY: KAKINADA

KAKINADA-533003, Andhra Pradesh (India)

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II B.Tech (Electronics and Communication Engineering)

II Year I Sem		**P**	**C**	**II Year II Sem**		**P**	**C**
S.No.	**Subject**	**P**	**C**	**S.No.**	**Subject**	**P**	**C**
1	Managerial Economics and Financial Analysis	4	4	1	Electronic Circuit Analysis	4	4
2	Electronic Devices and Circuits	4	4	2	Control Systems	4	4
3	Probability Theory & Stochastic Processes	4	4	3	Pulse & Digital Circuits	4	4
4	Network Analysis	4	4	4	Switching Theory & Logic Design	4	4
5	Signals & Systems	4	4	5	EM Waves and Transmission Lines	4	4
6	Electrical Technology	4	4	6	Analog Communications	4	4
7	EDC Lab	3	2	7	Electronic Circuits & P D C Lab	3	2
8	Networks &Electrical Technology Lab	3	2	8	Analog Communications Lab	3	2
9	English Communication Practice	2	-	9	English Communication Practice	2	2
Total Credits			**28**	**Total Credits**			**30**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
Common to all Branches (w.e.f.2010 batch)

Unit I

Introduction to Managerial Economics:

Introduction to Managerial Economics & Demand Analysis: Definition of Managerial Economics, Characteristics and Scope – Managerial Economics and its relation with other subjects- Basic economic tools in Managerial Economics

Demand Analysis: Meaning- Demand distinctions- Demand determinants- Law of Demand and its exceptions.

Unit-II

Elasticity of Demand & Demand Forecasting: Definition -Types of Elasticity of demand - Measurement of price elasticity of demand: Total outlay method, Point method and Arc method- Significance of Elasticity of Demand.

Demand Forecasting: Meaning - Factors governing demand forecasting - Methods of demand forecasting (survey of buyers' Intentions, Delphi method, Collective opinion, Analysis of Time series and Trend projections, Economic Indicators, Controlled experiments and Judgmental approach) - Forecasting demand for new products- Criteria of a good forecasting method.

Unit-III

Theory of Production and Cost Analysis: Production Function- Isoquants and Isocosts, MRTS, Law of variable proportions- Law of returns to scale- Least Cost Combination of Inputs, Cobb-Douglas Production function - Economies of Scale.

Cost Analysis: Cost concepts, Opportunity cost, Fixed Vs Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs.-Determination of Break-Even Point (simple problems) - Managerial Significance and limitations of BEP.

UNIT-IV

Introduction to Markets, Managerial Theories of the Firm & Pricing Policies: Market structures**:** Types of competition, Features of Perfect Competition, Monopoly and Monopolistic Competition. Price-Output Determination under Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly Managerial theories of the firm - Marris and Williamson's models.

Pricing Policies: Methods of Pricing**-**Marginal Cost Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Bundling Pricing, and Peak Load Pricing. Internet Pricing Models: Flat rate pricing, Usage sensitive pricing, Transaction based pricing, Priority pricing, charging on the basis of social cost, Precedence model, Smart market mechanism model.

Unit V

Types of Industrial Organization & Introduction to business cycles: Characteristic features of Industrial organization, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, State/Public Enterprises and their types.

Introduction to business cycles: Meaning-Phases of business cycles- Features of business cycles.

Unit VI

Introduction to Financial Accounting: Introduction to Double-entry system, Journal, Ledger, Trial Balance- Final Accounts (with simple adjustments)- Limitations of Financial Statements.

Unit VII

Interpretation and analysis of Financial Statement: Ratio Analysis – Liquidity ratios, Profitability ratios and solvency ratios – Preparation of changes in working capital statement and fund flow statement.

Unit VIII

Capital **and Capital Budgeting**: Meaning of capital budgeting, Need for capital budgeting – Capital budgeting decisions (Examples of capital budgeting) - Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR), IRR and Net Present Value Method (simple problems)

Text Books:

1. **J.V.Prabhakar Rao**: Managerial Economics and Financial Analysis, Maruthi Publications, 2011

2. **N. Appa Rao. & P. Vijaya Kumar**: 'Managerial Economics and Financial Analysis', Cengage Publications, New Delhi, 2011

References:

1. A R Aryasri **-** Managerial Economics and Financial Analysis, TMH 2011

2. Suma damodaran- Managerial Economics, Oxford 2011

3. S.A. Siddiqui & A.S. Siddiqui, Mangerial Economice and Financial Analysis, New Age International Publishers, 2011.

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Electronic Devices and Circuits

Unit-I

Electron Ballistics and Applications: Force on Charged Particles in Electric field, Constant Electric Field, Potential, Relationship between Field Intensity and Potential, Two Dimensional Motion, Electrostatic Deflection in Cathode ray Tube, CRO, Force in Magnetic Field, Motion in Magnetic Field, Magnetic Deflection in CRT, Magnetic Focusing, Parallel Electric and Magnetic fields and Perpendicular Electric and Magnetic Fields.

Unit- II

Review of Semi Conductor Physics : Insulators, Semi conductors, and Metals classification using Energy Band Diagrams, Mobility and Conductivity, Electrons and holes in Intrinsic Semi conductors, Extrinsic Semi Conductor, (P and N Type semiconductor) Hall effect, Generation and Recombination of Charges, Diffusion, Continuity Equation, Injected Minority Carriers, Law of Junction, Fermi Dirac Function, Fermi level in Intrinsic and Extrinsic Semiconductor

Unit- III

Junction Diode Characteristics : Open circuited P N Junction, Forward and Reverse Bias, Current components in PN Diode, Diode Equation,Volt-Amper Characteristic, Temperature Dependence on V – I characteristic, Step Graded Junction, Diffusion Capacitance and Diode Resistance (Static and Dynamic), Energy Band Diagram of PN Diode,

Special Diodes: Avalanche and Zener Break Down, Zener Characterisitics, Tunnel Diode, Characteristics with the help of Energy Band Diagrams, Varactor Diode, LED, PIN Diode, Photo Diode

Unit IV

Rectifiers and Filters: Half wave rectifier, ripple factor, full wave rectifier(with and without transformer), Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L-section filter, Π- section filter, Multiple L- section and Multiple Π section filter, and comparison of various filter circuits in terms of ripple factors, Simple circuit of a regulator using zener diode, Series and Shunt voltage regulators

Unit- V

Transistors :

Junction transistor, Transistor current components, Transistor as an amplifier, Characteristics of Transistor in Common Base and Common Emitter Configurations, Analytical expressions for Transistor Characteristics, Punch Through/ Reach Through, Photo Transistor, Typical transistor junction voltage values.

Unit VI

Field Effect Transistors:

JFET characteristics (Qualitative and Quantitative discussion), Small signal model of JFET, MOSFET characteristics (Enhancement and depletion mode), Symbols of MOSFET, Introduction to SCR and UJT and their characteristics,

UNIT-VII

Transistor Biasing and Thermal Stabilization : Transistor Biasing and Thermal Stabilization: Operating point, Basic Stability, Collector to Base Bias, Self Bias Amplifiers, Stabilization against variations in V_{BE},, and β for the self bias circuit, Stabilization factors, (S, S', S'') , Bias Compensation, Thermistor and Sensitor compensation, Compensation against variation in V_{BE}, I_{co},, Thermal runaway, Thermal stability

UNIT- VIII

Small signal low frequency Transistor models: Two port devices and the Hybrid model, Transistor Hybrid model, Determination of h-parameters from characteristics, Measurement of h-parameters, Conversion formulas for the parameters of three transistor configurations, Analysis of a Transistor Amplifier circuit using h- parameters, Comparison of Transistor Amplifier configurations

Text Books

1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill

Reference

1. Electronic Devices and Circuits – K Satya Prasad, VGS Book Links
2. Integrated Electronics – Jacob Millman, Chritos C. Halkies,, Tata Mc-Graw Hill, 2009
3. Electronic Devices and Circuits – Salivahanan, Kumar, Vallavaraj, TATA McGraw Hill, Second Edition
4. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall,9thEdition,2006
5. Electronic Devices and Circuits -BV Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu, Pearson, 2nd edition

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PROBABILITY THEORY AND STOCHASTIC PROCESSES

UNIT I

PROBABILITY: 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:

UNIT II

THE RANDOM VARIABLE : Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

UNIT III

OPERATION ON ONE RANDOM VARIABLE – EXPECTATIONS : Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Nonmonotonic Transformations of Continuous Random Variable

UNIT IV

MULTIPLE RANDOM VARIABLES : Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density –Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, Unequal Distribution, Equal Distributions.

UNIT V

OPERATIONS ON MULTIPLE RANDOM VARIABLES : Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT VI

RANDOM PROCESSES – TEMPORAL CHARACTERISTICS : The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

UNIT VII

RANDOM PROCESSES – SPECTRAL CHARACTERISTICS: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

UNIT VIII

LINEAR SYSTEMS WITH RANDOM INPUTS : Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties, Modeling of Noise Sources: Resistive (Thermal) Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Average Noise Figures, Average Noise Figure of cascaded networks.

TEXT BOOKS :

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.

REFERENCES :

1. .Probability Theory and Stochastic Process – B Prabhakara Rao , Oxford University Press.
2. Probability and Random Processes with Application to Signal Processing – Henry Stark and John W. Woods, Pearson Education, 3rd Edition.
3. Probability Methods of Signal and System Analysis. George R. Cooper, Clave D. MC Gillem, Oxford, 3rd Edition, 1999.
4.Statistical Theory of Communication - S.P. Eugene Xavier, New Age Publications, 2003.

NETWORK ANALYSIS

UNIT – I

Introduction to Electrical Circuits : Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also. (Text Books: 1,2,3, Reference Books: 3)

UNIT – II

A.C Fundamentals and Network Topology: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality with examples.

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule. (Text Books: 2,3, Reference Books: 3)

UNIT – III

Steady State Analysis of A.C Circuits : Response to sinusoidal excitation - pure resistance, pure inductance, pure capacitance, impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving. (Text Books: 1,2, Reference Books: 3)

UNIT – IV

Coupled Circuits : Coupled Circuits: Self inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, Conductively coupled equivalent circuits- problem solving.

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, general case- resistance present in both branches, anti resonance at all frequencies. (Text Books:2,3, Reference Books: 3)

UNIT – V

Network Theorems: Thevinin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens- problem solving using dependent sources also. (Text Books: 1,2,3, Reference Books: 2)

UNIT – VI

Two-port networks : Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks, problem solving including dependent sources also. (Text Books: 1,2, Reference Books: 1,3)

UNIT – VII

Transients : First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, Evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method. (Text Books: 1,2,3, Reference Books: 1,3)

UNIT – VIII

Filters : L.P.F, H.P.F, B.P.F, Band Elimination, All pass prototype filters design, M-derived filters of L.P. and H.P. filters only, Composite design of L.P. and H.P filters. (Text Books: 2, Reference Books:1, 2,3)

TEXT BOOKS :

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.
2.Network Analysis by K.Satya Prasad and S Sivanagaraju, Cengage Learning
3. Electric Circuit Analysis by Hayt and Kimmarle, TMH

REFERENCES :

1. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
2. Basic Circuit Analysis by DR Cunninghan, Jaico Publishers.
3. Network Analysis and Filter Design by Chadha, Umesh Publications.

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SIGNALS AND SYSTEMS

UNIT I

SIGNAL 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.

UNIT II

FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS : 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

UNIT III

FOURIER TRANSFORMS : Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.

UNIT IV

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 Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT V

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 VI

SAMPLING : 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.

UNIT VII

LAPLACE TRANSFORMS : Review of Laplace transforms, 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's, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

UNIT VIII

Z–TRANSFORMS : Fundamental difference between continuous and discrete time signals, discrete time signal representation using complex exponential and sinusoidal components, Periodicity of discrete time 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, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.

REFERENCES :

1. Signals & Systems - Simon Haykin and Van Veen,Wiley, 2nd Edition.
2. Signals & Systems- Narayan Iyer and K Satya Prasad , Cenage Pub.
3. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
4. Signals and Systems – A Rama Krishna Rao, Tata McGrawHill

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ELECTRICAL TECHNOLOGY

UNIT I

DC MACHINES : Principle of operation of DC Machines- EMF equation – Types of generators – Magnetization and load characteristics of DC generators

UNIT II

D.C. MOTORS : DC Motors – Types of DC Motors – Characteristics of DC motors – 3-point starters for DC shunt motor – Losses and efficiency – Swinburne's test – Speed control of DC shunt motor – Flux and Armature voltage control methods.

UNIT III

TRANSFORMERS : Principle of operation of single phase transformer – types – Constructional features – Phasor diagram on No Load and Load – Equivalent circuit

UNIT IV

PERFORMANCE OF TRANSFORMERS : Losses and Efficiency of transformer and Regulation – OC and SC tests – Predetermination of efficiency and regulation (Simple Problems).

UNIT V

THREE PHASE INDUCTION MOTOR : Principle of operation of three-phase induction motors –Slip ring and Squirrel cage motors – Slip-Torque characteristics – Efficiency calculation – Starting methods.

UNIT VI

ALTERNATORS : Alternators – Constructional features – Principle of operation – Types - EMF Equation – Distribution and Coil span factors – Predetermination of regulation by Synchronous Impedance Method – OC and SC tests.

UNIT VII

SINGLE PHASE INDUCTION MOTORS : Principle of operation - Shaded pole motors – Capacitor motors, AC servomotor, AC tachometers, Synchros, Stepper Motors – Characteristics.

UNIT VIII

ELECTRICAL INSTRUMENTS : Basic Principles of indicating instruments – Moving Coil and Moving iron Instruments (Ammeters and Voltmeters)

TEXT BOOKS:

1.Basic Electrical Engineering by Nagsarkar,Sukhija, Oxford Publications,2nd edition

REFERENCE BOOKS:

1.Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications

2.Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications,2nd edition

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ELECTRONIC DEVICES AND CIRCUITS LAB

PART A : (Only for viva voce Examination)

ELECTRONIC WORKSHOP PRACTICE (in 6 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.
2. Identification, Specifications and Testing of Active Devices, Diodes, BJTs, Lowpower JFETs, MOSFETs, Power Transistors, LEDs, LCDs, Optoelectronic Devices, SCR, UJT, DIACs, TRIACs, Linear and Digital ICs.
3. Soldering practice – Simple Circuits using active and passive components.
4. Single layer and Multi layer PCBs (Identification and Utility).
5. Study and operation of
   - Multimeters (Analog and Digital)
   - Function Generator
   - Regulated Power Supplies
     1. Study and Operation of CRO.

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

1. **Frequency measurment using Lissajous Figures**
2. PN Junction diode characteristics A. Forward bias B. Reverse bias.(cut-in voltage & Resistance calculations)
3. Zener diode characteristics and Zener as a regulator
4. Transistor CB characteristics (Input and Output) & h Parameter calculations
5. Transistor CE characteristics (Input and Output) & h Parameter calculations
6. Rectifier without filters (Full wave & Half wave)
7. Rectifier with filters (Full wave & Half wave)
8. FET characteristics
9. SCR Charecteristics
10. UJT Charectristics
11. CE Amplifier
12. CC Amplifier (Emitter Follower).

PART C:

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 Resitance 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, MOSFETs,diodes,transistors

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NETWORKS & ELECTRICAL TECHNOLOGY LAB

PART – A

1. Serial and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.

2. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.

3. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.

4. Verification of Superposition and Reciprocity theorems.

5. Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads.

6. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.

7 Constant K - LP, HP, BP Filters

8. m derived filters

9. Composite Filters

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. Brake test on 3-phase Induction motor (performance characteristics).

6. Regulation of alternator by synchronous impedance method

Electronic Circuit Analysis

Unit I

Single stage Amplifiers : Simplified Common Emitter hybrid model, simplfied calculations for the common collector configuration and common base amplifier, Common emitter amplifier with emitter resistance, Emitter follower, Miller's Theorem and dual of Millers theorem,

FET small signal model, Low frequency common source and common drain amplifiers, FET as Voltage Variable Resistor, Biasing the FET

UNIT- II

Feedback Amplifiers : Classification of Amplifiers, Feedback concept, Transfer Gain with feedback, General characteristics of negative feedback amplifiers, Effect of Feedback on input and output Resistances, Method of Analysis of Feedback Amplifiers, Voltage series, voltage shunt, current series, and current shunt feedback amplifiers with discrete components and their analysis

UNIT-III

Oscillators : Condition for oscillations. RC-phase shift oscillators with Transistor and FET with necessary derivation for frequency of oscillation, Hartley and Colpitts oscillators, Wein bridge oscillator, Crystal oscillators, Frequency and amplitude stability of oscillators, Negative Resistance in Oscillator

Unit IV

Multistage Amplifier : Cascading Transistor Amplifiers, Choice of Transistor configuration in Cascade amplifier, High input Resistance Transistor Circuits – Darlington pair, Cascode amplifier, Frequency response and analysis of RC Coupling, Direct coupling and Transformer coupling, Difference amplifier Two Stage RC Coupled JFET amplifiers (in Common Source (CS) configuration).

Unit V

High Frequency Transistor and FET Circuits : Transistor at High Frequencies, Hybrid- π Common Emitter transistor model, Hybrid π conductances, Hybrid π capacitances, Validity of hybrid π model, Variation of Hybrid Parameters, CE short circuit gain, Current gain with

resistive load, Single stage CE transistor amplifier response, Gain Bandwidth product, Emitter follower at High frequencies.

FET: Common Source amplifier at Higher Frequencies, and Common Drain Amplifier at High frequencies

Unit VI

Power Amplifiers: Class A large signal Amplifiers, Second harmonic Distortions, Higher order harmonic Distortion, Transformer Coupled Audio power amplifier, Efficiency, Push-pull amplifiers, Class B Amplifiers, Class AB operation, Efficiency of Class B Amplifier, Complementary Symmetry push pull amplifier, Class D amplifier, Class S amplifier, MOSFET power amplifier, Thermal stability and Heat sink

Unit VII

Tuned Amplifiers : Introduction, Q-Factor, Small Signal Tuned Amplifier – Capacitance single tuned amplifier, Double Tuned Amplifiers, Effect of Cascading Single tuned amplifiers on Band width, Effect of Cascading Double tuned amplifiers on Band width, Staggered tuned amplifiers, Stability of tuned amplifiers

Unit VIII

Voltage Regulators : Voltage regulation – Line Regulation, Load Regulation, Types of Regulators, Series voltage regulator , shunt regulators, Overload Voltage protection.

Text Books :

1. Integrated Electronics – J. Millman and C.C. Halkias, Mc Graw-Hill, 1972.

2. Electronic Devices and Circuits - Salivahanan, N.Suressh Kumar, A. Vallavaraj, TATA McGraw Hill, Second Edition

References :

1. Introductory Electronic Devices and Circuits – Robert T. Paynter, Pearson Education, 7th Edition
2. Electronic Devices and Circuits Theory – Robert L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9th Edition, 2006.

3. Micro Electronic Circuits – Sedra A.S. and K.C. Smith, Oxford University Press, 5th ed.

4. Electronic Circuit Analysis and Design – Donald A. Neaman, Mc Graw Hill.

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CONTROL SYSTEMS

Objective :
In this course it is aimed to introduce to the students the principles and applications of control systems in every day life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain.

UNIT – I INTRODUCTION
Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback.

Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems

UNIT II TRANSFER FUNCTION REPRESENTATION

Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

UNIT-III TIME RESPONSE ANALYSIS

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – IV
STABILITY ANALYSIS IN S-DOMAIN *:* The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability
Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT – V
FREQUENCY RESPONSE ANALYSIS : Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT – VI

STABILITY ANALYSIS IN FREQUENCY DOMAIN : Polar Plots, Nyquist Plots Stability Analysis.

UNIT – VII

CLASSICAL CONTROL DESIGN TECHNIQUES : Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, PID Controllers.

UNIT – VIII

State Space Analysis of Continuous Systems Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.,

2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited,Pub. 2nd edition.

REFERENCE BOOKS:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.

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Pulse and Digital Circuits

Unit I

Linear wave shaping : High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, double differentiation, attenuators, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT II

Non – Linear Wave Shaping : Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

Unit III

Switching Characteristics of Devices: Diode and Transistor as switches, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times.

Digital Logic gate circuits: Realization of Logic Gates using DTL, TTL,ECL and CMOS logic circuits ,Comparison of logic families

Unit IV

Multivibrators: Analysis & Design of Bistable Multivibrators : Fixed bias& self biased transistor binary, Commutating capacitors, Triggering in binary, Schmitt trigger circuit,Applications

UNIT V

Multivibrators(Cotnd.): Analysis & design of Monostable Multivibrator: Collector-coupled and Emitter-coupled Monostable multivibrators, Triggering in monostable multi;

Analysis & design of Astable multivibrator (Collector coupled and Emitter-coupled) using transistors.

UNIT VI

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, Current time base generators.

Unit VII

Synchronization and Frequency Division : Principles of Synchronization, Frequency division in sweep circuit, Astable relaxation circuits, Monostable relaxation circuits, Phase delay&phase jitters;Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit.

Unit VIII

Blocking oscillators & Sampling Gates:

Blocking oscillators: Monostable blocking oscillators (Basetiming& Emitter timing): Astable blocking oscillators (Diode-Controlled & RC controlled), Applications

Sampling gates; Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of pedestal in gate circuits, Four-diode sampling gates; Applications of sampling gates.

Text Books :

1 . J. Millman and H. Taub, "Pulse, Digital and Switching Waveforms", McGraw-Hill, 1991.

2. A. Anand Kumar, "Pulse and Digital Circuits", PHI, 2005.Second Edition

References :

1. Venkat Rao. K. Ramasudha K, Manmadha Rao G, "Pulse and Digital Circuits," Pearson Education, 2010

2.David J.Comer,"Digital Logic State Machine Design', Oxford University Press,2008,Third Edition

3 MS Prakash Rao – " Pulse and Digital Circuits " Tata McGrawHill

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SWITCHING THEORY AND LOGIC DESIGN

UNIT I: Review of Number systems:

Representation of numbers of different radix, conversion of numbers from one radix to another radix, r-1's complement and r's complement of unsigned numbers subtraction, problem solving. Signed binary numbers, different forms, problem solving for subtraction. 4-bit codes: BCD, EXCESS 3, alphanumeric codes,9's complement, 2421, etc.. (Text Books: 2,, Reference Books: 1,2,4)

UNIT II

Logic operation, error detection and correction codes: Basic logic operations NOT, OR,AND,Boolean theorems, Complement and dual of logical expressions, NAND and NOR Gates, EX-OR, EX-NOR Gates, standard SOP and POS, Minimisation of logic functions using theorems, Generation of self dual functions. Gray code, error detection and error correction codes, parity checking even parity, odd parity, Hamming code, multi leveled AND-NOR Realisations. Two level NAND-NAND and NOR-NOR realizations. Degenerative forms and multi level realizations. (Text Books: 1,2, Reference Books: 12,4)

UNIT III

Minimisation of switching functions: Minimisation of switching functions using K-Map up to 6-variables, Tabular minimization, minimal SOP and POS Realisation. Problem solving using K-map such as code converters binary multiplier etc.,(Text Books: 1,2 , Reference Books: 2,4)

UNIT IV

Combinational logic circuits-I: Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary adder, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit Excess3 adder circuit, look-a-head adder circuit. (Text Books: 2, , Reference Books: 1,2,3)

UNIT V

Combinational logic circuits-II: Design of decoder, Demultiplexer, higher order demultiplexing, encoder, multiplexer, higher order multiplexer, realization of Boolean functions using decoders and multiplexers, priority encoder, different code converter using full adders. (Text Books: 1,2, Reference Books: 1,2,3)

UNIT VI

Combinational logic circuits-III: PROM,PLA,PAL, realization of switching functions using PROM,PLA and PAL; comparison of PROM,PLA,and PAL, Programming tables of PROM,PLA and PAL. (Text Books: 1,2, Reference Books: 1,2,4)

UNIT VII

Sequential circuits I: Classification of sequential circuits (synchronous and asynchronous): basic flip-flops, truth tables and excitation tables (nand RS latch, nor RS latch, RS flip-flop. JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals).Conversion of flip-flop to flip-flop. Design of ripple counters, design of synchronous counters, Johnson counters, ring counters. Design of registers, Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register. (Text Books: 1,2, Reference Books: 1,2,3)

UNIT VIII

Sequential circuits II: Finite state machine, capabilities and limitations, analysis of clocked sequential circuits, design procedures, reduction of state tables and state assignment. Realization of circuits using various flip-flops. Meelay to Moore conversion and vice-versa. (Text Books: 1 Reference Books: 1,2,4)

TEXTBOOKS:

1. Switching theory and logic design by Hill and Peterson Mc-Graw Hill MH edition
2. Modern Digital Electronics by RP Jain, TMH.

Reference Books:

1. Fundamentals of Digital Circuits by Ananda Kumar, EEE Editiion.
2. Digital design by Mano 2nd edition PHI.

3. Micro electronics by Millman MH edition.

4. Fundamentals of Logic Design by Charles H.Roth Jr, Jaico Publishers.

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EM WAVES AND TRANSMISSION LINES

Review of Coordinate Systems, Vector Calculus :

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, Related Problems. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Related Problems.

UNIT II

Magneto Statics : Biot-Savart 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. Related 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. Related Problems .

UNIT IV

EM Wave Characteristics - I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H. Sinusoidal Variations. Wave Propagation in Lossless and Conducting Media. Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics. Polarization. Related Problems.

UNIT V

EM Wave Characteristics – II: Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance. Poynting Vector and Poynting Theorem – Applications, Power Loss in a Plane Conductor. Related Problems.

UNIT V

Guided Waves : Parallel Plane Waveguides: Introduction, TE, TM, TEM Modes - Concepts and Analysis, Cut-off Frequencies, Velocities, Wavelengths, Wave Impedances. Attenuations Factor – Expression for TEM Case. Related Problems.

UNIT VII

Transmission Lines - I : 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. Related Problems.

UNIT VIII

Transmission Lines – II : Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; λ/4, λ /2, λ/8 Lines – Impedance Transformations. Smith Chart – Configuration and Applications, Single and Double Stub Matching. Related Problems.

TEXT BOOKS :

1. Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed., 2001.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

REFERENCES :

1. Electromagnetic Fields and Wave Theory –GSN Raju, Pearson Education 2006
2. Engineering Electromagnetics – Nathan Ida, Springer (India) Pvt. Ltd., New Delhi, 2nd ed., 2005.
3. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.
4. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan (Tech. India Publications), New Delhi, 2001.

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ANALOG COMMUNICATIONS

UNIT I

INTRODUCTION : Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

UNIT II

DSB MODULATION : Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop.

UNIT III

SSB MODULATION : Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT IV

ANGLE MODULATION : Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM & AM.

UNIT V

NOISE : Noise in Analog communication System, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis

UNIT VI

TRANSMITTERS : Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter.

UNIT VII

RECEIVERS : Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

UNIT VIII

PULSE MODULATION : Time Division Multiplexing,, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, TDM Vs FDM

TEXT BOOKS:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 2007 3rd Edition.
2. Communication Systems – B.P. Lathi, BS Publication, 2006.

REFERENCES:

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed.,.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Communication Systems– R.P. Singh, SP Sapre, Second Edition TMH, 2007.
4. Fundamentals of Communication Systems - John G. Proakis, Masond, Salehi PEA, 2006.

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ELECTRONIC CIRCUITS & P D C LAB

List of Experiments (Twelve experiments to be done) :

I) Design and Simulation in Simulation Laboratory using Multisim OR Pspice OR Equivalent Simulation Software. & Veryfing the result by Hardware (Any Six):

1. Common Emitter and Common collector amplifier-Freq. response,Impedances measurement
2. Two Stage RC Coupled Amplifier
3. Current shunt and Voltage shunt Feedback Amplifier- Freq. response,Impedances measurement(with and without feedback)
4. Wien Bridge Oscillator using Transistors- Design for different frequencies
5. RC Phase Shift Oscillator using Transistors - Design for different frequencies
6. Class A Power Amplifier (with and without transformer load)
7. Class B Power Amplifier
8. Single Tuned Voltage Amplifier
9. Series Voltage Regulator
10. Shunt Voltage Regulator

II) Pulse and Digital Circuits (Any Six)- By designing the Circuit

1. Linear wave shaping (Diff. Time Constants, Differentiator, Integrator)
2. Non Linear wave shaping – Clippers.,Clampers
3. Logic gates with discrete components (Diodes, Transistors)
4. Bistable Multivibrator
5. Astable Multivibrator. (Voltage- Frequency convertor)
6. Monostable Multivibrator.
7. Schmitt Trigger.
8. UJT Relaxation Oscillator.
9. Bootstrap sweep circuit.
10. Sampling Gates

Equipments required for Laborataries:

i. For software simultation of Electronic circuits
   - i) Computer Systems with latest specifications
   - ii) Connected in Lan (Optional)
   - iii) Operating system (Windows XP)
   - iv) Simulations software (Multisim/TINAPRO) Package

Equipment:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. Components
5. Multimeters

ANALOG COMMUNICATIONS LAB

List of Experiments (Twelve experiments to be done) - (a. Hardware, b.MATLAB Simulink, c. MATLAB Communication tool box)

A. Amplitude Modulation - Mod. & Demod.
B. AM - DSB SC - Mod. & Demod.
C. Spectrum Analysis of Modulated signal using Spectrum Analyser
D. Diode Detector
E. Pre-emphasis & De-emphasis
F. Frequency Modulation - Mod. & Demod.
G. AGC Circuits
H. Sampling Theorem
I. Pulse Amplitude Modulation - Mod. & Demod.
J. PWM , PPM - Mod. & Demod.
K. PLL

Equipments & Software required:

Software :

i.) Computer Systems with latest specifications
ii) Connected in Lan (Optional)
iii) Operating system (Windows XP)
iv) Simulations software (Simulink & MATLAB)

Equipment:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. Components
5. Multimeters
6. Spectrum Analyser

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