DR. A P J ABDUL KALAM UNIVERSITY, INDORE

SYLLABUS

of

BACHELOR OF ENGINEERING

(Second Year, Grading System)

Dr. A P J Abdul Kalam University, Indore

DR. A P J ABDUL KALAM UNIVERSITY, INDORE

Syllabus for BE-Electronics & Communication Engineering

List of Subject (Second Year, Grading System)

Sub Code : MA220T **Sub Name :** Mathematics-III **4 Credits**

Unit I Functions of complex variables

Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for evaluation of real integrals.

Unit II Numerical Solution of Algebraic and Transcendental Equations

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi , Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Unit III Interpolation, Numerical differentiation & Integration

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit IV Functions of Complex Variables

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit V Transformation

Fourier Transform: Definition and properties of Fourier transform, Sine and Cosine transform. Z-transform .Testing of Hypothesis :Students t-test, Fisher's z-test, Chi-Square Method

References:

1. Erwin Kreyszig: Advanced Engineering Mathematics, Wiley India.
2. B.S. Grewal: Higher Engineering Mathematics , Khanna Publication.
3. Engineering Mathematics By Samnta Pal and Bhutia, Oxford Publication
4. Ramana: Advance Engg. Mathematics, TMH New Delhi
5. Numerical Methods for Engineers by Steven C. Chapra, McGraw Hill Education
6. Introductory Methods of Numerical Analysis by S. S. Sastry, PHI Learning Pvt. Ltd.
7. Numerical Methods By Shrimanta Pal, Oxford

Sub Code: EC221T **Sub Name:** Digital circuits & system **3 Credits**

Unit-1

Review of Logic gates and binary operations- AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND–NOR implementations – Multi level gate implementations- Multi output gate implementations. Introduction to number systems and binary operations. **Boolean postulates and laws** – De-Morgan's Theorem - Principle of Duality, Boolean function, Canonical and standard forms,Minimization of Boolean functions, Minterm,Maxterm, Sum of Products (SOP), Product of Sums (POS),Karnaugh map Minimization, Don't care conditions, Quine-McCluskey method of minimization.

Unit-2

Combinational logic circuits: Half adder – Full Adder – Half subtractor - Full subtractor– Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder– Serial. Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/De-multiplexer – decoder - encoder – parity checker – parity generators –code converters - MagnitudeComparator.

Unit-3

Sequential logic circuits: Latches, Flip-flops - SR, JK, D, T, and Master-Slave, Characteristic table and equation–Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor.

Unit-4

Registers and Counters: Asynchronous Ripple or serial counter. Asynchronous Up/Down counter – Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram-State table –State minimization –State assignment - Excitation table and maps-Circuit. Implementation -Modulo–n counter, Registers – shift registers - Universal shift registers. Shift register counters – Ring counter – Shift counters - Sequence generators.

Unit-5

Logic Families: Introduction to different logic families and their characteristics ,RTL,DTL,TTL, ECL, IIL,TTL inverter – circuit description and operation, CMOS inverter – circuit description and operation, other TTL and CMOS gates, **Memories** – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization Static RAM, Dynamic RAM, Programmable Logic Array (PLA) - Programmable Array Logic (PAL).

References

1. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
2. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 6thEdition,TMH, 2003.
3. Anil K. Maini, Digital electronics Principles and Integrated circuits Wiley India Pvt. Ltd.
4. Anand kumar- fundamental of digital circuit. 3rd edition.PHI.
5. John. F. Wakerly, Digital Design, Principles and Practices, Pearson Prentice Hall

Unit-1
Network Graph theory: Concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks.

Unit-2
Network Theorems: Thevenins & Norton's, Super positions, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.

Unit-3
Transient analysis: Transients in RL, RC&RLC Circuits, initial& final conditions, time constants. Steady state analysis

Unit-4
Laplace transform: solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain.

Unit-5
Two port parameters: Z, Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Reciprocity and Symmetry in all parameter.

References

1. M.E. Van Valkenburg, Network Analysis, (Pearson).
2. S P Ghosh A K Chakraborty Network Analysis & Synth. (MGH).
3. Sudhakar-Circuit Network Analysis & Synth(TMH).
4. Robert L Boylestad introductory Circuit analysis, Pearson
5. Smarajit Ghosh, NETWORK THEORY: ANALYSIS AND SYNTHESIS (PHI).
6. Roy Choudhary D; Network and systems; New Age Pub.
7. Bhattacharya and Singh- Network Analysis & Synth (Pearson).

Unit-1

Introduction to semiconductor physics: insulator, conductor, semiconductor and semiconductor types. Drift and diffusion carries, Hall Effects. **Review of PN junction diode**: PN junction diode in forward and reverse bias, temperature dependence of V-I characteristics, diode resistances, diode junction capacitance. Types of diodes: Zener Diode, Varactor Diode, Tunnel Diode, PIN Diode, Schottky Diode, LED and Photo Diodes, Switching characteristics of diode.

Unit-2

Bipolar junction transistor - Construction, basic operation, current components and equations, CB, CE and CC configuration, input and output characteristics, Early effect, Region of operations: active, cut-off and saturation region. BJT as an amplifier. Ebers-Moll model, Power dissipation in transistor ($P_{d,max}$ rating), Photo transistor. **Transistor biasing circuits and analysis:** Introduction, various biasing methods:Fixed bias,Self bias, Voltage Divider bias, Collector to base bias, Load-line analysis: DC and AC analysis, Operating Point and Bias Stabilization and Thermal Runaway. Transistor as a switch.

Unit-3

Small Signal analysis: Small signal Amplifier,Amplifier Bandwidth, Hybrid model, analysis of transistor amplifier using h-parameter, Multistage Amplifier: Cascading amplifier, Boot-strapping Technique, Darlington amplifier and cas-code amplifier, Coupling methods in multistage amplifier, Low and high frequency response, Hybrid π model, Current Mirror circuits. **Large Signal analysis and Power Amplifiers:** Class A,Class B,Class AB,Class C,Class D, Transformer coupled and Push-Pull amplifier.

Unit-4

FET construction- JFET: Construction, n-channel and p-channel, transfer and drain characteristics, parameters, Equivalent model and voltage gain, analysis of FET in CG, CS and CD configuration. Enhancement and Depletion MOSFET drain and transfer Characteristics.

Unit-5

Uni-junction Transistor (UJT) and Thyristors:UJT: Principle of operation, characteristics, UJT relaxation oscillator, PNPN Diode and its characteristics, Silicon controlled rectifier: V-I characteristics, DIAC and TRIAC, Thyristors parameters and applications.

References

1. Millman and Halkias: Integrated electronics, TMH.
2. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education.
3. Sedra and Smith: Microelectronics, Oxford Press.
4. Anil K. Maini, VarshaAgarwal: Electronic Devices and Circuits, Wiley Publications.
5. Rashid: Electronic Devices and Circuits, Cengage learning.
6. Salivahanan: Electronic Circuits Analysis and Design, TMH.
7. Kumar and Jain: Electronic Devices and Circuits, PHI.
8. David A. Bell Electronic Devices and Circuits Oxford University press.

Unit-1
Accuracy and Precision, Sensitivity, Linearity, Resolution, Hysteresis, Loading Effect. Measurements of Current, Voltage, Power and Impedance: DC and AC Ammeter, DC Voltmeter- Chopper type and solid-state, AC voltmeter using Rectifier. Average, RMS, Peak responding voltmeters, Multi-meter, Power meter, Bolometer and Calorimeter.

Unit-2
Different parts of CRO, Block diagram, Electrostatic focusing, Electrostatic deflection, Post deflection acceleration. Screen for CRTs, Graticules, Vertical and Horizontal deflection system, Time base circuit, Oscilloscope Probes, Applications of CRO, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog and Digital) Oscilloscope. Maxwell's bridge (Inductance and Inductance-Capacitance), Hay's bridge, Schering bridge (High voltage and Relative permittivity), Wein bridge. Impedance measurement by Q-meter.

Unit-3
Non-Electrical Quantities (Transducer): Classification of Transducers, Strain gauge, Displacement Transducer-Linear Variable Differential Transformer (LVDT) and Rotary Variable Differential Transformer (RVDT), Temperature Transducer- Resistance Temperature Detector (RTD), Thermistor, Thermocouple, Piezo-electric transducer, Optical Transducer- Photo emissive, Photo conductive, Photo voltaic, Photo-diode, Photo Transistor.

Unit-4
Signal and Function Generators, Sweep Frequency Generator, Pulse and Square Wave Generator, Beat Frequency Oscillator, Digital display system and indicators, Classification of Displays, Display devices: Light Emitting diodes (LED) and Liquid Crystal Display (LCD).

Unit-5
Advantages of Digital Instrument over Analog Instrument, Digital-to-analog conversion (DAC) - Variable resistive type, R-2R ladder Type, Binary ladder, Weighted converter using Op-amp and transistor, Practical DAC. Analog-to digital Conversion (ADC) -Ramp Technique, Dual Slope Integrating Type, Integrating Type (voltage to frequency), Successive Approximations. Digital voltmeters and multi-meters, Resolution and sensitivity of digital multi-meter.

References

1. Millman and Halkias: Integrated electronics, TMH.
2. H.S. Kalsi: Electronics Instrumentation, TMH.
3. A.K. Sawhney: Instrumentation and Measurements, Dhanpat Rai and Co.
4. Oliver: electronic Measurements introduction TMH
5. Helfric and Cooper: Modern Electronic Instrumentation and Measurement Techniques, Pearson.
6. Ghosh: introduction to measurements and instrumentation 4th edition PHI
7. Bell: electronic Instrumentation and Measurement oxford press.
8. Banerjee: electrical and electronics Measurement 2nd PHI.

Unit-1
Introduction: Communication, definition and role of communication, Process of communication.

Unit-2
Importance of professional communication, Levels of communication, Types of communication, Challenges in communication.

Unit-3
Non –verbal communication – Body language, personal appearance, posture, gesture and hand movement, eye contact, facial expressions,

Unit-4
Paralinguistic features - proxemics, haptics, chronemics. Oral presentations.

Unit-5
Case studies on different case or topic.

References

1. Business Communication, Mc Graw Hill Education, Matthukutty M. Monippally.
2. Effective Business Communication , Mc Graw Hill Education, Neera Jain, Shoma Mukherji.
3. Technical Communication , Cengage , P. Subba Rao, B. Anita Kumar, C. Hima Bindu.
4. Business Correspondence & Report Writing , Mc graw Hills. , R.C. Sharma & Krishna Mohan .
5. Technical Communication – Principles & Practice , Oxford , Meenakshi Raman.
6. Business Communication- Mc graw Hills , Peter Cordom.
7. Communication Skills , Oxford , Sanjay Kumar & Pushpa TMH.
8. Effective Technical Communication, M. Ashraf Rizvi ,Mc Graw Hill Education.

The purpose of the subject Idea Generation student design business ideas and involve in coming up with many ideas in a group discussion, selecting the best idea or ideas, working to create a plan to implement the idea, and then actually taking that idea and putting it into practice. The idea can be tangible, something you can touch or see, or intangible, something symbolic or cultural. In this subject students figure out solutions to any number of difficult challenges faces by the industries or companies.

Sub Code HU222P	Sub Name: Learning Through Experts	2 Credits

The purpose of the subject is students learn through subject expert in different areas and fields. Expert understands how student learn. Experts are skilled instructional designers and are able to create interaction-rich learning experiences that support a given outcome. In the corporate world, a learning expert should also have an understanding of the business needs of a given learning experience and design it in a way that supports those needs. Students benefit from the expert to create a good critical thinking related to the subjects as well as business needs.

EXPERIMENTS LIST:

1. To verify the truth table of all basic logic gates and to implement all gate using universal gate.
2. Design of 4 bit Adders (CLA, CSA, CMA, Parallel adders)
3. Design of Binary Subtractors
4. Design of Encoder (8X3), Encoder(3X8)
5. Design of Multiplexer (8X1), and De-multiplexer (1X8)
6. Design of code converters & Comparator
7. Design of FF (SR, D, T, JK, and Master Slave with delays)
8. Design of registers using latches and flip-flops

Sub Code EC222P	Sub Name: Network Analysis	1 Credits

EXPERIMENTS LIST:

1. To Verify Thevenin Theorem and Superposition Theorem.
2. To Verify Reciprocity Theorem and Millman's Theorem.
3. To Verify Maximum Power Transfer Theorem.
4. To Determine Open Circuit and Short Circuit parameters of a Two Port Network.
5. To Determine A,B, C, D parameters of a Two Port Network.
6. To determine h parameters of a Two Port Network.
7. To Find Frequency Response of RLC Series Circuit RLC parallel Circuit and determine resonance and 3dB frequencies.
8. To determine charging and discharging times of Capacitors.

EXPERIMENTS LIST:

1. To determine and analyzethe V-I characteristics of PN Junction diode and Zener diode.
2. To determine input and output characteristics of transistor amplifiers in CE, CB &CC configurations.
3. To determine the frequency response of transistor CE amplifier, direct coupled and RC coupled amplifier.
4. To determinecharacteristics ofUJT as relaxation Oscillator.
5. To determineDrain and Transfer Characteristicsof JFET Amplifier.
6. To determineDrain and Transfer Characteristicsof MOSFET Amplifier.
7. To determinecharacteristics of class A and Bpower amplifiers.
8. To determine characteristics of classC and AB power amplifiers.

EXPERIMENTS LIST:

1. Study of Cathode Ray Oscilloscope and Function Generator.
2. Study of displacement measurement by LVDT.
3. Force measurement by strain gauge.
4. Measurement of Capacitor using Q-meter.
5. Measurement of Self-induction using Q-meter.
6. Temperature measurement by thermistor, RTD and thermocouple.
7. Study of optical Transducers: Photo conductive, Photo voltaic, Photo-diode, Photo-Transistor.
8. Design of digital to analog converter,R-2R ladder Type and analysis of its characteristics.

EXPERIMENTS LIST:

Language Lab II

Module 1 : Reading comprehension

Module 2 : Role plays

Module 3 : Debate

Module 4 : Group discussion

Module 5 : Resume writing

Module 6 : Interview skills

Module 7 : Body language

Module 8 : Oral presentations

Unit-1

Overview of signals: Basic definitions. Classification of signals, Continuous and discrete time signals, Signal operations and properties, discretization of continuous time signals, Signal sampling and quantization.

Unit-2

Continuous Time and Discrete Time System characterization: Basic system properties: Linearity, Static and dynamic, stability and causality, time invariant and variant system, invertible and non-invertible, representation of continuous systems. **Response of Continuous Time−LTI System:**Impulse response and convolution integral, properties of convolution, signal responses to CT-LTI system.

Unit-3

z- Transform: Introduction, ROC of finite duration sequence, ROC of infinite duration sequence, Relation between Discrete time Fourier Transform and z-transform, properties of the ROC, Properties of z-transform, Inverse z-Transform, Analysis of discrete time LTI system using z- Transform, Unilateral z-Transform

Unit-4

Discrete Time System: Impulse response characterization and convolution sum, Causal signal response to DT-LTI systems. Properties of convolution summation, Impulse response of DT-LTI system and its properties. **Fourier analysis of discrete time signals:** Introduction, Properties and application of discrete time Fourier series, Representation of Aperiodic signals, Fourier transform and its properties, Convergence of discrete time Fourier transform, Fourier Transform for periodic signals, Applications of DTFT

Unit-5

Systems with Finite and infinite duration response: Recursive and non-recursive discrete time systems-realization structures-direct form-I, direct form-II, Transpose, cascade and parallel forms, state space analysis: Representation and solution for continuous and discrete time LTI system.

References

1. Allan V. Oppenheim, S. Wilsky and S. H. Nawab, Signals and Systems, Pearson Education.
2. A. Anand kumar signal and system 3rdEdition, PHI.
3. Edward W. Kamen & Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education.
4. H. P. Hsu, Rakesh Ranjan "Signals and Systems", Schaum's Outlines, Tata McGrawHill.
5. Simon Haykins and Barry Van Veen: Signals and Systems, John Wiley & sons.
6. Rawat: Signal and Systems, Oxford Publication.
7. Nagoorkani: signal and system (TMH).

Unit-1

Feedback Amplifier and Oscillators: Concept of feedback and their types, Amplifier with negative feedback and its advantages. Feedback Topologies. **Oscillators:** Concept of Positive feedback, Classification of Oscillators, Barkhausen criterion, Types of oscillators: RC oscillator, RC Phase Shift, Wien Bridge Oscillators. LC Oscillator: Hartley, Colpitt's, Clapp and Crystal oscillator. **Introduction to integrated circuits:** Advantages and characteristic parameters of IC's, basic building components, data sheets,

Unit-2

Operational Amplifier: Differential amplifier and analysis, Configurations- Dual input balanced output differential amplifier, Dual input Unbalanced output differential amplifier, Single input balanced output differential amplifier, Single input Unbalanced output differential amplifier Introduction of op-amp, Block diagram, characteristics and equivalent circuits of an ideal opamp, Power supply configurations for OP-AMP. **Characteristics of op-amp:** Ideal and Practical, Input offset voltage, offset current, Input bias current, Output offset voltage, thermal drift, Effect of variation in power supply voltage, common-mode rejection ratio (CMRR), Slew rate and its Effect, PSRR and gain bandwidth product, frequency limitations and compensations, transient response, analysis of TL082 datasheet.

Unit-3

OP-AMP applications: Inverting and non-inverting amplifier configurations, Summing amplifier, Integrators and differentiators, Instrumentation amplifier, Differential input and differential output amplifier, Voltage-series feedback amplifier, Voltage-shunt feedback amplifier, Log/ Antilog amplifier, Triangular/rectangular wave generator, phase-shift oscillators, Wein bridge oscillator, analog multiplier-MPY634, VCO, Comparator, Zero Crossing Detector.

Unit-4

OP-AMP AS FILTERS: Characteristics of filters, Classification of filters, Magnitude and frequency response, Butterworth 1st and 2nd order Low pass, High pass and band pass filters, Chebyshev filter characteristics, Band reject filters, Notch filter; all pass filters, self-tuned filters, AGC, AVC using op-AMP.

Unit-5

TIMER: IC-555 Timer concept, Block pin configuration of timer. Monostable, Bistable and Astable Multivibrator using timer 555-IC,Schmitt Trigger, Voltage limiters, Clipper and clampers circuits, Absolute value output circuit, Peak detector, Sample and hold Circuit, Precision rectifiers, Voltage-to-current converter, Current-to-voltage converter. **Voltage Regulator:** simple OP-AMP Voltage regulator, Fixed and Adjustable Voltage Regulators, Dual Power supply, Basic Switching Regulator and characteristics of standard regulator ICs.

References

1. RamakantA.Gaikward,"OP- Amp and linear Integrated circuits"Third edition- 2006, Pearson.
2. B. VisvesvaraRao Linear Integrated Circuits Pearson.
3. David A. Bell: Operational Amplifiers & Linear ICs, Oxford University Press, 2nd edition,2010.
4. D. Roy Choudhury:Linear Integrated Circuits New Age Publication.
5. B. Somanathan Nair: Linear Integrated Circuits analysis design and application Wiley India Pvt. Ltd.
6. S.Salivahanan,V S KanchanaBhaaskaran: Linear Integrated Circuits",second edition, McGraw Hill.

Unit-1

Frequency domain representation of signal: Fourier transform and its properties, condition of existence, Fourier transform of impulse, step,signum , cosine, sine, gate pulse, constant, properties of impulse function. Convolution theorem (time & frequency), correlation(auto & cross), energy & power spectral density.

Unit-2

AM modulation: Block diagram of a communication system,need of modulation, types of modulations techniques, Amplitude modulation, Equation and its frequency domain representation, Bandwidth, Power requirement, efficiency. AM suppressed carrier (DSB-SC, SSB-SC, VSB-SC) Power requirement, efficiency waveform equation and frequency domain representation, Generation of AM, DSB-SC, SSB-SC, VSB-SC & its detection, synchronous generation& detection & errors.

Unit-3

AM transmitter& receiver: Tuned radio receiver & super heterodyne, limitation of TRF, IF frequency, image signal rejection, selectivity, sensitivity and fidelity, Noise in AM, FM

Unit-4

Angle modulation: Types of angle modulation, narrowband FM, wideband FM, its frequency spectrum, transmission BW, methods of generation (Direct & Indirect), detection of FM (discriminators: balanced, phase shift and PLL detector),pre emphasis and de-emphasis.

Unit-5

FM transmitter & receiver: Block diagram of FM transmitter& receiver, AGC, AVC, AFC, **Noise:** Classification of noise,S ources of noise, Noise figure and Noise temperature, Noise bandwidth, Noise figure measurement, Noise in analog modulation, Figure of merit for various AM and FM, effect of noise on AM & FM receivers.

References

1. Simon Haykins, Communication System, John Willy
2. Singh &Sapre, Communication System, TMH
3. B.P. Lathi, Modern Digital and analog communication system; TMH
4. Singhal, analog and Digital communication, TMH
5. Rao, Analog communication, TMH
6. P K Ghose, principal of communication of analog and digital, universities press.
7. Taub& shilling, Communication System, TMH
8. Hsu; Analog and digital communication(Schaum); TMH
9. Proakis fundamental of communication system. (Pearson edition).

Unit-1

Introduction to Control system: Terminology and classification of control system, examples of control system, Laplace Transform and its application, mathematical modeling of mechanical and electrical systems, differential equations, transfer function, block diagram representation and reduction, signal flow graph techniques.

Unit-2

Feedback characteristics of control systems: Open loop and closed loop systems, effect of feedback on control system and on external disturbances, linearization effect of feedback, regenerative feedback.

Unit-3

Time response analysis: Standard test signals, time response of 1st order system, time response of 2nd order system, steady-state errors and error constants, effects of additions of poles and zeros to open loop and closed loop system. **Time domain stability analysis:** Concept of stability of linear systems, effects of location of poles on stability, necessary conditions for stability, Routh-Hurwitz stability criteria, relative stability analysis, Root Locus concept, guidelines for sketching Root-Locus.

Unit-4

Frequency response analysis: Correlation between time and frequency response, Polar plots, Bode Plots, all-pass and minimum-phase systems, log-magnitude versus Phase-Plots, closed-loop frequency response. **Frequency domain stability analysis:** Nyquist stability criterion, assessment of relative stability using Nyquist plot and Bode plot (phase margin, gain margin and stability).

Unit-5

Approaches to system design: Design problem, types of compensation techniques, design of phase-lag, phase lead and phase lead-lag compensators in time and frequency domain, proportional, derivative, integral and PID compensation. **State space analysis:** State space representation of systems, block diagram for state equation, transfer function decomposition, solution of state equation, transfer matrix, relationship between state equation and transfer function, controllability and observability.

References

1. I. J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Benjamin C. Kuo, Automatic Control systems, Wiley India Pvt. Ltd, 9th edition.
3. A. Anand Kumar, " Control Systems" PHI, New Delhi, 2007
4. Norman S. Nise, Control System Engineering, Wiley India Pvt. Ltd.
5. R. Anandnatarajan, P. Ramesh Babu, "Control System Engineering" Scitech Publication
6. (India) Pvt. Ltd. 2014
7. Distefano (schaum series) Control Systems TMH
8. M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi,
9. 2002.
10. Manik, Control System, Cengage Learnings.
11. Stefani shahian- Design of feedback control system oxford university press.
12. Salivahanan Control Systems engg. Pearson Education, New Delhi
13. K. Ogata, 'Modern Control Engineering', Pearson Education, New Delhi
14. B.S. Manke linear control system, khanna publishers

Unit-1

Atomic structure, molecules and general bonding principles, crystal system and structure, Miller indices, Bravais lattice, Bragg's law, crystal structure for metallic elements, structural imperfections, dielectric parameters, polarsation, static dielectric constant of solids, ferroelectric materials, piezoelectricity, compex dielectric constant, dipolar relaxation, Debye equation , dielectric loss, insulating materials and their properties, composite materials

Unit-2

Magnetism: fundamental concepts pertaining to magnetic fields, magnetic dipole movement of current loops, orbital magnetic dipole movement and angular momentum of simple atomic model, classification of magnetic materials, spin magnetic moment, paramagnetism, ferromagnetism, spontaneous magnetization and Curie-Weiss law, ferromagnetic domains, magnetic anisotropy, magnetostriction, antiferromagnetism, ferrites and its applications, magnetic resonance

Unit-3

Conductors: introduction, atomic interpretation of Ohm's law, relaxation time, collision time, mean free path , electron scattering, resistivity of metals, Linde's rule, Joule's law, thermal conductivity of metals, high conductivity materials, high resistivity materials, solder and electrical contact materials, carbon brushes, fuses, superconductivity-The free electron model, thermodynamics and properties of superconductors, meissner effect, classification of superconductors

Unit-4

Semiconductors: chemical bonds in Ge and Si, carrier density, extrinsic semiconductor, n-type , p-type semiconductor, Hall effect, mechanism of current flow, drift current, diffusion current, Einstein relation, materials for fabrication of semiconductor devices, fabrication technology, continuity equation, capacitance of junction barrier, junction transistors, thermistor, variastors

Unit-5

Optical properties of materials: introduction, electromagnetic radiation spectrum, refractive index, reflection, Birefringence, Translucency, colour centres, dispersion, absorption, excitons, photoelectric emission, electroluminescence , photoconductivity, photoelectric cells, lasers, ruby lasers, Nd-YAG laser, carbon dioxide laser, optical fibres, fibre materials, mechanism of refractive index variations, fabrication of fibre, fibre cables, solar cell, fuel cell, MHD generators.

References

1. Banerjee-Electrical & Electronics Material,PHI.
2. S. O. Kasap-Priniciple of Electronics Material &Device,TMH.
3. Jones- Material Science for Electrical & Electronics Enginnering,Oxford.
4. V.Raghvan Material science&engineering,PHI.
5. J.Allison ElectronicsEnginnering, Material &Device,TMH.
6. Gilmore: Material Science, Cengage Learnings.
7. Gupta & Gupta Advance Electrical & Electronics Material,Wieley India.
8. James F.Shackelford-Introduction Material Science for Enginnering Pearson.
9. V.Rajendran - Material science,TMH.

Unit-1
What is System Engineering, Origin, Examples of Systems requiring systems engineering, Systems Engineer Career Development Model, Perspectives of Systems Engineering, Systems Domains, Systems Engineering Fields, System Engineering Approaches.

Unit-2
Structure of Complex Systems, System Building Blocks and Interfaces, Hierarchy of Complex Systems, System Building Blocks, The System Environment, Interfaces and Interactions, Complexity in Modern Systems.

Unit-3
Concept Development and Exploration, Originating a New System, Operations Analysis, Functional Analysis, Feasibility, System Operational Requirements, Implementation of Concept Exploration.

Unit-4
Engineering Development, Reducing Program Risks, Requirements Analysis, Functional Analysis and Design, Prototype Development as a Risk Mitigation Technique, Development Testing, Risk Reduction.

Unit-5
Integration and Evaluation, Integrating, Testing, And Evaluating The Total System, Test Planning And Preparation, System Integration, Developmental System Testing, Operational Test And Evaluation, Engineering For Production, Transition From Development To Production, Production Operations.

References

1. Alexander Kossiakoff, William N Sweet, "System Engineering Principles and Practice, Wiley India
2. Blanchard Fabrycky, Systems engineering and analysis, Pearson
3. Dennis M. Buede, William D.Miller, "The Engineering Design of Systems: Models & Methods" Wiley India
4. Jeffrey L Whitten, Lonnie D Bentley, "System Analysis and Design Methods"
5. Richard Stevens, Peter Brook," System Engineering – Coping with complexity, Prentice Hall

COURSE CONTENTS:

Introduction to circuit simulation software (TINA-PRO/ PSPICE/ CIRCUIT MAKER).

Study of the key features and applications of the software in the field of Electronic Circuits, Electronic Instrumentation and Network Analysis. Design, Optimization and simulation of;

1. Basic Electronic circuits (examples rectifiers, clippers, clampers, diode, transistor characteristics etc).
2. Transient and steady state analysis of RL/ RC/ RLC circuits, realization of network theorems.
3. Use of virtual instruments built in the software.

Introduction to PCB layout software

Overview and use of the software in optimization, designing and fabrication of PCB pertaining to above circuits simulated using above simulation software.

Students should simulate and design the PCB for at least two circuits they are learning in the current semester.

Sub Code HU223P	Sub Name: NSS/NCC	0 Credits

NSS/NCC is just a qualifier subject which means student has to compulsorily qualify this is a mandatory requirement for the award of degree before completing the course

List of Experiments:

Introduction to MATLAB

1. To implement delta function, unit step function, Ramp function.
2. To explore the commutation of even and odd symmetries in a signal with algebraic operations.
3. To explore the effect of transformation of signal parameters (amplitude-scaling, time scaling and time-shifting).
4. To explore the time variance and time invariance property of a given system.
5. To explore causality and non-causality property of a system.
6. To demonstrate the convolution and correlation of two continuous-time signals.
7. To demonstrate the convolution and correlation of two discrete-time signals.
8. To determine Magnitude and Phase Response of Fourier Transform of given signals.

List of Experiments:

Apparatus Required –Function Generator, TL082, MPY634/ASLK Pro, Power Supply, Oscilloscopes, connecting wires, bread board.

1. To determine voltage gain and frequency response of inverting and non-inverting amplifiers using IC-741.
2. To measure offset voltages, bias currents, CMRR, Slew Rate of OPAMP using IC-741.
3. To design an instrumentation amplifier anddetermine its voltage gainusing IC-741.
4. To design op-amp integrator (low pass filter) and determine its frequency response.
5. To design op-amp differentiator (high pass filter) and determine its frequency response.
6. To design Analog filters – I and II and analyse its characteristics.
7. To design Astable,Monostable andBistablemultivibrator using IC-555and analyse its characteristics.
8. Automatic Gain Control (AGC) Automatic Volume Control (AVC).

List of Experiments:

1. To analyze characteristics of AM modulator & Demodulators.
2. To analyze characteristics of FM modulators& Demodulators.
3. To analyze characteristics of super heterodyne receivers.
4. To analyze characteristics of FM receivers.
5. To construct and verify pre emphasis and de-emphasis and plot the wave forms.
6. To analyze characteristics of Automatic volume control and Automatic frequency control.
7. To construct frequency multiplier circuit and to observe the waveform.
8. To design and analyze characteristics of FM modulatorand AM Demodulator using PLL.