OBJECTIVES: The objective of this course is to fulfill the needs of engineers to understand applications of Numerical Analysis, Transform Calculus and Statistical techniques in order to acquire mathematical knowledge and to solving wide range of practical problems appearing in different sections of science and engineering. More precisely, the objectives are:

- To introduce effective mathematical tools for the Numerical Solutions algebraic and transcendental equations.
- To enable young technocrats to acquire mathematical knowledge to understand Laplace transformation, Inverse Laplace transformation and Fourier Transform which are used in various branches of engineering.
- To acquaint the student with mathematical tools available in Statistics needed in various field of science and engineering.


Textbooks/References:


Unit-2 CRO: 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

Bridges: 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 (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.
Text/Reference Books:
Unit-1 Number Systems: Decimal, Binary, Octal and Hexadecimal systems, conversion from one base to another, Codes-BCD, Excess-3, Gray Reflected ASCII, EBCDIC.

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.

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-5 Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA. Logic implementation using Programmable Devices.
Text/Reference Books:

1. Malvino & Leach, “Digital Principles and Applications”, TMH.

DIGITAL SYSTEM DESIGN LAB

1. Study of different basic digital logic gates and verification of their Truth Table.
2. Study and verification of the law of Boolean Algebra and De-Morgan’s Theorem.
3. Construction and verification of various combinational circuits such as Half Adder, Full Adder, Half & Full Subtractor.
4. Study of Multiplexer, De-multiplexer.
5. Study of Different Code Converters, Encoder, Decoder.
6. Construction and verification of various types of Flip-Flops using gates and IC’s.
7. Construction and Verification of different Shift Registers.
8. Construction and verification of different types of Counters.
9. Study of important TTL technologies, Verifications of important TTL Circuit Parameters.
RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electronics & Communication Engineering III-Semester

EC304 Electronic Devices

Unit-1 Semiconductor Material Properties: Elemental & compound semiconductor materials, Bonding forces and Energy bands in intrinsic and extrinsic silicon, Charge carrier in semiconductors, carrier concentration, Junction properties, Equilibrium condition, biased junction, Steady state condition, breakdown mechanism (Rectifying Diodes, Zener Diodes), Metal Semiconductor Junction.

Special diodes: Tunnel diodes, Varactor diodes, Schottky diode, Photo diodes, Photodetector, LED, solar cell.

Unit-2 Diode circuits: Ideal and Practical diode, Clipper, Clamper.

Power Supply: Rectifiers-Half wave, Full wave, Bridge rectifier, filter circuits, Voltage regulation using shunt & series regulator circuits, Voltage regulation using IC.

Unit-3 Fundamentals of BJT: 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 (Pd, 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-5** 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. Unijunction Transistor (UJT) and Thyristors: UJT: Principle of operation, characteristics, UJT relaxation oscillator.

**Text/Reference Books:**

1. Millman & Halkias, “Electronic Devices And Circuits”, TMH.
2. Salivahanan, Kumar & Vallavaraj, “Electronic Devices And Circuits”, TMH.
4. Schilling & Belove, “Electronic Circuits , Discrete & Integrated”, TMH.

**ELECTRONIC DEVICES LAB**

1. **Diode Characteristic**
   a) pn junction diode Characteristics and Static & Dynamic resistance measurement from graph.
   b) To plot Zener diode Characteristics curve.
2. **Clipper Clamper**
   a) To plot the Characteristics curve of various clamper circuits.
   b) To plot the Characteristics curve of various clamper circuits.
3. **Half wave, full wave & bridge rectifier**
   a) To measure Vrms, Vdc for half wave, full wave & bridge rectifier.
   b) To measure ripple factor, ratio of rectification for full wave & half wave rectifier.
4. **Voltage regulation using zener diode shunt regulator and transistor series voltage regulator in the following cases**
   a) Varying input
   b) Varying load
5. **Characteristic of BJT**
   a) To plot the input & output Characteristics curve in CB & CE configuration
   b) To find $\alpha$ & $\beta$ and Q point from the above curve.
c) To plot the Characteristics curve of various clipper circuits.

6. h- Parameter
   To measure h- parameter (Av, Ai, Ro & Ri) in CE Amplifier

7. Multi Stage Amplifier
   a) To plot the Characteristics curve for Direct Coupled Amplifier.
   b) To plot the Characteristics curve for RC Coupled Amplifier.
   c) To plot the Characteristics curve for transformer Coupled Amplifier.

8. FET Characteristic
   a) To plot the Characteristics curve for n channel – JFET in CS configuration.
   b) To find out pinch off voltage from the above characteristics curve

9. UJT Characteristic
   a) To plot the Characteristics curve for UJT.
   b) To determine intrinsic stand off ratio.
Unit-1 Introduction to circuit theory: basic circuit element R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources, controlled & uncontrolled sources KCL and KVL analysis, Steady state sinusoidal analysis using phasors; Concept of phasor & vector, impedance & admittance, Nodal & mesh analysis, analysis of magnetically coupled circuits. Dot convention, coupling coefficient, tuned circuits, Series & parallel resonance

Unit-2 Network Graph theory: Concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks

Unit-3 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-4 Transient analysis: Transients in RL, RC&RLC Circuits, initial& final conditions, time constants. Steady state analysis
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.


3. Kuo- Network Analysis & Synthesis, Wiley India.
4. Robert L Boylestad introductory Circuit analysis, Pearson
6. Roy Choudhary D; Network and systems; New Age Pub.
7. Bhattacharya and Singh- Network Analysis & Synth (Pearson)

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.
EC306 EMI Lab

List of Experiments:

1. Study of Cathode Ray Oscilloscope.
2. Study of displacement measurement by LVDT.
3. Force measurement by strain gauge.
6. Temperature measurement by thermistor.
7. Study of optical Transducers: Photo-diode, Photo-Transistor.
8. Design of digital to analog converter, R-2R ladder Type and analysis of its characteristics.
9. To measurement of the unknown Inductance by using Maxwell’s bridge method.
10. To measurement of the unknown capacitance by using Schering bridge method.
11. To measurement of the unknown Frequency by using Wein’s bridge method.
12. To measurement of the unknown Inductance by using Hay’s bridge method.
14. To calculate Frequency using Lissajious Pattern.
15. To study RVDT.
17. Temperature measurement by thermocouple.
18. Temperature measurement by RTD.
19. Study of optical Transducers: Photo conductive, Photo voltaic.
20. To study digital Multimeter.