Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

New Scheme Based On AICTE Flexible Curricula

BT301	**Mathematics-III**	**3L-1T-0P**	**4 Credits**

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.

Module 1: Numerical Methods – 1: (8 hours): Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Module 2: Numerical Methods – 2: (6 hours): Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Solution of Simultaneous Linear Algebraic Equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's, Gauss-Seidal, and Relaxation method.,

Module 3: Numerical Methods – 3: (10 hours): Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator-corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poission equation, Implicit and explicit methods for one dimensional heat equation (Bender-Schmidt and Crank-Nicholson methods), Finite difference explicit method for wave equation.

Module 4: Transform Calculus: (8 hours): Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace Transform method, Fourier transforms.

Module 5: Concept of Probability: (8 hours): Probability Mass function, Probability Density Function, Discrete Distribution: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Exponential Distribution.

Textbooks/References:

1. P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand & Company, 2nd Edition, Reprint 2012.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008.
7. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
8. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
9. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. Statistics

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

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Electronics & Communication Engineering III-Semester

EC302 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Unit-1 Theory of Measurement: Introduction, Characteristics of Instruments and measurement systems (Static &Dynamic) Error analysis: Sources, types and statistical analysis. Instrument Calibration: Comparison Method. 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 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-todigital 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:

1. Albert D. Helfrick, William David Cooper, “Modern electronic instrumentation and measurement techniques”, TMH 2008.
2. Oliver Cage, “Electronic Measurements and Instrumentation”, TMH, 2009.
3. Alan S. Morris, “Measurement and Instrumentation Principles”, Elsevier (Buterworth Heinmann), 2008.
4. David A. Bell, “Electronic Instrumentation and Measurements”, 2nd Ed., PHI, New Delhi 2008.
5. H.S. Kalsi, “Electronics Instrumentation”, TMH Ed. 2004
6. A.K.Sawhney, “A Course in Electrical and Electronic Measurements and Instrumentation”, Dhanpat Rai.
7. MMS Anand, “Electronic Instruments & Instrumentation Technology”, PHI Pvt. Ltd., New Delhi Ed. 2005

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Electronics & Communication Engineering III-Semester

EC303 DIGITAL SYSTEM DESIGN

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-2 Combinational logic circuits :Half adder – Full Adder – Half subtractor - Full subtractor– Parallelbinary 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 – codeconverters - Magnitude Comparator.

Unit-3. **Sequential Logic Design**: Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation

Unit-4 Registers and Counters: Asynchronous Ripple or serial counter. Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Downcounters – 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 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, Conceptof Programmable logic devices like FPGA. Logic implementation using Programmable Devices.

Text/Reference Books:

1. Malvino & Leach, “Digital Principles and Applications”, TMH.
2. M. Morris Mano, “Digital Logic Design”, PHI
3. R.P. Jain, “Modern Digital Design”, TMH.
4. S. Salivahanan & S. Arivazhagan, “Digital Circuits and Design”, Vikas Publishing.
5. D. Roy Chaudhuri, Digital Circuits, “An Introduction Part -1 & 2”, Eureka Publisher.
6. Ronald J Tocci , “Digital Systems, Principles and Applications”, PHI.
7. Taub & Schilling, “Digital Integrated Electronics”, 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.

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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-4 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 πmodel, 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-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. Uni-junction 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.
3. Boylestad & Neshelsky, "Electronic Devices & Circuits", PHI.
4. Schilling & Belove, "Electronic Circuits , Discrete & Integrated", TMH.
5. Chattopadhyay & Rakhshit, "Electronic Fundamentals & Applications", New Age
6. Adel S. Sedra & Kenneth C. Smith, "Microelectronic Circuits", OUP.
7. R. A. Gayakwad, "Op-Amps And Linear Integrated Circuits", PHI
8. Theodore F. Bogart, Jeffrey S. Beasley, "Guillermo Rico Electronic Devices & Circuits".
9. Allen Mottershead, "Electronic Devices & Circuits".

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 α & β 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.

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Electronics & Communication Engineering III-Semester

EC305 Network Analysis

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.

Text/Reference Books: 1. M.E. Van Valkenburg, Network Analysis, (Pearson)
2. S P Ghosh A K Chakraborty Network Analysis & Synth. (MGH).
3. http://www.nptelvideos.in/2012/11/networks-and-systems.html

REFERENCE:- 1. Sudhakar-Circuit Network Analysis & Synth(TMH).
2. J. David Irwin Engineering Circuit analysis tenth edition, Wiley india.
3. Kuo- Network Analysis & Synthesis, Wiley India.
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)

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.

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Electronics & Communication Engineering III-Semester

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.**
4. **Measurement of Capacitor using Q-meter.**
5. **Measurement of Self-induction using Q-meter.**
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.**
13. **To calculate Frequency and amplitude using CRO & Function Generator.**
14. **To calculate Frequency using Lissajious Pattern.**
15. **To study RVDT.**
16. **Study of Function Generator.**
17. **Temperature measurement by thermocouple.**
18. **Temperature measurement by RTD.**
19. **Study of optical Transducers: Photo conductive, Photo voltaic.**
20. **To study digital Multimeter.**