Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal

Branch- Common to All Discipline

New Scheme Based On AICTE Flexible Curricula

BT401	**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

New Scheme Based On AICTE Flexible Curricula

Electronics & Instrumentation Engineering, IV-Semester

EI402 Analog Electronics

Unit-I

Low frequency analysis of RC coupled amplifiers, effect of coupling and bypass Amplifier at high frequencies, Hybrid-πmodel equivalent circuit in CE configuration, $f_\alpha, f_\beta, f_\gamma f_\alpha, f_\beta, f_\gamma$ parameter, High frequency response of single/two stage amplifiers using BJT & FET. Gain-band width product. Effect of cascading on gain & bandwidth, Transformer coupled and Direct coupled amplifier.

Unit-II

Feedback Amplifier: General feedback theory, characteristics of negative feedback amplifiers, Effect of negative feedback on input and output resistance of amplifiers. Oscillators: Principle of oscillation, Barkhausen stability criterion, Audio frequency oscillator: Phase shift & Wien bridge oscillators, RF Oscillator: Colpitts & Hartley, Crystal Oscillator..

Unit -III

Operational amplifiers: Differential Amplifiers, swamping resistor, Constant current source and current mirror circuit, Equivalent circuit of Op-amp, Virtual ground, Offset error in voltages & currents & their temperature drift, Op-amp parameters such as CMRR, PSRR, Slew rate, frequency response of Op-Amp, Study of Op-amp ICs like 741,324,308 etc., Linear and non-linear application of Op-amp, Integrator, Differentiator, Log& antilog amplifiers, Precision rectifier, comparators, Schmitt trigger , Sample & hold circuit, Instrumentation amplifiers.

Unit -IV

Tuned RF voltage amplifiers: Single and double tuned amplifiers, Gain and bandwidth calculations, frequency response of under coupled, critically and over coupled circuits, Introduction to RFICs, Power supplies: Review of regulators using Zener diodes, series and shunt regulators, Over current protection using current limiting fold back and crowbar protection, Regulators using ICs,

Unit-V

Multivibrators circuit using BJT and Op-amp, Emitter coupled binary circuit, 555 – Timer IC, application, Square wave and Triangular wave and Sawtooth wave generators, Linear Wave shaping circuits, RC high pass & low pass circuit, Effect of Tilt or sage

TEXT BOOKS

1. Robert Boylsted Electronic devices and Circuits, PHI
2. Sedra& Smith L, Electronic circuits, McGraw Hill.
3. D Choudhury Roy, Linear Integrated Circuits, New Age International

REFERENCE BOOKS

1. John D. Ryder, Electronics fundamentals & Applications, PHI
2. Milliman and Grabel, Microelectronics, TMH
3. Johns and Martin, Analog Integrate Circuits design, Wiely.
4. Milliman&Halkias Integrated Electronics, McGraw Hill
5. Gayakwad R.A OpAmp 7 Linear Integrated Circuits, PHI

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New Scheme Based On AICTE Flexible Curricula

Electronics & Instrumentation Engineering, IV-Semester

EI403 SENSORS AND TRANSDUCERS

Unit-I

Role of transducers in instrumentation- Transducers construction, classification and characteristics. Principles of operation and characteristics, interfacing of transducers and signal conditioning

Unit-II

Transducers for measurement of displacement, strain, velocity, acceleration etc. Potentiometer, LVDT, Strain gauge, capacitance gauge, piezoelectric transducers and accelerometers.

Unit-III

Force and pressure measurement: Force: Standards and Calibration, Basic methods of force Measurement (Spring, beam,diaphragm) Strain gauge: basic principal, gauge factor, types of strain gauge, materials and their properties, bonding material compensation techniques, bridge configuration, Rosettes, Tactile sensors, Piezoelectric sensors, LVDT as secondary sensor. Pressure: Standards and calibration Units and relations.:Positive Pressure Sensors: Manometers – U tube, Well type, inclined tube, Ring balance, Micro manometer, use of seal pots, range of measurement Elastic – Bourdon, Diaphragm, Bellows and their types, materials and their properties, range of measurement Electronic – LVDT, Strain gauge, Capacitive, Piezoelectric, Thin film, Variable reluctance, Vibrating element (Diaphragm and Wire), High Pressure Measurement – Bulk modulus cell, Bridgeman type Differential Pressure Measurement: Force balance, Motion balance, Capacitance delta cell, Ring balance DP cell Vacuum measurement McLeod gauge, Thermal Conductivity (Pirani, Thermocouple), hot cathode ionization gauge, Molecular momentum (Knudsen) gauge, Cold Cathode ionization (Penning) gauge.calibrating Instruments – Dead Weight Tester (Pressure, Vacuum).

Unit-IV

Temperature measurement: Temperature Scales, Standards and Units and relations, Classification of temperature sensors., Mechanical: Bimetallic Thermometer – Working Principle, Various types, Filled system thermometers – SAMA classifications, Sources of errors and their remedies, Dip effect. Electrical: Resistance Temperature Detectors – Principle, materials and their properties, Types and ranges, different sources of errors and compensations. Thermistor: Types (NTC, PTC), Measuring Circuits, Thermocouple: Terminology, Types (B, E, J, K, R, S, T), determination of polarity, Characteristics, Laws of thermoelectricity, Study of thermocouple tables (calculation of intermediate temperature and voltage), Lead wire compensation, Cold junction compensation techniques, Protection (Thermo well), EMF Measurement methods, Thermopiles, Non-contact Types: Pyrometers: Total Optical, Infrared.

Unit-V

Transducers for measurement of flow and level. Turbo magnetic, Electromagnetic and other flow meters. Various methods of level measurements, Ultrasonic level gauge. Measurement of humidity and moisture. Various sensors employed in instrumentation, introduction to MEMS, wireless sensors, finger print sensors.

TEXT BOOKS:

1. Nakra B.C. &Choudhory K.K., Instrumentation, Measurement & Analysis, TMH.

REFERENCE BOOKS:

1. Patranabis D., Principles of Industrial Instrumentation. TMH.
2. Murthy, Transdu.

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Electronics & Instrumentation Engineering, IV-Semester

EI404DIGITAL ELECTRONICS

Unit-I

Minimization Techniques And Logic Gates : Minimization Techniques: Boolean postulates and laws – De-Morgan's Theorem -Principle of Duality - Boolean expression - Minimization of Boolean expressions-Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions - Quine-McCluskey method of minimization .

Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NORImplementations of Logic Functions using gates, NAND–NOR implementations – Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates

Unit-II

Combinational Circuits : Design procedure – 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/ Demultiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator.

Unit-III

Sequential 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- 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-IV

Memory Devices : Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization – Write operation – Read operation. Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell. Implementation of combinational logic circuits using ROM, PLA, PAL.

Unit-V

Synchronous & Asynchronous Circuit: Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine. **Asynchronous Sequential Circuits:** Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits.

TEXTBOOKS RECOMMENDED:

1. M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 /
2. Pearson Education (Singapore) Pvt. Ltd., New Delhi.
3. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design.

REFERENCE BOOKS:

1. John F.Wakerly, Digital Design, Fourth Edition, Pearson/PHI
2. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications.
3. William H. Gothmann, Digital Electronics.

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Electronics & Instrumentation Engineering, IV-Semester

EI405 DATA STRUCTURE

Unit-I

Basic Concept : Data Structure and algorithm preliminaries: Definitions; Data types, Time and Space analysis of Algorithms; Time and space trade-off, Pointers and dynamic memory allocation; Recursion.

Unit-II

Arrays and Structure: Concepts of Linear Search, Binary Search, Evaluation of Polynomial, Polynomial representation, Polynomial Addition, Structures: Internal representation of structure, Self–referentialstructure, Array: Definitions of Arrays and Lists, Strings, Row/Column major representation of Arrays.

Unit-III

Stack and Queues: Introduction to Stack, Static and Dynamic Representation, Operation, Application of Stack, Evaluation of Expression, postfix expression, Infix, prefix, Queue, Static and DynamicRepresentation, Operation, Priority Queue, Circular Queue.

Unit-IV

Linked List and Trees: Introduction to Linked List: Singly linked list, circular linked list, doubly linked list, operations on linked list, Introduction to Tree: Definition, Terminology, Generalised tree representation, Binary tree definitions and properties, Representation, Binary Tree Traversal In order, Pre order, Post order,Introduction to Binary Search Tree.

Unit-V

Graphs; Searching & Sorting: Introduction to Graphs: Representation, Adjacency Matrix and List, Indegree, out degree of Graph, Graphs Operation, DFS & BFS, Spanning Tree, Shortest path. Searching and SortingMethods: Various Searching and Sorting algorithms with complexity analysis.

TEXT BOOKS:

REFERENCES

1. E Balagurusamy, **Data Structures Using C**, Tata McGraw Hill Education
2. N.K. Tiwari, Jitendra Agrawal, Shishir K. Shandilya, **Data Structures**, I K International Publishing House
3. Achuthsankar S. Nair & T. Mahalekshmi, **Data Structures in C**, PHI
4. R. Venkatesan & S. Lovelyn Rose, **Data Structures**, Wiley India
5. Rajesh K. Shukla, **Data Structures Using C & C++,** Wiley India
6. Langsam, Augenstein& Tenenbaum, **Data Structures Using C & C++,** Pearson
7. Dharmender Singh Kushwaha & Arun Kumar Mishra **Data Structures: A Programming Approach with C**, PHI