Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology Branch:All Branches **Semester: III**
Subject: Mathematics – III **Code: B000311(014)**
Total Theory Periods: 03 **Total Tutorial Periods: 01**
Class Tests: Two (Minimum) **Assignments: Two (Minimum)**
ESE Duration: Three Hours **Maximum Marks: 100** **Minimum Marks: 35**

Course Objectives:

1. To provide knowledge of Laplace transform of elementary functions including its properties and applications to solve ordinary differential equations.
2. To have thorough knowledge of partial differential equations which arise in mathematical descriptions of situations in engineering.
3. To study about a quantity that may take any of a given range of values that can't be predicted as it is but can be described in terms of their probability.
4. To provide a thorough understanding of interpolation and methods to solve ordinary differential equation.

UNIT-I Laplace transform: Definition, Transform of elementary functions, Properties of Laplace transform, Transform of derivatives & integrals, Multiplication by t^n, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

UNIT- II Partial differential equation: Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

UNIT- III Random variable: Discrete and continuous probability distributions, Mathematical expectation, Mean and Variance, Moments, Moment generating function, probability distribution, Binomial, Poisson and Normal distributions.

UNIT- IV Interpolation with equal and unequal intervals: Finite differences, Newton's Forward & Backward Difference Formulae, Central Difference Formula, Stirling's Formula, Bessel's Formula, Lagrange's Formula and Newton's Divided Difference Formula.

UNIT-V Numerical Solution of Ordinary Differential Equations: Picard's Method, Taylor's Series Method, Euler's Method, Euler's Modified Method, Runge-Kutta Methods, Predictor-corrector Methods- Milne's Method, Adams-Bashforth Method.

Text Books:

1. "Higher Engg. Mathematics", Dr. B.S. Grewal– Khanna Publishers.
2. "Advanced Engg. Mathematics" , Erwin Kreyszig – John Wiley & Sons.
3. "Numerical Methods in Engineering and Science" , Dr. B.S. Grewal, Khanna Publishers.
4. "Numerical Methods for Scientific and Engineering Computation" , M .K. Jain, S. R. K

Reference Books:

1. "Applied Mathematics", P. N. Wartikar& J. N. Wartikar. Vol-II Pune Vidyarthi Griha Prakashan, Pune.
2. "Applied Mathematics for Engineers & Physicists", Louis A. Pipes- TMH.
3. "Numerical Methods for Scientists and Engineers" K. Shankar Rao, Prentice Hall of India.
4. "Numerical Methods" P. Kandasamy, K. Thilagavathy and K. Gunavathi, S. Chand publication.

Course outcomes: After studying the contents of the syllabus in detail the students will be able to: Define (mathematically) unit step unit impulse, Laplace transform its properties, inverse and applications to solve ordinary differential equations and find Numerical solution of differential equations, which may be arising due to mathematical modelling based on engineering problems. Hands on these Mathematical topics will make them equipped to prepare for higher studies through competitive examinations.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech III
Subject: Electrical Circuit Analysis
Total Theory Periods: 36
Total Marks in End Semester Exam: 100

Branch: Electrical Engineering
Code: B024312(024)
Total Tutorial Periods: 12 Total Credits: 4

Course Outcomes:

1. CO1: Evaluate the responses by applying network theorems to electrical circuits.
2. CO2: Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
3. CO3: Obtain and analyze the transient and steady-state response of electrical circuits.
4. CO4: Obtain and analyze the response of electrical circuits using Laplace Transform for standard inputs.
5. CO5: Analyze two port circuit behavior with different parameters.

UNIT I: Network Theorems (10 Hours)
Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Millman's theorem (all theorems - analysis with dependent current and voltage sources). Super node and Super mesh Analysis, Concept of duality and dual networks. Series and parallel resonance conditions.

UNIT II: Sinusoidal steady state analysis (11 Hours)
Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits (balanced circuit), Mutual coupled circuits, Dot Convention in coupled circuits,

UNIT III: Solution of First order networks (7 Hours)
Solution of first order differential equations for Series and parallel R-L, R-C, R-L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response

UNIT IV: Electrical Circuit Analysis Using Laplace Transforms (10 Hours)
Review of Laplace Transform, initial and final value theorem. Analysis of electrical circuits using Laplace Transform for standard inputs (step, ramp and impulse functions), convolution integral, inverse Laplace transform, transformed network with initial conditions..

UNIT V: Two Port Network and Network Functions (10 Hours)
Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks, Reciprocity & Symmetry, cascade, series, parallel and series-parallel connections of Two port Networks, Barlett's bisection Theorem.

Text Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.

Reference Books:

1. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.
2. Alexander &Sadiku, "Fundamentals of Electric Circuits", TMH Publications.
3. C. L. Wadhwa, "Network Analysis and Synthesis", New Age Publications.
4. Kuriakose, "Circuit theory", PHI Learning Publications.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech III **Branch: Electrical Engineering**
Subject: Electrical Machines – I **Code: B024313(024)**
Total Theory Periods: 36 **Total Tutorial Periods: 12**
Total Marks in End Semester Exam: 100 **Total Credits: 4**

Course Outcomes: After successful completion of this course students will be able to-

1. CO1: Calculate various magnetic circuit variables and app for force/torque generation.
2. CO2: Develop equivalent circuit, phasor diagram of transformer and use them for performance analysis.
3. CO3: Analyze different type of connections of single and three phase transformer.
4. CO4: Appreciate various tests on transformer and DC machines.
5. CO5: Analyze the performance and operation of transformer and DC machines.

UNIT I: Magnetic Circuits and Electromagnetic Force/Torque (8 hours)

Review of magnetic circuit - MMF, flux, reluctance, inductance, B-H curve of magnetic materials, linear and non-linear magnetic circuits.

Electromechanical energy conversion - Energy stored in magnetic circuit, force as a partial derivative of stored energy with respect to position of a moving element, torque as a partial derivative of stored energy with respect to angular position of a rotating element; Examples-galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency.

UNIT II: Single Phase Transformer (10 hours)

Review of single phase transformer - Constructional features, operating principle, EMF equation, ideal transformer, phasor diagram of transformer on no-load and on load, excitation phenomenon.

Performance and Testing-Equivalent circuit, per unit representation, voltage regulation, losses, efficiency, condition for maximum efficiency, all-day efficiency, open circuit and short circuit test, back-to-back test, polarity test, separation of losses, parallel operation (equal and unequal voltage ratios)

Auto-transformer-Equivalent circuit, phasor diagram, comparison with two winding transformer, conversion from auto-transformer to two winding transformer and vice versa.

UNIT III: Three Phase Transformer (10 hours)

Three-phase transformers-Constructional details (three and five limb), bank of three single phase units, three phase single unit transformer, different connections and vector groups, calculation of efficiency and regulation **Applications** - Power transformer, distribution transformer, parallel operation of three-phase transformer, Scott connection, open delta connection, tap changing transformer.

UNIT IV: DC Machine-I (10 hours)

Electromagnetic principle of DC machine, BLV and BLI concept, constructional details, production of voltage and torque, classification of DC machine, armature reaction and its effect, methods to reduce armature reaction, commutation, methods of improving commutation, effect of brush shift, Operating characteristics of DC separately excited, series and shunt generator, condition of self excitation, critical speed and critical resistance.

UNIT V: DC Machine-II (10 hours)

Electrical and mechanical characteristics of DC motor, starters for shunt motors-three point and four point starter, speed control of DC motors- armature and field control method, losses in DC machines, efficiency and condition for maximum efficiency, Testing of DC machines- Swinburne's test and Regenerative test (Study only).

Text Books:

1. Nagrath and Kothari, "Electric Machines", TMH Publications.
2. B. R, Gupta, "Electrical machines", New Age International.
3. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers.

Reference Books:

1. J. B. Gupta, "Theory & Performance of Electrical Machines", S. K. Kataria & Sons.
2. Ashfaq Hussain, "Electric Machines", Dhanpat Rai Publication.
3. Samarjeet Ghosh, "Electrical Machines", PHI Publications.
4. P. K. Mukherjee and S. Chakravarti "Electric Machines", Dhanpat Rai Publication.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech III **Branch: Electrical Engineering**
Subject: Digital Electronics **Code: B0324314(024)**
Total Theory Periods: 24 **Total Tutorial Periods: 12**
Total Marks in End Semester Exam: 100 **Total Credits: 3**

Course Outcomes:

1. CO1: Understand working of logic gates.
2. CO2: Design and implement Combinational logic circuits.
3. CO3: Design and implement Sequential logic circuits.
4. CO4: Analyze Analog to Digital conversion and Digital to Analog Convertor circuit.
5. CO5: Construct a small memory subsystem.

UNIT I: Fundamentals of Digital Systems and logic families (8 Hours)
Digital signals, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes.

UNIT II: Combinational Digital Circuits (7 Hours)
Standard representation for logic functions, K-map representation, and simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De Multiplexer/ Decoders, Adders, Subtractors, BCD arithmetic, digital comparator, parity checker/ generator, code converters, priority encoders, decoders, Q-M tabulation method of function realization.

UNIT III: Sequential circuits and systems (7 Hours)
SR flip flop, JK flip flop T flip flop and D type flip flops, Applications of flip flops, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops.

UNIT IV: A/D and D/A Converters (7 Hours) Digital to analog converters, weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, analog to digital converters, successive approximation A/D converter, voltage to frequency and voltage to time conversion.

UNIT V: Semiconductor Memories and Programmable Logic Devices. (7 Hours)
Memory organization, memory size, classification and characteristics of memories, Random and sequential access memory, read only memory (ROM), read and write memory(RAM), ROM as a PLD, Programmable logic array, PLA Program Table.

Text Books:

1. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

Reference Books:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech III **Branch: Electrical Engineering** **Code: BO22415(024)**
Subject: Numerical Methods **Total Tutorial Periods: 0**
Total Theory Periods: 24 **Total Credits: 2**
Total Marks in End Semester Exam: 100

Course Outcomes:

1. CO1: Determine roots of polynomials by various methods.
2. CO2: Solve system of equations by numerical methods.
3. CO3: Estimate polynomial values by various numerical methods.
4. CO4: Determine integration and integration from tabulated values of a function.
5. CO5: Solve ordinary differential equations by numerical methods.

UNIT I: Nonlinear Equations (5 Hours): Errors in numerical calculations, Determination of roots of polynomials and transcendental equations by Bisection method, Method of Regula Falsi Position, Newton-Raphson method; convergence analysis, Solution to system of nonlinear equations by Method of iteration & Newton-Raphson Method.

UNIT II: System of Linear Equations (5 Hours): Matrix notation, Triangular matrices, LU Decomposition of a matrix, Eigen values and eigenvectors, Solutions of linear algebraic equations by Gauss Elimination and Gauss-Jordan methods, Iterative methods-Jacobi and Gauss-Seidel methods.

UNIT III: Interpolation and Approximation (5 Hours): Polynomial interpolation, finite differences, Backward, Forward and central difference, divided difference, Detection of errors using difference tables, Lagrange formula and Newton's formula for interpolation, Central difference interpolation formulae, Interpolation with unevenly spaced points by Lagrange's interpolation formula,.

UNIT IV: Numerical Differentiation and Numerical Integration(5 Hours): Introduction, numerical differentiation, differentiation based on Forward differences, Backward differences and Central differences, Maximum and Minimum values of a tabulated function, Numerical Integration, Trapezoidal rule, Simpson's 1/3 & 3/8 rules.

UNIT V: Ordinary Differential Equations(4 Hours): Numerical solution of ordinary differential equations, Taylor series method, Picard's method, Euler and Modified Euler's method, Runge-Kutta methods,

.**Text Books:**

1. S. S. Sastry, "Introductory Methods of Numerical Analysis", PHI Learning Private Ltd, Fifth Edition.
2. M. K. Jain, S. R. K. Iyengar and R.K. Jain, "Numerical Methods for Scientific and Engineering computation", New Age International.

Reference Books:

1. C. F. Gerald and P. O. Wheatley, "Applied Numerical Analysis", Pearson Education, Sixth edition.
2. W. Cheney and D. Kincaid, "Numerical Mathematics and Computing", Thomson Brooks/Cole, Vikas Publishing House, Fourth edition.
3. B. S. Grewal, "Numerical Methods in Engineering & Science with Programs in C, C++ & Matlab", Khanna Publisher.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Branch: Electrical Engineering

Semester: B.Tech III
Subject: Electrical Circuit Analysis Laboratory
Total Practical Periods: 24
Total Marks in End Semester Exam: 40

Code: B024322(024)

Total Credits: 1

Course Outcomes:

1. CO1: Understand the usage of common electrical measuring instruments.
2. CO2: Evaluate the responses by applying network theorems to electrical circuits.
3. CO3: Analyze the transient and steady-state response of electrical circuits.
4. CO4: Analyze two port networks behavior by determining different parameters.
5. CO5: Verify the properties of interconnected two port networks.

List of experiments: (Minimum 10 experiments are to be performed)

1. To study the different functions of a Analog / Digital multimeters.
2. To verify Thevenin's theorem for DC/AC Circuits.
3. To verify Norton's theorem for DC/AC Circuits.
4. Determination of transient response of current in series RL circuit with step voltage input and understand the time constant concept with DC Power Supply.
5. Determination of transient response of current and voltage in series RC circuit with step voltage input and understand the time constant concept with DC Power Supply.
6. Determination of transient response of current in RLC circuit with step voltage input for under damped, critically damped and over damped cases.
7. Determination of line and phase voltages in wye and delta connected three phase balanced circuits.
8. Determination of Z parameters for a dc network and computation of Y, Transmission and h parameters.
9. Determination of Y parameters for a dc network and computation of Z, Transmission and h parameters.
10. Determination of transmission parameters for a dc network and computation of Z, Y and h parameters.
11. Determination of h parameters for a dc network and computation of Z, Y and transmission parameters.
12. Determination of driving point and transfer impedances of a two port ladder network and verification with theoretical values.
13. Verification of parameter properties in inter-connected two port series networks.
14. Verification of parameter properties in inter-connected two port parallel networks.

Requirements: Voltmeter, ammeter, wattmeter, power factor meter, Resistors, Inductors, Capacitors, Lamp load, DC supply, Three phase supply, Three-phase autotransformer, Multimeter, Simulation tools like SCILAB, MATLAB, PSIM, MULTISIM

Reference Books:

1. S. K. Bhattacharya, "Experiments in basic electrical engineering", New Age International, 2007.
2. Mehta and Gupta, "Basic shop practical", Dhanpat Rai Publishing Company (P) Ltd-New Delhi, 2003
3. N. K. Jain, "Practical in electrical engineering", Jain Book Depot

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Branch: Electrical Engineering

Semester: B.Tech III
Subject: Electrical Machines Laboratory - I
Total Practical Periods: 24
Total Marks in End Semester Exam: 40

Code: B024321(024)

Total Credits: 1

Course Outcomes:

1. CO1: Perform various tests on single and three phase transformer.
2. CO2: Connect and operate three phase transformer in various configurations.
3. CO3: Perform speed control on DC machine.
4. CO4: Perform various tests on DC machine.

List of experiments: (Minimum 10 experiments are to be performed)

1. To determine the equivalent circuit parameters of a single phase transformer.
2. To determine the voltage regulation of a single phase transformer operating at lagging and upf condition.
3. To determine the efficiency of a single phase transformer under different loading condition
4. To perform the tests required for parallel operation of transformers.
5. To perform parallel operation of two single phase transformer.
6. To study the voltage/current ratios for different types of three phase transformer connection.
7. To perform Back to Back test on two single phase transformer.
8. To perform 3- phase to 2- phase conversion (Scott connection)
9. To study the various routine tests performed on three phase transformers as per IS code.
10. To determine the armature & field winding resistance of D.C machine by voltmeter/ammeter method.
11. To determine the magnetization or Open circuit characteristics of a D.C machine
12. To perform load test on D.C shunt generator.
13. To perform Swinburne's test a D.C machine & calculate its efficiency at full load operating condition.
14. To study three point and four point motor starters and observe its impact on the motor staring current.
15. Speed control of a D.C shunt motor by
    (a) Varying field current with armature voltage kept constant
    (b) Varying armature voltage with field current kept constant.
16. To study the reversal of D.C shunts motor.

Requirements:
Single Phase Transformer, Three Phase Transformer, Three Phase Auto Transformer, DC Shunt Generator Set, DC Shunt Motor, DC series Motor, Ammeters (AC & DC), Voltmeter (AC & DC), Wattmeter, Tachometer

Reference Book:

1. S. G. Tarnekar and P. K. Kharbanda, "Laboratory courses in electrical engineering", S. Chand & Company Ltd.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Branch: Electrical Engineering

Semester: B.Tech III
Subject: Digital Electronics Laboratory
Total Practical Periods: 24 **Code: B024323(024)**
Total Marks in End Semester Exam: 40

Course Outcomes:

1. CO1: Develop circuits from truth tables using basic gates.
2. CO2: Develop circuits from MSI ICs.
3. CO3: Summarize the truth table of various flip flops.
4. CO4: Design a counter from a sequence diagram.
5. CO5: Examine functioning of A/D converter.

List of experiments: (Minimum 10 experiments are to be performed)

1. To Verify the Properties of NOR & NAND Gates As Universal Building Block.
2. Realization of Boolean Expression Using NAND Or NOR Gates.
3. To Construct X- OR Gate Using Only NAND Or NOR Gates Only.
4. To Construct a Half Adder Circuit. And Logic Gates And Verify its Truth table.
5. To Construct a Full Adder Circuit and Verify its truth table (Using Two X-OR And 3 nand gates).
6. To Construct a Half Subtractor Circuit. by Using Basic Gates and Verify its truth table.
7. To Construct a Full Subtractor Circuit by using Basic Gates and Verify its truth table.
8. To Construct a Circuit of 4 -Bit Parity Checker & Verify its truth table.
9. To construct a BCD Adder using MSI 4 bit parallel adder IC.
10. To Construct a Programmable Inverter Using X-OR Gates & Verify its truth table.
11. To Design a Comparator Circuit & Verify its truth table.
12. To Construct A RS Flip Flop Using Basic & Universal Gates (NOR & NAND)
13. To Construct a J.K. Master Slave Flip Flop & Verify its truth table.
14. To Verify the Operation of a Clocked S-R Flip Flop and J. K. Flip Flop.
15. To Construct a T & D Flip Flop Using J. K. Flip Flop and Verify Its Operations & truth table.
16. To design and verify the Operation of Counters.
17. Study of A/D and D/A converters.

Requirements: Bread boards, Power supplies, Logic Gates, CRO, Function Generator, Counters, and General Purpose Digital Experimental Kits.

Reference Books:

1. William Kleitz, “Lab Experiments--Digital Electronics, a Practical Approach”, Prentice Hall, 1990.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B.Tech III **Branch: Electrical Engineering**
Subject: Applications of Numerical Methods in Open Source Software Laboratory **Code: B024324(024)**
Total Practical Periods: 24
Total Marks in End Semester Exam: 40 **Total Credits: 1**

Course Outcomes: Type your text

1. CO1: Develop computer programs for various numerical methods.
2. CO2: Analyze advantages of numerical methods over conventional methods.
3. CO3: Compare various algorithms for a particular method.
4. CO4: Apply numerical methods to engineering applications.

List of experiments: (Minimum 10 experiments are to be performed)

Write a program using SCILAB or C /CPP or any other programming language, ,

1. Bisection method.
2. Regula-Falsi Method.
3. Newton Raphson Method.
4. Multiplication of 2 Matrices.
5. Inversion of a Matrix.
6. Gauss Elimination Method.
7. Factorization Method.
8. Gauss Jordan Method.
9. Gauss Seidal Method.
10. Newton Forward Interpolation.
11. Lagrange's Interpolation.
12. Trapezoidal Rule for Integration.
13. Simpson 1/3 Rule for Integration.
14. Simpson 3/8 Rule for Integration,
15. Euler's Method.
16. Modified Euler's Method,
17. Runge Kutta Method.

Requirements: Lab equipped by PCs as per AICTE Norms and Open Source Softwares, SCILAB Etc.

Reference Books:

1. B. S. Grewal, "Numerical Methods in Engineering & Science with Programs in C, C++ & Matlab", Khanna Publisher.