25SEE301T	**Applied Mathematics**	**PCC**	**3L – 0T – 0P**	**3 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hrs/week Tutorial: 0 hrs/week	CA – I: 15 Marks Mid-Semester Examination: - 20 Marks CA – II: 15 Marks End Semester Exam: 50 Marks

Course Objectives:

1. To introduce fundamental concepts of Laplace Transform & Inverse Laplace transform and its applications.
2. To introduce Partial Differential Equations and its Applications
3. To develop Mathematical skills and enhance thinking power of students.
4. To introduce Mathematics and their applications in engineering fields

Course Outcomes: After the completion of the course the student should be able to:

CO1	Comprehend the fundamental knowledge of the Laplace transforms and its properties for elementary functions.
CO2	Use Laplace Transform and Inverse Laplace Transform to solve linear differential equations with constant coefficients
CO3	Understand the Fourier transform and its properties
CO4	Apply PDEs for solving Engineering problems.
CO5	Apply numerical methods for differentiation and integration to solve engineering problems.

Course Contents

Unit 1: Laplace Transform **9**

Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n , scale change property, transforms of functions divided by t, transforms of integral of functions, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms of some special functions- periodic function, Heaviside unit step function, Dirac delta function.

Unit 2: Inverse Laplace Transform **9**

Introductory remarks; Inverse transforms of some elementary functions; General methods of finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients

Unit 3: Fourier Transform **9**

Definitions – integral transforms; Fourier integral theorem (without proof); Fourier sine and cosine integrals; Complex form of Fourier integrals; Fourier sine and cosine transforms; Properties of Fourier transforms; Parseval's identity for Fourier Transforms.

Unit 4: Partial Differential Equations and Their Applications **9**

Formation of Partial differential equations by eliminating arbitrary constants and functions; Equations solvable by direct integration; Linear equations of first order (Lagrange's linear equations); Method of separation of variables – applications to find solutions of one-dimensional heat flow equation (∂u ∂t = c 2 ∂ 2u ∂x 2), and one-dimensional wave equation (i.e.∂ 2y ∂t 2 = c 2 ∂ 2y ∂x 2).

Unit 5: Numerical Differentiation and Integration **9**

Numerical differentiation, methods based on interpolation, Error analysis, numerical integration, methods based on interpolation, Newton cotes methods, Error estimates for trapezoidal and Simpson's rule.

Text Books

1. Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.
2. A course in Engineering Mathematics (Vol III) by Dr. B. B. Singh, Synergy Knowledgeware, Mumbai.
3. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
4. "A Text Book of Applied Mathematics", P. N. and J. N. Wartikar, Vol I and II", Vidyarthi Griha Prakashan, Pune, 2006.
5. "Introductory Methods of Numerical Analysis", S.S. Sastry, 3rd edition, Prentice Hall of India, 1999.

Reference Books

1. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
2. A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd., Singapore.
3. Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., New Delhi.
4. "Advanced Engineering Mathematics", Wylie C.R, Tata McGraw Hill Publication, 8th Edition, 1999.
5. "Fundamentals of Mathematical Statistics", Gupta and Kapoor, S. Chand & Sons Publishers, 10th Edition, 2000.
6. "Numerical methods for scientific and Engineering Computation", M. K. Jain, S. R. K. Iyengar, R. K. Jain, New Age International Limited Publishers.

25SEE302T	ELECTRICAL MACHINE-I	PCC	3L – 0T – 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week Tutorial: 0 hrs/week	Test – I: 15 Marks Test – II: 15 Marks Teacher Assessment: - 20 Marks End Semester Exam: 50 Marks

Course Objectives:

1. Understand the Principles and Construction of DC Machines
2. Analyze Transformer Operations.
3. Explore Electromechanical Energy Conversion
4. Study Control and Applications of Electric Machines
5. Familiarize with Special Electric Machines.

Course Outcomes: After the completion of the course the student should be able to:

CO1	Explain DC Machine Operation and Performance.
CO2	Evaluate Transformer Characteristics and Testing.
CO3	Apply Principles of Electromechanical Energy Conversion.
CO4	Select and Control Electric Machines for Practical Use.
CO5	Analyze and Compare Special Electrical Machines.

Course Contents:

Unit 1: DC Generators **9**

Construction of armature and field systems, Working, types, emf equation, Armature windings, Characteristics and applications, EMF equation, Armature reaction Demagnetizing and Cross magnetizing mmfs and their estimation; Remedies to overcome the armature reaction; Commutation process, Causes of bad commutation and remedies: Construction of armature and field systems, Working, types, emf equation, Armature windings, Characteristics and applications, Building of emf, Armature reaction - Demagnetizing and Cross magnetizing mmfs and their estimation; Remedies to overcome the armature reaction.

Unit 2: D.C. Motor **9**

Principles of working, Significance of back emf, Torque Equation, Types, Characteristics and Selection of DC Motors, Starting of DC Motors, Speed Control, Losses and Efficiency, Condition for Maximum Efficiency, Braking of DC Motors, Effect of saturation and armature reaction on losses; Applications, Permanent Magnet DC Motors, Type and Routine test.

Unit 3: Single Phase Transformer **9**

Transformer construction, Ideal and practical transformer, exact and approximate equivalent circuits, no load and on load operation, phasor diagrams, power and energy efficiency, voltage regulation, parallel operation, effect of load on power factor, Per Unit system, excitation phenomenon in transformers, switching transients, Auto transformers, Variable frequency transformer, voltage and current transformers, welding transformers, Pulse transformer and applications

Unit 4: Three Phase Transformers **9**

Constructional features of three phase transformers, Cooling methodology, Standard and special transformer connections, Phase conversion, Parallel operation of three phase transformers, three winding transformers and its equivalent circuit, on load tap changing of transformers, Modern trends in transformers, Type and routine tests, Standards.

Unit 5: Electromechanical Energy Conversion Principles & Special Machine **9**

Energy in a magnetic system, field energy and mechanical force, energy in singly and multiply excited magnetic systems, determination of magnetic force and torque from energy and coenergy, Forces and torques in magnetic field systems, dynamic equations of electromechanical systems and analytical techniques.Constructional details of reluctance machine, variable-reluctance machines, basic VRM analysis, practical VRM analysis, stepper motors and their analysis, Brushless DC motors.

Reference Books:

1. J. B. Gupta," Theory and Performance of Electrical Machines," S. K. Kataria& Sons, New Delhi
2. P. S .Bimbra," Electrical Machinery", Khanna Publishers
3. B. L. Theraja, A. K. Theraja," A text book of Electrical Technology," S. Chand Publishers
4. Asfaq Hussein," Electric Machines," Danpat Rai Publisher
5. Bhattacharya S. K, "Electrical Machines",(Tata McGraw Hill Publications)
6. Kothari Nagrath, "Electrical Machines", (Tata McGraw Hill Publications)
7. M. N. Bandopadhyay, "Electrical Machines", (Tata McGraw Hill Publications)
8. Fitzaralda, "Electrical Machines", (Tata McGraw Hill Publications)

25SEE303T	Electrical Circuit Analysis	PCC	3L – 0T – 0P	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week Tutorial: 0 hrs/week	CA – I: 15 Marks Mid-Semester Examination: - 20 Marks CA – II: 15 Marks End Semester Exam: 50 Marks

Course Objectives:

1. Understand the Fundamentals of Electrical Circuit Elements and Laws.
2. Apply Network Reduction Techniques and Theorems.
3. Analyze Sinusoidal Steady-State Circuits.
4. Understand Non-Sinusoidal Signal Analysis.
5. Study the Behavior of Polyphase Systems.

Course Outcomes: After the completion of the course the student should be able to:

- **CO1** Explain and Apply Fundamental Circuit Concepts
- **CO2** Simplify Complex Circuits Using Theorems
- **CO3** Perform AC Steady-State Analysis
- **CO4** Analyze Non-Sinusoidal Signals and Apply Fourier Series
- **CO5** Understand and Analyze Three-Phase Systems

Course Contents

Unit 1: **Sources and elements of circuit** **9**

Ideal Voltage and Current Sources Dependent and Independent Sources Concept of resistance inductance and capacitance Concept of Mutual Inductance Dot Rule Ohms Law KCL KVL, Node Loop Mesh Equations Introduction of Magnetic Circuit. Flux, Flux Density (B), Intensity (H) and hysteresis curve

Unit 2: Circuit Reduction and Network Theorems (DC and AC) **9**

Series Parallel combination of R, L C. Star delta conversion and Rosen theorem. Current –voltage divider rule. super node super mesh equations source conversion Bride Lattice and Twin T Circuits. Average and RMS values and AC waveform. Terminology Superposition Theorem, Thevenin-Norton Theorem , Maximum Power Transfer Theorem, Millman Theorem, Reciprocity Theorem Substitution Theorem Tellenges Theorem.

Unit 3: Sinusoidal Seady State Analysis **9**

Simple R, RL RC series ans parallel Configuration Concept of Admittance and Impedance Power Triangle Impedance Triangle. Phasor Diagrams Active and reactive power calculation for simple circuit

Unit 4: Non-Sinusoidal Waveforms **9**

Various Non sinusoidal Waveforms Average RMS values and power factor calculations all types of waveforms Fourier Series and Symmetry Exponential Fourier series

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Unit 5: Polyphase Systems **9**

Three phase and multiphase supply generation winding arrangement, Star delta arrangement. Concept of Line and phase voltage and current Balanced and unbalanced arrangement. Shift in Neutral. Active and Reactive Power and apparent power calculation and measurement

Text Books

1. Engineering Circuit analays- Hyat and Kemmerly –-- McGraw Hill
2. Fundamentals of Electrtic Circuit- Alaxander and Sadiku --McGraw Hill
3. Circuits and Networks – Sudhakar and Shyamohan – McGraw Hill
4. Circuit Theory –A Chakravarti --Dhanpat Rai

Reference Books

1. Network Analysis – Van Valkenberug Prentice Hall India
2. Circuit Theory – K Gangadhar—Khanna Publishers

25SEE304T	**Electrical Testing, Maintenance and Costing**	**PCC**	**2L – 1T – 0P**	**3 Credits**

Teaching Scheme	**Examination Scheme**
Lecture: 2 hrs/week Tutorial: 1 hrs/week	CA – I: 15 Marks Mid-Semester Examination: - 20 Marks CA – II: 15 Marks End Semester Exam: 50 Marks

Course Objectives:

1. To introduce students to various types of electrical wiring systems and methods.
2. To develop knowledge of electrical maintenance practices
3. To provide an understanding of the design considerations
4. To impart practical skills in testing and maintenance
5. To enable students to estimate and cost electrical installations

Course Outcomes: After the completion of the course the student should be able to:

CO1	Identify and compare various types of electrical wiring systems and materials.
CO2	Perform routine maintenance and fault diagnosis.
CO3	Design basic electrical installations
CO4	Conduct standard tests on electrical installations.
CO5	Prepare detailed estimates and cost calculations

Course Contents:

Unit 1: Electrical Wiring **6**

Different types of wires, wiring system and wiring methods, Comparison of different types of wiring, Specifications of Different types of wiring materials, Accessories Different types of wiring tools. Domestic and industrial panel wiring, different types of wiring circuits, I.E. rules for wiring, Electricity supplyact- 1948

Unit 2: Introduction to Electrical Maintenance **6**

Types of maintenance, maintenance schedules, procedures, Maintenance of Motors: Over hauling of motors, preventive maintenance, and trouble shopping of electric motors. Maintenance of Transmission and Distribution System, danger notice, caution notice permit to work, arranging of shutdowns personally and temporary earths cancellation of permit and restoration of supply, Patrolling and visual inspection of lines – points to be noted during patrolling from ground: special inspections and night inspections,

Location of faults using Meggar, effect of open or loose neutral connections provision of proper fuses on service lines and their effect on system, causes and dim and flickering light.

Unit 3: Maintenance & Testing of Distribution Transformers **6**

Transformer maintenance and points to be attended to be attended to in respect of various items of equipment, checking of insulation resistance transformer oil level and BDV test of oil, measurement of earth resistance. Checking and maintenance of bus bars, isolating switches, HT/LT circuit breakers, LT switches, Power Transformers.

Unit 4: Design Considerations Of Electrical Installations **6**

Electric Supply System, Three phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, General requirements of Electrical Installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections, Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution Board, guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electrical installations.

Unit 5: Estimating And Costing of Domestic And Industrial Wiring **6**

Principles of circuit design in lighting and power circuits, Procedures for designing the circuits and deciding the number of circuits, Method of drawing single line diagram, Selection of type of wiring and rating of wires and cables, Load calculations and selection of size of conductor, Selection of rating of main switch, distribution board, protective switchgear ELCB and MCB and wiring accessories, Earthing of residential Installation, Sequence to be followed for preparing estimate, Preparation of detailed estimates and costing of residential installation, Important considerations regarding motor installation wiring, Determination of input power, input current to motors, rating of cables, rating of fuse, size of Conduit, size of distribution Board, main switch and starter. Preparation of detailed estimates and costing industrial installation, I.E. rules observed for above wiring.

Reference Books:

1. Electrical Design Estimating and Costing K. B. Raina, New Age International, 2007.
2. A course in Electrical Installation, Estimating and costing, J B Gupta, S K Kataria and Sons.
3. Electrical Design Estimating and Costing, K.B. Raina, S.K. Bhattacharya, New Age International Publisher.
4. Design of Electrical Installations, Dr. V.K. Jain, Dr. Amitabh Bajaj, University Science Press.
5. Electricity pricing Engineering Principles and Methodologies, Lawrence J. Vogt, P.E., CRC Press.
6. Guide for Electrical Layout in residential buildings, Indian Standard Institution, IS:4648-1968

25SEE305T	Renewable Energy and Cogeneration in Industry	MDM	2L – 0T – 0P	2 Credits

Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week Tutorial: 0 hrs/week	CA – I: 15 Marks Mid-Semester Examination: - 20 Marks CA – II: 15 Marks End Semester Exam: 50 Marks

Course Objectives:

To introduce students to the principles of renewable energy sources and cogeneration systems, with a focus on industrial applications and integration with electrical and autonomous technologies.

Course Outcomes: After the completion of the course the student should be able to:

CO1	Understand various types of renewable energy sources used in industry.
CO2	Explain the working and benefits of cogeneration (combined heat and power) systems.
CO3	Analyze the role of electrical systems in renewable energy integration.
CO4	Identify how autonomous control systems improve energy efficiency.
CO5	Evaluate small-scale renewable and cogeneration setups for industrial use.

Course Contents

Unit 1: Introduction to Renewable Energy in Industry **6**

Importance of energy in industry; Types of renewable energy: Solar, wind, biomass, small hydro, Comparison with conventional energy sources

Unit 2: Solar and Wind Energy Systems **6**

Basic components and working, Industrial applications: Solar panels, solar water heating, wind turbines, Electrical system integration and control.

Unit 3: Cogeneration (Combined Heat and Power - CHP) **6**

What is cogeneration? Types: Steam turbine, gas turbine, reciprocating engine-based systems, Benefits and efficiency improvement in industries

Unit 4: Energy Management and Autonomous Control **6**

Basics of industrial energy management, Role of IoT and automation in energy systems, Smart sensors and autonomous controls in renewables

Unit 5: Case Studies and Industrial Applications **6**

Case studies on renewable and cogeneration use in industries, Mini project: Design a small renewable cogeneration setup, Safety, standards, and future trends

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Text Books

1. Title: Non-Conventional Energy Resources
   Author: B.H. Khan
   Publisher: McGraw-Hill Education
   Note: Covers various renewable energy sources with industrial applications.

Reference Books:

1. Title: Renewable Energy: Power for a Sustainable Future
   Author: Godfrey Boyle
   Publisher: Oxford University Press
   Note: Good explanation of technologies like solar, wind, hydro, and bioenergy.
2. Title: Cogeneration & Combined Heat and Power (CHP): Principles and Applications
   Author: J.H. Horlock
   Publisher: Pergamon
   Note: Focused on CHP system design and performance in industries.
3. Title: Solar Energy: Fundamentals, Design, Modeling and Applications
   Author: S.P. Sukhatme & J.K. Nayak
   Publisher: McGraw-Hill
   Note: Useful for solar applications in industrial systems.
4. Title: Energy Management
   Author: Paul W. O'Callaghan
   Publisher: McGraw-Hill

25UHV306T	UHV	HSSM	2L – 0T – 0P	2 Credits

Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week Tutorial: 0 hrs/week	CA – I: 15 Marks MSE: - 20 Marks CA–II: 15 Marks ESE: 50 Marks

Course Outcomes: After the completion of the course the student should be able to:

CO1	To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
CO2	To facilitate the development of a Holistic perspective among students towards life and profession
CO3	To highlight the possible implications of Holistic understanding in terms of ethical human conduct, trustful mutually fulfilling human behaviour.

Course Contents:

Module 1 – Introduction to Value Education **6**

- Understanding Value Education
- Self-exploration as the Process for Value Education
- Continuous Happiness and Prosperity – the Basic Human Aspirations
- Right Understanding, Relationship and Physical Facility
- Happiness and Prosperity – Current Scenario
- Method to Fulfil the Basic Human Aspirations

Module 2 – Harmony in the Human Being **6**

- Understanding Human being as the Co-existence of the Self and the Body
- Distinguishing between the Needs of the Self and the Body
- The Body as an Instrument of the Self
- Understanding Harmony in the Self
- Harmony of the Self with the Body
- Programme to Ensure self-regulation and Health

Module 3 – Harmony in the Family and Society **6**

- Harmony in the Family – the Basic Unit of Human Interaction
- Values in Human-to-Human Relationship
- ‘Trust' – the Foundational Value in Relationship
- 'Respect' – as the Right Evaluation
- Understanding Harmony in the Society
- Vision for the Universal Human Order

Module 4 – Harmony in the Nature (Existence) **6**

- Understanding Harmony in the Nature
- Interconnectedness, self-regulation, and Mutual Fulfilment among the Four Orders of Nature
- Realizing Existence as Co-existence at All Levels
- The Holistic Perception of Harmony in Existence

Module 5 – Implications of the Holistic Understanding – a Look at Professional Ethics **6**

- Natural Acceptance of Human Values
- Definitiveness of (Ethical) Human Conduct
- A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
- Competence in Professional Ethics
- Holistic Technologies, Production Systems and Management Models-Typical Case Studies
- Strategies for Transition towards Value-based Life and Profession

Reference Books:

Textbooks

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2 nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. Teachers‟ Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English).

25SEE307T	Energy Conservation Management	HSSM-VEC	2L – 0T – 0P	2 Credits

Teaching Scheme	Examination Scheme
Lecture: 2 hrs/week Tutorial: 0 hrs/week	CA – I: 25 Marks CA – II: 25 Marks

Course Objectives:

1. Understand the current global and national energy scenario and recognize the need for sustainable energy practices.
2. Familiarize with the basic concepts and principles of energy conservation and energy efficiency.
3. Gain knowledge of energy audit methods, tools, and management techniques used in industrial and commercial setups.
4. Identify and analyze opportunities for improving energy efficiency in electrical systems (like motors, transformers, and lighting).
5. Recognize the significance of energy efficiency in thermal systems and evaluate performance improvements.
6. Understand the key provisions of the Energy Conservation Act, the role of BEE, and the importance of energy standards and ISO 50001.

Course Outcomes: After the completion of the course the student should be able to:

CO1	Understand the importance of energy conservation and analyze the current energy scenario (India and global).
CO2	Explain the methodologies of energy audits and the role of energy managers and auditors.
CO3	Apply energy efficiency techniques in electrical systems like motors, transformers, and lighting.
CO4	Analyze and evaluate performance of thermal systems and identify improvement opportunities.
CO5	Interpret national energy policies, standards, and the role of agencies like BEE and ISO 50001.

Course Contents

Unit 1: Basics of Energy Conservation **6**

Energy sources: Renewable and non-renewable, India's and global energy scenario, Need and importance of energy conservation, Basic principles of energy efficiency.

.**Unit 2: Energy Audit and Energy Management** **6**

Types of energy audits: Preliminary & Detailed, Steps in energy audit, Energy audit instruments and data analysis, Duties and responsibilities of Energy Manager and Auditor.

Unit 3: Energy Efficiency in Electrical Systems **6**

Power factor correction, Maximum demand and load management, Transformers and motor efficiency, Energy-efficient lighting (LED, CFL, LPSV, etc.)

Unit 4: Energy Efficiency in Thermal Systems **6**

Boiler and furnace performance evaluation, Heat recovery and steam utilization, Basics of insulation and cogeneration systems.

Unit 5: Energy Policies and Standards **6**

Energy Conservation Act, 2001, Bureau of Energy Efficiency (BEE) – Roles and Schemes, PAT Scheme, Energy Labels, Basics of ISO 50001.

Text Books

1. **Bureau of Energy Efficiency (BEE) Study Material** – Volumes 1 to 4

   Publisher: Bureau of Energy Efficiency, Government of India

   Official guidebooks used for Energy Manager & Energy Auditor certification

   Available for free download from: https://beeindia.gov.in

Reference Books

1. BEE Guidebook Vol. 1, S.C. Tripathi – "Energy Conservation and Management"
2. BEE Guidebook Vol. 1, "Handbook of Energy Audits" – Albert Thumann.
3. BEE Guidebook Vol. 2, "Energy Efficiency in Electrical Systems" – R.K. Rajput
4. BEE Guidebook Vol. 3, "Thermal Engineering" – R.K. Rajput.
5. BEE Guidebook Vol. 4, Govt. of India Documentation

25SEE308L	ELECTRICAL MACHINE-I	Lab PCC	0L – 0T – 4P	2 Credits

Teaching Scheme	Examination Scheme
Practical: 2 hrs/week	CA – I: 30 Marks CA – II: 30 Marks Practical Examination / Oral: 40 Marks

Course Objectives:

1. Introduce Practical Transformer Testing Methods.
2. Understand Transformer Configurations and Connections
3. Explore DC Machine Operations
4. Analyze DC Motor Speed and Load Characteristics.
5. Apply Theoretical Concepts in Practical Scenarios

Course Outcomes: At the end of the course, students will be able to

CO1	Perform Essential Transformer Tests.
CO2	Connect and Analyze Three-Phase Transformers.
CO3	Conduct DC Motor Tests and Control Experiments.
CO4	Evaluate Transformer Performance.
CO5	Study DC Generator Characteristics.

Minimum 8-10 experiments are to be performed based on contents from syllabus

List of Experiments:

1. To perform the polarity test on single phase transformer
2. To perform the transformation ratio test on single phase transformer
3. To perform the following three phase transformer connections:

   1) Star-star 2) Star-Delta
   3) Delta – Delta 4) Delta –Star
   5) Open Delta 6) Scott Connection

4. To perform the direct loading test on three phase transformers to calculate efficiency and Regulation
5. To perform the indirect loading test on three phase transformers to calculate efficiency
6. To perform the parallel operation of two single phase transformers.
7. To study D. C. Machine
8. To draw the speed characteristics of DC shunt motor by- (1) Armature Control method (2) Field Control method
9. To perform the load test on DC Shunt motor.
10. To study the load characteristics of DC generator

Recommended Books:

1. J. B. Gupta," Theory and Performance of Electrical Machines," S. K. Kataria& Sons, New Delhi
2. P. S .Bimbra," Electrical Machinery", Khanna Publishers
3. B. L. Theraja, A. K. Theraja," A text book of Electrical Technology," S. Chand Publishers
4. Asfaq Hussein," Electric Machines," Danpat Rai Publisher
5. Bhattacharya S. K, "Electrical Machines",(Tata McGraw Hill Publications)
6. Kothari Nagrath, "Electrical Machines", (Tata McGraw Hill Publications)
7. M. N. Bandopadhyay, "Electrical Machines", (Tata McGraw Hill Publications)
8. Fitzaralda, "Electrical Machines", (Tata McGraw Hill Publications)

25SEE309L	Electrical Circuit Analysis Lab	Lab PCC	0L – 0T – 2P	1 Credits

Teaching Scheme	Examination Scheme
Lecture: 0 hrs/week Practical: 2 hrs/week	CA – I: 15 Marks CA – II: 15 Marks End Semester Exam: 20 Marks

Course Objectives:

1. To verify fundamental electrical laws and theorems through practical experiments.
2. To develop an understanding of AC circuit behavior.
3. To introduce practical techniques for network analysis and simplification.
4. To provide hands-on experience with three-phase power systems
5. To equip students with methods to measure passive components.

Course Outcomes: After the completion of the course the student should be able to:

CO1	Students will be able to verify and apply basic electrical laws
CO2	Students will be able to apply key network theorems
CO3	Students will demonstrate the ability to analyze simple AC circuits
CO4	Students will be able to perform power measurement in three-phase systems
CO5	Students will be able to use experimental techniques to determine circuit parameters

List of Experiments:

Minimum 8 to 10 experiments to be performed on software or hardware method

1. Verification of Kirchhoff's Law
2. Study of RL Circuit
3. Verification of Thevenin Theorem
4. Verification of Maximum Power Transfer Theorem
5. Study of Power measurement in 3 phase star load
6. Observe and calculate RMS and avg values of AC waveform
7. Solution of network using super node technique
8. Measurement of capacitance and inductance using various techniques
9. Star delta conversion
10. Verification of Ohms law

Text Books

01. Engineering Circuit analays- Hyat and Kemmerly –-- McGraw Hill

25SEE310L	Electrical Testing, Maintenance and Costing Lab	Lab PCC	0L – 0T – 2P	1 Credits

Teaching Scheme	Examination Scheme
Lecture: 0 hrs/week Practical: 2 hrs/week	CA – I: 15 Marks CA – II: 15 Marks Practical Examination/Oral: 20 Marks

Course Objectives:

1. **Understand** the fundamental principles and procedures involved in testing various electrical machines, cables, and installations.
2. **Develop skills** to carry out preventive and breakdown maintenance of electrical equipment such as transformers, motors, and circuit breakers.
3. **Familiarize** with safety standards and practices used during electrical testing and maintenance.
4. **Learn** how to perform basic estimation and costing for domestic and industrial electrical installations.
5. **Apply knowledge** of testing and maintenance tools to real-life scenarios through hands-on experiments and exercises.

Course Outcomes: After the completion of the course the student should be able to:

CO1	Perform insulation, continuity, and load tests on electrical machines and cables
CO2	Carry out basic maintenance procedures on motors, batteries, and circuit breakers
CO3	Interpret test results and prepare maintenance records/logs
CO4	Estimate material, labor, and cost for simple electrical installations
CO5	Follow electrical safety procedures and use testing equipment safely

List of Experiments:

Minimum 8 to 10 experiments to be performed on software or hardware method

1. Testing of Electrical Cables (continuity, insulation, polarity)
2. Insulation Resistance Test of Transformer and Motor using Megger
3. Polarity and Phase Sequence Test for 3-phase Supply
4. Open Circuit and Short Circuit Tests on a Single-phase Transformer
5. Routine Maintenance of Circuit Breakers (inspection, operation, contact check)
6. Battery Maintenance – Checking electrolyte levels, voltage, and charging conditions
7. Wiring Estimate for a Small Residential Room – load calculation, material list, and cost
8. Cost Estimation of Single-phase Motor Installation with wiring and protection
9. Preparation of Bill of Materials (BOM) for an industrial lighting installation
10. Preparation of Quotation / Tender Draft for a small electrical installation project

Text Books

1. Testing, Commissioning, Operation and Maintenance of Electrical Equipment
S. Rao,Publisher: Khanna Publishers

Widely used for standard testing procedures, maintenance practices, and safety norms.

2. Electrical Wiring, Estimating and Costing
S.L. Uppal & G.C. Garg,Publisher: Khanna Publishers

Covers wiring estimation, layout preparation, labor and material costing in detail.

Reference Books

01. Estimating and Costing in Electrical Engineering– J.B. Gupta S.K. Kataria & Sons
02. Electrical Maintenance Manual– Surya Prakashan—Useful for practical and workshop-level maintenance work