SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – DIPLOMA IN ENGINEERING BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 3rd ACADMIC SESSION 2024-25

DEE 031
BASIC ELECTRICAL ENGINEERING & MATERIALS

Course Objectives: This course provides a solid foundation in fundamental electrical engineering concepts, including D.C. and A.C. circuits, the magnetic effects of electric current, and essential electrical engineering materials. Students will analyze and solve electrical circuit problems using Ohm's law, KCL, and KVL, understand and differentiate between AC and DC circuit elements and quantities, grasp the principles of magnetism and electromagnetic induction, learn about different electrical materials and their applications, focusing on conductors, insulators, and semiconductors, and understand the properties and applications of various magnetic materials.

Unit I.

D.C. Circuits –

Concept of charge, current, voltage, EMF, resistance, resistivity. Ohm's law, Main parts of circuit, Series, and parallel combination of resistances, KCL, KVL, star-delta connection, star to delta and delta to star transformation.

Unit II

A.C. Fundamentals - Concept of inductance, capacitance, reactance, impedance, admittance, phasor diagram of pure resistive, inductive, and capacitive circuit. Difference between AC and DC quantities, sinusoidal waveform, frequency, time. Instantaneous, maximum, average and RMS value, form factor

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Unit III

Magnetic effect of electric current - Concept of lines of force, flux, MMF, reluctance, permeability, magnetic flux density, magnetic field intensity. Analogy of electric and magnetic circuits, units. Faraday's laws of electromagnetic induction, self and mutual induction. Lenz's laws, Fleming's left- and right-hand rule.

Unit IV

Electrical Engineering materials - Definition of conductors, insulators, and semiconductors. Intrinsic and extrinsic semiconductor materials. Properties and applications of conducting, s. -conducting and insulating materials, classification of insulating materials based on temperature.

Unit V

Magnetic materials: - Different magnetic materials, properties applications. B-H curve.

Reference Books: -

1. Basic Electrical Engineering by Nagrath Kothari
2. Electrical Engineering Materials by TTTI Madras.
3. Basic Electrical Engineering by Jain & Jain
4. Basic Electrical Engineering by V.K. Mehta

Course outcomes-

CO1- Understand the basic elements of the electrical network.

CO2- Analyze the DC circuits based on Kirchoff's law.

CO3- Understand the basic concepts of magnetic circuit.

CO4- Analyze the AC electrical circuits and its components.

CO5- Understand the basic electrical & magnetic properties of materials.

LIST OF EXPERIMENTS

1) Measurement of current & voltage in single phase & three phase series & parallel circuit.
2) To study different types of meters/ indicators, ammeter, voltmeter & wattmeter etc.
3) To verify Kirchhoff's voltage Law (KVL) & Kirchhoff's Current Law (KCL)
4) To Study construction and working millimeter.
5) To verify Ohm's law in an electrical circuit.
6) To Study RLC series circuit.
7) To Study RLC parallel circuit.
8) To trace hysteresis loop for different magnetic materials.

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DEE 032
ELECTICAL CIRCUIT

Course Objectives: This course aims to provide a comprehensive understanding of electrical circuit analysis, covering active and passive elements, ideal sources, mesh and nodal analysis, and key network theorems. Students will learn to represent and analyze single-phase and polyphase A.C. circuits using phasor methods, and understand the concepts of impedance, power, power factor, and resonance. The course also covers the advantages of polyphase systems, generation of three-phase voltage systems, and the analysis of star and delta connections in three-phase circuits.

Unit I.
CIRCUIT ANALYSIS
Active and passive elements, ideal current source, and voltage source. unilateral and bilateral elements, number of loops, nodes, branches of a network. Analysis of networks by "Mesh" and "Node" methods, Nodal analysis,

Unit II.
NETWORK THEOREMS: - Superposition Theorem, Thevenin's Theorem, Norton's Theorem, and maximum power Transfer Theorem Millman Theorem with numerical problems.

Unit III
SINGLE PHASE CIRCUITS
Representation of A.C. quantity by phasor methods, rectangular and polar representation of A.C. RLC series combinations Circuit. Impedance, power in single phase circuits. Concept of power factors, conductance, admittance, and susceptance. Series resonance.

Unit IV
POLY PHASE CIRCUITS
Concept of poly phase A.C. circuits, advantages over single phase. Generation of three phase voltage system. Three phase circuits, phase sequence. Star and delta connections, phase, and line values of current and voltage, power in three phase circuits.

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Unit V
TRANSIENTS: - Concept of transient, variation of current when connected to D.C. or A.C. series circuit (R.L. combination and R.C. combination). Time constant.

Reference Books: -

1. Circuit Theory by A K Chakraborty
2. Basic Electrical Engineering by Nagrath Kothari
3. Electrical Engineering Materials by TTTI Madras.
4. Basic Electrical Engineering by Jain & Jain
5. Basic Electrical Engineering by V.K. Mehta

Course Outcomes: -

CO1-Apply the knowledge of network analysis techniques in DC circuits.
CO2- Apply the knowledge of network analysis techniques in AC circuits.
CO3- Apply the knowledge of Laplace transform in solving electrical circuits.
CO4- Examine single phase & polyphase AC power.
CO5- Examine transient and steady state response of DC circuits.

List of Experiments

1) To verify Ohm's Law in an electrical circuit.
2) To verify Kirchhoff's voltage Law (KVL) & Kirchhoff's Current Law (KCL)
3) To verify Superposition theorem in an electrical circuit.
4) To verify Norton's theorem in an electrical circuit.
5) To verify Thevenin's theorem in an electrical circuit.
6) To Study RLC series circuit & Parallel circuit
7) To study electrical resonance in the series circuit
8) To study transient response of an electrical circuit

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SYLLABUS

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DEE 033
ELECTICAL MACHINES-I

Course Objectives: - This course aims to provide a comprehensive understanding of energy conversion principles, including the conservation of energy and electromechanical energy conversion, and the fundamentals of D.C. generators and motors, covering their principles, construction, types, and applications. Students will also learn about the principles and workings of single-phase and three-phase transformers, including EMF equations, phasor diagrams, voltage regulation, efficiency, and various connection methods. The course includes practical applications and simple numerical problems to enhance understanding.

Unit I.

Energy Conversion Principle -Law of conservation of energy, electromechanical energy conversion classification of machines.

Unit II

D. C. Generator - Principle, construction, armature winding, types of winding, EMF equation, Types of generators, characteristics and applications, losses, and efficiency. Simple numerical.

Unit III

D. C. Motors -Principle, production of back EMF, torque equation. Classification, characteristics of D. C. motors, starters, speed control, losses and efficiency, applications of motors. Simple numerical.

Unit IV.

Single phase transformers - Principle, construction, classification. EMF equation, turns ratio, phasor diagram, no load and on load equivalent circuit. Voltage regulation, open and short circuit tests, losses and efficiency, condition of maximum efficiency.

Unit V.

Three phase transformers - Connections, groups, Scott, and open delta connection. Comparison of three phase transformers with bank of three single phase transformers. Parallel
operation.

List of Experiments

1) To study construction of DC machines.
2) To study speed control methods for DC motor (Armature control & Field control).
3) To perform Swinburne's test on DC motor.
4) To study construction of single phase & three phase transformers.
5) To perform Polarity test on single phase transformer.
6) To perform Ratio test on single phase transformer.
7) To perform Open circuit test on single phase transformer.
8) To perform short circuit test on single phase transformer.

Reference Books: -

1. Electrical Technology Vol. II by B. L. Thareja Khanna Publisher
2. Electrical Machines by Bhattacharya, T.T.T.I.
3. Electrical Machines by Nagrath & Kothari, PHI Publication
4. Electrical Machines Vol. I & II by P.S. Bhambra, Khanna publishers

Course Outcomes: -

CO1-Summarize the basics of Single and Three Phase transformers.
CO2-Understand the concepts of D.C. Machines, construction, armature reaction and characteristics.
CO3-Classify various DC motors and demonstrate their characteristics.
CO4-Compare distribution and power transformers.
CO5-Understand concepts of harmonics.

SARDAR PATEL UNIVERSITY, BALAGHAT (M.P.)

SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

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DEE 034

ELECTRICAL AND ELECTRONICS MEASUREMENTS AND MEASURING INSTRUMENTS

Course Objectives: - This course aims to provide a comprehensive understanding of various measuring instruments, their classifications, and operations. Students will learn to analyze and measure electrical quantities using different types of meters, including moving coil, electro dynamometers, and induction type instruments. The course covers water and energy meters for measuring power in various load conditions and the techniques for measuring resistance using various methods. Additionally, students will understand the principles and applications of A.C. bridges for measuring inductance and capacitance. Through practical examples and numerical problems, students will gain the skills necessary to accurately measure and interpret electrical data.

Unit I.–

Classification of measuring instruments (primary & secondary instruments),

Indicating, recording, and integrating types of meters. Static characteristics of measuring instruments, accuracy, precision and sensitivity, Errors and types of errors, Electrical measuring instruments - Construction, operation. Deflecting, controlling, and damping forces, supporting systems,

Unit II–

moving coil, electro dynamo meter, moving iron and induction type instruments, simple numerical. Hot wire type instruments, vibration galvanometer, shunt and multipliers, CT & PT.

Unit III

Wattmeter and Energy meters: – Dynamometer and induction type wattmeter, Induction type energy meter. measurement of 1-phase and 3-phase power in balanced and unbalanced load condition, 3 phase wattmeter Comparison of dynamo type & induction type ammeter.

Unit IV

Measurement of resistance

Classification of resistance, measurement of low, medium, and high resistance. Kelvin's double bridge, wheat–stone bridge, Ammeter, voltmeter method and ohmmeter, multimeter, megger. Importance of earth resistance, Earth tester.

Unit V

A.C. Bridges – Measurement of inductance and capacitance by A.C. bridges.

Maxwell, Anderson, Hays, Schering'sDesauty and Wien's bridge. (no phasor diagram)

Reference:

1. "Electrical Measurements and Instrumentation" by V. K. Mehta and Rohit Singh.
2. "Electrical and Electronic Measurements and Instrumentation" by D. P. Kothari and I. J. Nagrath
3. "Principles of Electrical Measurements" by P. S. Bimbhra
4. "Electrical Measurements" by J. B. Kuo
5. "Electrical Measurement and Instrumentation" by S. K. Sharma and V. K. Mehta

Course Outcomes: -

CO1-Classify different Analo meters and explain the working principles of each device.
CO2-Explain the principles of water, energy meters and frequency meters.
CO3-Compare different bridges and understand the concept of potentiometers.
CO4-Find and understand proper measuring methods in magnetic fields.
CO5-Explain the principles of Instrument transformers and electronic instruments.

LIST OF EXPERIMENTS

1) To study construction & working of Digital multimeter.
2) To study construction & working of Darsana galvanometer.
3) To study standardization of potentiometer & use the same for calibrating ammeter & voltmeter.
4) To study the characteristics of magnetic hysteresis loop.
5) To calibrate & evaluate the single-phase energy meter for different loads.
6) Measurement of three phase power and power factors.
7) To measure unknown resistance using Wheatstone bridge.
8) To measure unknown resistance using Kelvin's double bridge.
9) To measure unknown inductance using Maxwell's bridge.
10) To measure unknown capacitance using Schering's bridge.

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SYLLABUS

COURSE – DIPLOMA IN ENGINEERING BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 3rd ACADMIC SESSION 2024-25

DEE 035

BASIC ELECTRONICS

Course Objectives: - This course aims to provide a thorough understanding of semiconductor devices, rectifiers, regulated power supplies, amplifiers, and digital techniques. Students will learn about electronic emission, diode and transistor characteristics, and various special semiconductor devices. They will explore rectifier types, calculate output values, and understand filters. The course covers the differences between linear and switch mode power supplies and examines amplifiers and their applications. Additionally, students will gain knowledge in digital techniques, including number systems and logic gates, ensuring a comprehensive foundation in electronics.

Unit I.

Semiconductor Devices –

(a) Concept of electronic emission – Different methods of electronic emission and their applications.

(b) Diodes - Formation of PN junction, forward biasing, and reverse biasing of PN junction, construction, characteristics, and application of different types of diodes, Zener diode.

(c) Transistor - PNP/ NPN Junction Transistors, different configurations: CB, CE, CC. Transistors Characteristics, and applications.

(d) Special Semiconductor devices – Construction, symbol and Application of Tunnel diode, photo diode, varactor, FET, MOSFET, UJT.

Unit II.

Rectifiers –single phase, half wave, full wave, and bridge types of rectifiers. Calculation of output voltage, average and RMS values, ripple factor and rectification efficiency. Filter, and types of filters.

Unit III.

Regulated Power Supply - Difference between linear and switch mode power supply, regulated power supply and its limitations, series and shunt power supply using transistors, SMPS (Block diagram only), IC regulated power supply (78XX and 79XX series).

Unit IV.

Amplifiers - Principal of amplification, types of transistor amplifiers, biasing techniques, RC coupled, transformer coupled, and direct coupled amplifiers, push pull Amplifier, advantages and disadvantages, detailed study of circuit diagram, working principle and applications of above amplifiers, use of comparator, multiplier, summer, integrator and differentiator.

Unit V.

Digital Techniques - Number system, binary, decimal number system. Addition, subtraction, multiplication & division of binary numbers. Logic gates- their symbols, truth table and applications.

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SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

COURSE – DIPLOMA IN ENGINEERING BRANCH – ELECTRICAL ENGINEERING

SEMESTER – 3rd ACADMIC SESSION 2024-25

List of Experiments

1) TO Study Of CRO.
2) To Study of Electrical and Electronic components.
3) To Measurement of resistance by color coding method.
4) Testing of Diode and Transistor.
5) To study Half wave and Full wave Rectifier.
6) To study V-I characteristics of Zener Diode.
7) Input and output characteristics of transistor in common emitter configuration.
8) To study V-I characteristics of P-N junction diode.

Reference Books: -

1. Basic Electronics & Linear Circuits-: By Bhargava, T.T.T.I. Chandigarh.
2. Basic Electronics -: By V.K. Mehta
3. Electronics Principal -: By math.
4. "Practical Electronics for Inventors" by Paul Scherz and Simon Monk.
5. "The Art of Electronics" by Paul Horowitz and Winfield Hill
6. "Basic Electronics" by David A Bell -
7. "Electronics for Dummies" by Cathleen Shamieh
8. "Microelectronic Circuits" by Adel S. Sedra and Kenneth C. Smith

Course Outcomes: -

CO1- Understand the characteristics of diodes, transistors, OP-amps, and digital electronic components.
CO2-Understand the concepts of Digital electronics and analog to digital conversion and vice versa.
CO3- Analyze various circuits viz. Rectifiers, Voltage Regulators, Amplifier circuits, Op-Amp based linear & non-linear circuits.
CO4-Apply knowledge of electronics devices and circuits to implement engineering applications.
CO5-Design Combinational and Sequential logic circuits

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SCHOOL OF ENGINEERING AND TECHNOLOGY

SYLLABUS

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DEE 036 P
Professional Activities

OBJECTIVES:

1. To allow for professional development of students as per the demand of engineering profession.
2. To provide time for organization of student chapter activities of professional bodies) i.e., Institute of engineers, ISTE or Computer Society of India etc.)
3. To allow for development of abilities in students for leadership and public speaking through organization of student seminar etc.
4. To provide time for organization of guest lectures by expert engineers/eminent professionals of industry.
5. To provide time for the organization of technical quizzes or group discussion or any other group activity.
6. To provide time for visiting the library or using the Internet.
7. To provide time for group discussion or solving case studies.
8. To provide time for personality development of students.
9. To provide time for working for social cause like awareness for environmental and ecology etc.