

# LESSON PLAN

## FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING (TH 6)

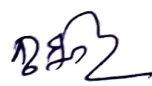
DISCIPLINE: ELECTRICAL ENGINEERING  
BY: NRUSINGH CHARAN BEHERA

YEAR: 1ST YEAR  
WEF: 17.08.26 TO 17.04.27

| Class/Week                                                                          | Topics to be covered                                                                                                                      | Remark |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <b>UNIT I: ELECTRIC AND MAGNETIC CIRCUITS (Weeks W1 – W9)</b>                       |                                                                                                                                           |        |
| W1                                                                                  | Introduction to Electrical Engineering: EMF, Current, Potential Difference, Ohm's Law and temperature dependence.                         |        |
| W2                                                                                  | Concept of electrical source and load, Series circuit connections of V, I, and R with numericals.                                         |        |
| W3                                                                                  | Parallel circuit connections of V, I, and R, Voltage Division Rule and Current Division Rule.                                             |        |
| W4                                                                                  | Electric Power and Energy concepts, Kirchhoff's Current Law (KCL) with numerical problems.                                                |        |
| W5                                                                                  | Kirchhoff's Voltage Law (KVL) and circuit analysis with simple numerical problems.                                                        |        |
| W6                                                                                  | Magnetic Circuits: Definitions of M.M.F, magnetic force, magnetic flux, permeability, reluctance, and permeance.                          |        |
| W7                                                                                  | Electromagnetic Induction: Faraday's Laws, Lenz's Law, Self-inductance, Mutual inductance, and Leakage factor.                            |        |
| W8                                                                                  | Magnetic Hysteresis loop and B-H curve, Analogy between electric and magnetic circuits.                                                   |        |
| W9                                                                                  | AC Fundamentals: Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS, Average value, Form Factor, Peak Factor, Phase Angle. |        |
| <b>UNIT II: A.C. CIRCUITS (Weeks W10 – W17)</b>                                     |                                                                                                                                           |        |
| W10                                                                                 | Mathematical and phasor representation of alternating EMF and current waveforms.                                                          |        |
| W11                                                                                 | Three-phase systems: Voltage and Current relationships in Star (Y) connection with derivation.                                            |        |
| W12                                                                                 | Three-phase systems: Voltage and Current relationships in Delta ( $\Delta$ ) connection with derivation.                                  |        |
| W13                                                                                 | AC through Pure Resistance (R) circuit: Phasor representation, wave diagrams, and power calculation.                                      |        |
| W14                                                                                 | AC through Pure Inductance (L) circuit: Inductive reactance, phasor representation, and power calculation.                                |        |
| W15                                                                                 | AC through Pure Capacitance (C) circuit: Capacitive reactance, phasor representation, and power calculation.                              |        |
| W16                                                                                 | Impedance concept in R-L, R-C, and R-L-C series circuits with phasor diagrams.                                                            |        |
| W17                                                                                 | Power Triangle, Power Factor definition & significance, Real power (kW), Reactive power (kVAR), and Apparent power (kVA).                 |        |
| <b>UNIT III: TRANSFORMER AND DC MACHINES (Weeks W18 – W25)</b>                      |                                                                                                                                           |        |
| W18                                                                                 | Fundamentals of Electrical Machines: Fleming's Right-Hand Rule and Fleming's Left-Hand Rule applications.                                 |        |
| W19                                                                                 | DC Machines: Constructional details (Yoke, Poles, Armature, Commutator, Brushes) and working principle.                                   |        |
| W20                                                                                 | EMF equation derivation for DC Generators and DC Motors with numerical problems.                                                          |        |
| W21                                                                                 | Applications of DC Generators and DC Motors in industrial and domestic fields.                                                            |        |
| W22                                                                                 | Transformers: Operating principle of mutual induction, general constructional features (Core type & Shell type).                          |        |
| W23                                                                                 | Classification and principle of different types of transformers (Step-up, Step-down, Auto-transformer).                                   |        |
| W24                                                                                 | EMF Equation of single-phase transformer derivation and transformation ratio (K).                                                         |        |
| W25                                                                                 | Simple numerical problems on EMF equation, turns ratio, current ratio, and transformer voltage ratio.                                     |        |
| <b>UNIT IV: MEASURING INSTRUMENTS, WIRING &amp; POWER BILLING (Weeks W26 – W32)</b> |                                                                                                                                           |        |
| W26                                                                                 | Measuring Instruments: Introduction, classification, and operating torques (Deflecting, Controlling, Damping torque concepts).            |        |
| W27                                                                                 | PMMC Instruments: Working principle, construction, features, scale, and applications (DC Ammeter & Voltmeter).                            |        |
| W28                                                                                 | MI Instruments: Attraction and Repulsion type Moving Iron instruments, features, and applications (AC/DC).                                |        |
| W29                                                                                 | Single-phase Wattmeter and Energy Meter: Connection diagrams, operating principles, and practical uses.                                   |        |
| W30                                                                                 | Domestic Wiring: Types of wiring systems (Circuit, Wooden casing-capping, CTS/TRS, Conduit wiring concept).                               |        |
| W31                                                                                 | Power Billing: Energy consumption calculation methods, load assessment in kilowatt-hours (kWh).                                           |        |
| W32                                                                                 | Energy consumption calculations in small domestic electric installations with numerical power billing problems.                           |        |

### Course Outcome-

|      |                                                                                                         |
|------|---------------------------------------------------------------------------------------------------------|
| CO:1 | Acquire knowledge on Electrical and magnetic circuit parameters & AC circuits.                          |
| CO:2 | Basic analysis of Machines & Transformer.                                                               |
| CO:3 | Analyze measuring instruments, domestic wiring, and apply the knowledge for power billing calculations. |

  
 08.11.2019