COURSE CONTENT

BASIC ELECTRICAL ENGINEERING

I Semester: CSE

II Semester: CSD / CSM

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
2520201	Foundation	3	0	0	3	40	60	100
Contact Classes:45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes:45		

Prerequisites: **Mathematics.**

Course Overview:

This course provides a comprehensive foundation in basic electrical engineering, focusing on DC and AC circuit analysis, transformers, electrical machines, and electrical installations. Students develop analytical skills to apply circuit laws and network theorems, understand power and energy conversion, and analyze the operation of transformers and rotating machines. The course also introduces practical aspects of electrical wiring, switchgear, earthing, and batteries, preparing students for real-world electrical engineering applications.

Course Objectives:

1. To understand the fundamental principles of electrical circuits and apply Kirchhoff's laws and network theorems for DC and AC circuit analysis.
2. To develop analytical skills in evaluating current, voltage, power, and power factor in single-phase and three-phase AC circuits.
3. To explain the construction, working principles, equivalent circuits, and performance characteristics of electrical transformers.
4. To comprehend the operating principles, characteristics, and applications of DC machines, induction motors, and synchronous machines.
5. To familiarize with the components of electrical installations, wiring systems, earthing methods, and perform basic energy and power factor calculations.

Course Outcomes: After Completion of the Course, Students should be able to

1. Apply Kirchhoff's laws and network theorems for analyzing DC circuits and determine transient responses of first-order RL and RC circuits.
2. Analyze single-phase and three-phase AC circuits for compute voltage, current, power, and power factor, and identify resonance conditions.
3. Evaluate the performance of single-phase and three-phase transformers in terms of efficiency, voltage regulation, and losses.
4. Explain the construction, working principles, and performance characteristics of DC machines, induction motors, and synchronous generators.
5. Perform basic electrical installation calculations involving wiring, earthing, energy consumption, and power factor improvement.

UNIT - I: D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL & KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

UNIT - II: A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor

representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (only series), resonance in series R-L-C circuit.

UNIT - III: Transformers: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT - IV: **Electrical Machines:** Construction and working principle of dc machine, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Construction and working of Single-phase induction motor, Construction and working of synchronous generator.

UNIT - V: Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Characteristics of batteries and battery backup.

TEXTBOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.

REFERENCEBOOKS:

1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, "Basic Electrical Engineering", S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

ELECTRONIC RESOURCES:

1. **https://www.engineer4free.com/circuits.html?utm_source=chatgpt.com**
2. **https://wizape.com/English/Electrical-Engineering-Fundamentals?utm_source=chatgpt.com**
3. **https://archive.nptel.ac.in/courses/108/102/108102146/?utm_source=chatgpt.com**
4. **https://alison.com/course/electrical-engineering-electrical-transformer-components?utm_source=chatgpt.com**

MATERIALS ON LINE:

1. Course template
2. Tutorial question bank
3. Tech talk and Concept Video topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper–I
8. Model question paper–II
9. Lecture notes
10. E-Learning Readiness Videos (ELRV)