**COURSE PLAN**

**Department** **:** Chemical Engineering

**Course** **:** Basic Electrical Engineering

**Academic Year** **:** 2022-2023

**Class** **:** I B.Tech. II Semester (Chemical

**Course Coordinator** **:** Mr.K.S,Ravi Kumar

| **Sno.** | **Unit No.** | **Lecture No.** | **Topic(s) to be covered** | **Preferred book(s)** |
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| 1 | ----- | 1,2 | Orientation-Basic Electrical quantities, Applications of Electrical power | ----- |
| 2 | I | 3 | **Unit 1: D.C. Circuits**  Ohms law, KCL, KVL | T1, T2,R1 |
| 3 | 4,5 | Electrical circuit elements (R, L and C) |
| 4 | voltage and current sources, |
| 5 | 6,7 | Superposition theorem- |
| 6 | 8,9 | problems |
| 7 | 10 | Time-domain analysis of first-order RL and RC circuits. |
| 8 | 11 | Problems |
| 9 | 12 | Analysis of simple circuits with DC excitation, |
| 10 | 13,14 | Problems |
| 11 | II | 15 | **Unit2: A.C. Circuits**  Representation of sinusoidal waveforms | T1,T2,R1 |
| 12 | 16 | Average and RMS values |
| 13 | 17 | phasor representation, real power, reactive power, apparent power |
| 14 | 18,19 | power factor-problems |
| Analysis of single-phase AC circuits (Series & Parallel), Resonance |
| 15 | 20 | Three-phase balanced circuits |
| 16 | 21 | Problems |
| 17 | 22 | voltage and current relations in star and delta configurations. |
| 18 | 23 | Problems |
| 19 | III | 24 | **Unit 3: DC & AC Machines** [**Elementary treatment only**]  Principle and operation of DC Generator - | T1,T2,R1 |
| 20 | 25 | EMF equation -problems |
| 21 | 26 | Types of DC Generators |
| 22 | 27 | open circuit characteristic of DC shunt generator |
| 23 | 28 | Principle of operation of single phase and Three phase Induction Motors, |
| 24 | 29 | construction and working of synchronous motors, Alternators |
| 25 | IV | 30 | **Unit 4:** **Basics of Power Systems:** Structure of power system |
| 26 | 31 | Layout & operation of Hydro power plant | T1,T2,R1,R3 |
| 27 | 32 | Thermal power plant selection of site, layout |
| 28 | 33 | Nuclear Stations, advantages and disadvantages |
| 29 | 34 | Solar & wind generating stations |
| 30 | 35 | Typical AC Power Supply scheme |
| 31 | 36,37 | Elements of Transmission line |
| 32 | 38 | Types of Distribution systems: Primary & Secondary distribution systems. |
| 33 | V | 39 | **Unit 5: Electrical Installations**  Components of LT Switchgear: | T1,T2,R1,R3 |
| 34 | 40 | Switch Fuse Unit (SFU), MCB, ELCB, MCCB, |
| 35 | 41 | Types of Wires and Cables, |
| 36 | 42 | Earthing. Types of Batteries and applications |
| 37 | VI | 43 | Characteristics of Batteries. | T1,T2 |
| 38 | 44 | Elementary calculations for energy consumption, |
| 39 | 45 | Problems |
| 40 | 46 | power factor improvement, battery backup |
| 41 | Revision | 1-2 | Simple problems |  |

**Text books / References:**

1. T1 :D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010
2. T2: E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
3. T3: Vincent Del Toro, “Electrical Engineering Fundamentals”, Pearson, 2015.

**REFERENCE BOOKS**:

R1. Principles of Electrical Machines by V.K. Mehta & Rohit Mehta, S.Chand publications.

R2. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications.

R3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications, 2nd edition.

**COURSE OUTCOMES:** At the end of the course, Student will be able to

**CO1.** Recall the fundamental laws, equipment & terminology associated with basic electrical engineering. (L1)

**CO2.** Explain the principle of operation & working of various electric machines. (L2)

**CO3.**Apply the network theorems to solve engineering problems. (L3)

**CO4**.Analyze complex circuits and performance analysis of various electrical machines. (L4)

**CO5**.Estimate the size & rating of different electrical equipment for a particular application. (L5)

**List of Experiments**

Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope, resistors, capacitors and inductors.

1. Verification of Kirchhoff laws.
2. Verification of Network Theorems.
3. Magnetization characteristics of a DC Shunt Generator.
4. Torque Speed Characteristic of separately excited dc motor
5. Speed control of DC Shunt Motor.
6. Predetermination of performance parameters of 1 – Phase Transformer.
7. Brake test on 3 - Phase Induction Motor.
8. I – V Characteristics of Solar PV cell
9. I – V characteristics of battery.
10. Brake test on DC Shunt Motor.
11. Measurement of earth resistance.
12. Measurement of active power in three phase balanced circuit.
13. Measurement of Choke coil parameters
14. Determination of AC quantities using CRO/DSO.

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| CO / PO mapping | Program Outcomes | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | PSO1 | PSO2 |
| Recall the fundamental laws, equipment & terminology associated with basic Electrical Engineering. | H | M | L | L | M |  |  |  |  |  |  | H | H | M |
| Explain the principle of operation & working of various electric machines. | H | M | M | L | M |  |  |  |  |  |  | H | H | M |
| Apply the network theorems to solve engineering problems. | H | H | H | M | H |  |  |  |  |  |  | H | H | M |
| Analyze complex circuits and performance analysis of various electrical machines | H | H | H | H | H | L |  |  |  | H |  | M | H | H |
| Estimate the size & rating of different electrical equipment for a particular application. | H | H | H | H | H | H | M |  | M | H |  | M | H | H |

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| **A3EET201- Basic Electrical Engineering** | |
| Course designed by | Department of Electrical & Electronics Engineering |