Maharaja Agrasen Institute of Technology
Department of Information Technology

Electrical Machine-I Theory (EEC-211)

L. No.	TOPIC	No. of Lectures	CO
1.	Introduction of EMEC and its importance in electrical engineering.	1	CO1
2.	Fundamentals of magnetic Circuits, magnetic field, magnetic flux, permeability, and magnetic reluctance	1	CO1
3.	Energy storage in magnetic fields, energy density, and calculations.	1	CO1
4.	Flow of energy in Electro-Mechanical devices, energy and co-energy in magnetic fields	1	CO1
5.	Singly and doubly excited systems analysis and design of systems with multiple field windings.	1	CO1
6.	Understanding torque production in electromagnetic systems. DC Generators-Components and construction of DC generators.	1	CO2
7.	Armature Winding Details and Connections- Lap and wave winding, their advantages, and applications.	1	CO2
8.	EMF Equation and Types of DC Generators-Derivation of EMF equation, separately excited, shunt, series.	1	CO2
9.	Derivation of EMF equation of compound-connected generators. Numerical Problems	**1**	CO2
10.	Voltage build-up process, characteristics, and practical applications of DC generators.	**1**	CO2
11.	Introduction to armature reaction and its effects on the magnetic field. Explanation of demagnetizing and cross-magnetizing armature MMF.	1	CO2
12.	Role of interpoles in reducing commutation problems. Compensating windings and their importance in improving generator performance.	1	CO2
13.	Detailed explanation of the commutation process in DC generators. Techniques and methods to improve commutation, such as pole face skewing and interpoles.	1	CO2
14.	Derivation of speed and torque equations for DC motors. Understanding the relationship between speed and torque.	1	CO2
15.	Analysis of the speed-torque characteristics of series-wound DC motors. Applications where series motors are suitable.	1	CO2

16.	Analysis of the speed-torque characteristics of shunt-wound DC motors. Applications where shunt motors are suitable.	1	CO2
17.	Analysis of the speed-torque characteristics of compound-wound DC motors. Understanding cumulative and differential compound motors.	1	CO2
18.	Methods and devices for starting DC motors, including series-parallel control. Speed control techniques such as field control and armature voltage control.	1	CO2
19.	Different braking methods for DC motors, including regenerative braking and dynamic braking.	1	CO2
20.	Understanding efficiency calculations for DC generators and motors. Overview of testing methods and procedures.	1	CO2
21.	Introduction to DC servo motors and their applications in control systems. Discussion of precision and feedback control.	1	CO1, CO2
22.	Explanation of permanent magnet DC motors and their advantages. Introduction to brushless DC motors and their use in modern applications.	1	CO1, CO2
23.	Basics of Transformers	1	CO3
24.	Transformer Operation & Types of Single-Phase Transformers	1	CO3
25.	Transformer Equivalent Circuit (Exact)		CO3
26.	Transformer Approximate Equivalent Circuit	1	CO3
27.	Phasor Diagram for Transformers	1	CO3
28.	Open Circuit Test (OC Test) & Short Circuit Test (SC Test)	1	CO3
29.	Sumpner's Test Discussion of Sumpner's test as a method to determine transformer efficiency. Practical implementation and analysis of Sumpner's test.	1	CO3, CO4
30.	Transformer Efficiency Calculation of transformer efficiency and its significance. Factors affecting transformer efficiency.	1	CO3, CO4
31.	Voltage Regulation Understanding voltage regulation and its impact on transformer performance. Calculation of percentage voltage regulation.	1	CO3, CO4
32.	All Day Efficiency	1	CO3, CO4
33.	Three phase bank of single phase transformer	1	
34.	Parallel operation of 1-ø and 3-ø transformer,	1	CO3, CO4
35.	Load division between transformers in parallel	1	CO3, CO4
36.	Three winding transformer	1	CO4
37.	Zig zag connections	1	CO4
38.	Vector grouping with clock convention	1	CO4
39.	Tap changing, 3-ø to 2-ø and 3-ø to 6-ø conversion	1	CO3, CO4
40.	Auto transformer	**1**	**CO3, CO4**
41.	Welding Transformer, Traction Transformer	1	CO3, CO4
42.	Instrument and Pulse Transformer		CO3
43.	Revision unit 3 (weak students)	1	

44.	Revision unit 4 (weak students)	1	

Course Objectives

C.211.1	To impart the knowledge of magnetic circuit and EMEC devices.
C.211.2	To understand the concept of DC machines.
C.211.3	To impart the knowledge of single phase transformer.
C.211.4	To impart the knowledge of three phase transformer.