

SCHEME OF COURSE WORK

Course Details:

Course Title	: ELECTRICAL MACHINES-I		
Course Code	: 22EE1103	L T P C	: 3 0 0 3
Program:	: B. Tech.		
Specialization:	: ELECTRICAL AND ELECTRONICS ENGINEERING		
Semester	: III SEM		
Prerequisites	Ordinary Differential Equation and Vector Calculus		
Courses to which it is a prerequisite	: Electrical Machines-II		

Course Outcomes (COs):

At the end of the course students will be able to:

CO1: Apply the concepts of magnetic circuits to compute induced emf and force in electromagnetic systems.

CO2: Illustrate the working principle of different types of DC generators.

CO3: Illustrate the working principle of different types of DC motors including testing

CO4: Determine the equivalent circuit of a transformer and assess its performance.

CO5: Explain the operation of three phase transformers and Autotransformers.

Program Outcomes (POs):

The student of Electrical and Electronics Engineering at the end of the program will be able to:

1	Apply the knowledge of basic sciences and electrical and electronics engineering fundamentals to solve the problems of power systems and drives.
2	Analyze power systems that efficiently generate, transmit and distribute electrical power in the context of present Information and Communications Technology.
3	Design and develop electrical machines and associated controls with due considerations to societal and environmental issues.
4	Design and conduct experiments, analyze and interpret experimental data for performance analysis.
5	Apply appropriate simulation tools for modeling and evaluation of electrical systems.
6	Apply the electrical engineering knowledge to assess the health and safety issues and their consequences.
7	Demonstrate electrical engineering principles for creating solutions for sustainable development.
8	Develop a techno ethical personality that help to serve the people in general and Electrical and Electronics Engineering in particular.
9	Develop leadership skills and work effectively in a team to achieve project objectives.
10	Communicate effectively in both verbal and written form.
11	Understand the principles of management and finance to manage project in multi disciplinary environments.
12	Pursue life-long learning as a means of enhancing the knowledge and skills.

Course Outcome versus Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	3	3	3	2	2	3	2	2	-	-	2
CO-2	3	3	3	3	3	3	3	2	2	-	-	2
CO-3	3	3	3	3	3	2	3	2	2	-	-	2
CO-4	3	3	3	3	3	2	3	2	2	-	-	2
CO-5	3	3	3	3	3	3	3	2	2	-	-	2

3 - STRONGLY CORRELATED, 2 - MODERATELY CORRELATED, BLANK - NO CORRELATION

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam
----------------------------	--

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	CO	Sample questions	Teaching-Learning strategy	Assessment Method & Schedule
1	UNIT-I: MAGNETIC CIRCUITS Introduction, Magnetic materials and their properties, magnetically induced emf and force,	CO1	Explain different magnetic materials with their BH curve Explain magnetically induced emf and force in a machine	Chalk and talk Problem Solving	Mid-Test I Quiz-I Assignment-I Week (1-8)
2	AC operation of magnetic circuits, hysteresis and eddy current losses permanent magnets, and applications of permanent magnet materials	CO1	Explain how hysteresis and eddy currents are eliminated Explain permanent magnets, and applications of permanent magnet materials	Chalk and talk Problem Solving	Mid-Test I Quiz-I Assignment-I Week (1-8)
3	PRINCIPLES OF ELECTROMECHANICAL ENERGY CONVERSION: Energy in magnetic system, field energy and mechanical force, multiply-excited magnetic field systems, forces/torques in systems with permanent magnets, energy conversion via electric field, dynamical equations of electro mechanical systems	CO1	Explain single excited system Explain multi excited system Explain dynamical equations of electro mechanical systems	Chalk and talk Problem Solving	Mid-Test I Quiz-I Assignment-I Week (1-8)
4	UNIT-II: DC GENERATORS Constructional details of dc machine, armature windings and its types	CO2	Explain the construction of DC machine Explain the types of armature windings	Chalk and talk Problem Solving	Mid-Test I Quiz-I Assignment-I Week (1-8)
5	Emf equation, wave shape of induced emf, armature reaction	CO2	Derive EMF Equation of DC machine Write types of characteristics of dc generator and explain detailed? Write applications of dc series generator?	Chalk and talk Problem Solving	Mid-Test I Quiz-I Assignment-I Week (1-8)
6	Commutation, methods of improving commutation, methods of excitation OCC and load characteristics of different types of generators	CO2	Explain the commutation process in a DC machine Explain the methods to improve commutation	Chalk and talk Problem Solving	Mid-Test I Quiz-I Assignment-I Week (1-8)
7	UNIT-III: DC MOTORS Force on conductor carrying current, Torque and power developed by armature, characteristics of dc motors speed control of dc motors, starting of dc motors: 3-point and 4-point starters,	CO3	Explain the force and torque equation of DC motor Explain 3-point and 4-point starters	Chalk and talk Problem Solving	Mid-Test I Quiz-I Assignment-I Week (1-8)
8	Losses in dc machine, condition for maximum efficiency Testing of dc machines: Brake test, Swinburne's test,	CO3	How to determine efficiency of dc motor with brake test explain with neat diagram? Write a short notes on swinburn's test?	Chalk and talk Problem Solving	Mid-Test I Quiz-I Assignment-I Week (1-8)
MID-TEST I					
9	Hopkinson's test, Retardation test, Separation of iron and frictional losses	CO3	Write short notes on Hopkinson's test? Draw the power flow diagram and explain each block clearly?	Chalk and talk Problem Solving	Mid-Test II Quiz-II Assignment-I Week (9-16)

10	UNIT-IV: TRANSFORMERS Principle, construction and operation of single-phase transformers,	C04	Explain principle of transformer with neat diagrams? Derive the emf equation of transformer and write the differences between core type and shell type transformers?	Chalk and talk Problem Solving	Mid-Test II Quiz-II Assignment-I Week (9-16)
11	equivalent circuit, phasor diagram, voltage regulation, losses and efficiency	C04	Draw the equivalent circuit of a transformer and explain each parameter? Derive the voltage regulation and efficiency of a transformer with suitable?	Chalk and talk Problem Solving	Mid-Test II Quiz-II Assignment-I Week (9-16)
11	Testing - open circuit and short circuit tests, polarity test, back-to-back test	C04	Explain OC and SC test on a transformer Explain sumpners test in detail	Chalk and talk Problem Solving	Mid-Test II Quiz-II Assignment-I Week (9-
12	separation of hysteresis and eddy current losses, per unit system, transformer cooling-natural cooling and forced cooling.	C04	Explain cooling methods of transformers Explain how iron losses are separated	Chalk and talk Problem Solving	Mid-Test II Quiz-II Assignment-I Week (9-16)
13	UNIT-V: THREE PHASE TRANSFORMER Construction, types of connection and their comparative features, Phase conversion - Scott connection, three-phase to six-phase conversion.	C05	Write types three phase transformers with neat diagrams ? Explain the scott connection of transformers	Chalk and talk Problem Solving	Mid-Test II Quiz-II Assignment-I Week (9-16)
14	Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current	C05	Explain how harmonics are generated in a transformer How harmonics are eliminated when by three phase transformer connection	Chalk and talk Problem Solving	Mid-Test II Quiz-II Assignment-I Week (9-16)
15	Parallel operation of single-phase and three-phase transformers,	C05	Write advantages of parallel operation of transformers and write and explain the all conditions of parallel operation? Derive the current share equation with equal voltage ratio and unequal voltage ratio	Chalk and talk Problem Solving	Mid-Test II Quiz-II Assignment-I Week (9-16)
16	Autotransformers - construction, principle, applications and comparison with two winding transformers	C05	Write a short notes on auto transformers and write comparisons of two winding and auto transformers? Explain how amount of copper is reduced in autotransformer compared to two winding transformer	Chalk and talk Problem Solving	Mid-Test II Quiz-II Assignment-I Week (9-16)
17	MID-TEST II				
18	PREPARATION AND PRACTICAL EXAMINATION				
	END SEMESTER EXAMINATIONS				
	ASSESSMENT WILL BE DONE AS SOON AS THE COURSE IS COMPLETED IN ALL RESPECTS				