SCHEME OF COURSE WORK

Course Title	UTILIZATION OF ELECTRICAL ENERGY		
Course Code	**13EE1135**	L T P C	4 0 0 3
Program	B.Tech		
Branch	Electrical and Electronics Engineering		
Semester	VIII		
Prerequisites	Basic knowledge in physics, kinematics, electrical engineering.		
Course to which it is prerequisite	Engineering		

Course Outcomes (COs):

At the end of the Course, the Student will be able to:

CO-1	Identify a right drive for a particular application.
CO-2	Distinguish between various types of heating methods.
CO-3	Distinguish between various types of Welding methods.
CO-4	Design Illumination systems for various applications.
CO-5	Summarize different types of electrical traction systems.

Program Outcomes (POs):

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

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

Course Outcome versus Program Outcomes:

	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO-1	S	M	S	S	M	M	M					M
CO-2	S	M	S	S	M	M	M					M
CO-3	S	M	S	S	M	M	M					M
CO-4	S	M	S	S	M	M	M					M
CO-5	S	M	S	S	M	M	M					M

S - Strongly correlated, M - Moderately correlated, Blank - No correlation

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

Teaching-Learning and Evaluation

Week	TOPIC / CONTENTS	Course Outcomes	Sample questions	Teaching-learning strategy	Assessment Method & Schedule
1.	ELECTRIC DRIVES: Type of electric drives, choice of motor, starting and running characteristics.	CO-1	What is an Electric Drive and explain the classification of Electric Drives. What are the factors for selecting of Electric Drives and also explain the Speed Torque characteristics of it.	▪ Lecture ▪ Problem solving	Assignment (Week 2) Mid-Test 1 (Week 9) Quiz (Week 4)
2.	Speed control, temperature rise, Particular applications of electric drives.	CO-1	Explain the Operating/Running characteristics of Electric Motors. (DC Shunt, Series, Compound, 3-Φ IM, 1-Φ IM(Types), Universal, Repulsion, Synchronous, Hysterisis Motors)	▪ Lecture ▪ Problem solving	Mid-Test 1 (Week 9) Quiz (Week 4)
3.	Types of industrial loads, continuous, Intermittent and variable loads, load Equalization.	CO-1	A 4-pole, 50Hz IM has a Flywheel on its shaft. Total Inertia at the motor shaft is 1000 kg-m 2. Load torque is 100kg-m for 10 sec followed by no-load period long enough for the flywheel to regain its full speed. Motor has the slip of 6% at a torque of 50kg-m. Calculate the speed at the end of deceleration period. Assume motor speed torque characteristics to be a straight line in the region of interest and neglect friction and windage losses.	▪ Lecture ▪ Problem solving	Assignment (Week 2)
4.	ELECTRIC HEATING: Advantages and methods of electric heating.	CO-2	Explain the concept of choice of frequency for electric heating purposes. What are the methods of Electric Heating? Explain them briefly	▪ Lecture	Mid-Test 1 (Week 9) Quiz (Week 4)
5.	Resistance heating	CO-2	Compare Direct core type Induction furnace and Indirect core type Induction furnace. Explain briefly about Indirect Resistance Heating and also explain its applications.	▪ Lecture	Mid-Test 1 (Week 9) Quiz (Week 4)
6.	Induction heating and Dielectric heating.	CO-2	In a 3-phase 440V 50Hz star connected 20kW oven, the temperature of the wire is 1200 degree C and that of the charge is 700 0 C. If Radiating efficiency is 0.6 and emissivity is 0.9, design the heating element. A strip of thickness 0.025mm having resistivity 1.05 x 10 -6ohm-m is used.	▪ Lecture ▪ Problem solving	Mid-Test 1 (Week 9)

7.	ELECTRIC WELDING: Electric welding, resistance and arc welding.	CO-3	Explain the importance of welding and also mention its advantages and disadvantages. Mention few differences between Flash Welding and Upset Butt Welding.	▪ Lecture	Assignment (Week 2)
8.	Electric welding equipment	CO-3	Explain Butt Welding in detail. Write short notes on Projection Welding and also mention its advantages over Spot Welding.	▪ Lecture	Mid-Test 1 (Week 9) Quiz (Week 4)
9.	MID-I				
10.	Comparison between A.C. and D.C. Welding.	CO-3	Mention few differences between AC and DC Welding	▪ Lecture	Quiz (Week 13) Mid-Test 2 (Week 18)
11.	ILLUMINATION FUNDAMENTALS & VARIOUS ILLUMINATION METHODS: Introduction, terms used in illumination, laws of illumination	CO-4	What is Luminous Flux Intensity? What are the basic Laws of Illumination? Explain them in detail. Explain the different measurement techniques used for luminous intensity.	▪ Lecture	Assignment (Week 12) Mid-Test 2 (Week 18)
12.	Polar curves, photometry, integrating sphere, sources of light.	CO-4	Write short notes on Polar Curves. What is Photometry and what is its importance.	▪ Lecture	Quiz (Week 13) Mid-Test 2 (Week 18)
13.	Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes	CO-4	Write short notes on Tungsten and Fluorescent Lamps. Write short notes on Discharge lamps. A lamp fitted with 120 degrees angled cone reflector illuminates circular area of 200 metre in diameter. The illumination of the disc increases uniformly from 0.5 metre-candle at the edge to 2 metre-candle at the centre. Determine i. the total light received ii. Average illumination of the disc iii. Average c.p. of the source.	▪ Lecture ▪ Problem solving	Assignment (Week 12) Mid-Test 2 (Week 18)
14.	Basic principles of light control, Types and design of lighting and flood lighting.	CO-4	What are the basic principles involved in Light Control. What is Lightning? Types of Lightning. Explain them in detail.	▪ Lecture	Mid-Test 2 (Week 18)
15.	ELECTRIC TRACTION: System	CO-5	For a quadrilateral speed-time curve of an electric train, derive expression for	▪ Lecture ▪ Problem	Mid-Test 2 (Week 18)

	of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging rheostatic braking and regenerative braking		the distance between stops and speed at the end of the coasting period. A train is to be run between two stations 5kms apart at an average speed of 50km/hr. If the maximum speed is to be limited to 70km/hr, acceleration to 2km/hr/sec, braking retardation to 4km/hr/sec and coasting retardation to 0.1km/hr/sec, determine the speed at the end of coasting, duration of coasting period and braking period.	solving	
16.	Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves. Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation	CO-5	Briefly explain the a.c. motors used in traction. The scheduled speed of a trolley service is to be 53km/hr. The distance between stops is 2.8km. The track is level and each stop is of 30 sec duration. Using simplified speed-time curve, calculate the maximum speed, assuming the acceleration to be 2km/hr/sec, retardation 3.2km/hr/sec, the dead weight of the car as 16 tonnes, rotational inertia as 10% of the dead weight and track resistance as 40 newtons/tonne. If the overall efficiency is 80%, calculate (i) the maximum power output from the driving axles (ii) the specific energy consumption in watt-hr/tonnekm.	▪ Lecture ▪ Problem solving	Mid-Test 2 (Week 18)
17.	Adhesive weight and braking retardation adhesive weight and coefficient of adhesion.	CO-5	Explain dead weight, accelerating weight, coefficient of adhesion and train resistance referred to traction.	▪ Lecture ▪ Problem solving	Mid-Test 2 (Week 18)
18.	**MID TEST – 2**				
19. /20.	**SEMESTER END EXAM**				