25EEMJ203: Electrical Power System-I

w. e. f. Academic Year:	**2026-27**
Semester:	**3rd**
Category of the Course:	**PCC**
Prerequisite:	
Rationale:	

Course Outcomes:

After Completion of the Course, Student will able to:

	Course Outcome (CO)	RBT Level (Cognitive Domain)	Marks % Weightage
CO1	Understand power stations and working principles, and environmental considerations of various power plants including thermal, hydro, nuclear, gas, and renewable sources	Remember, Understand	30
CO2	Compare and analyze the advantages, disadvantages, and efficiency parameters of different power generation systems	Remember, Analyze	10
CO3	Classify various types of distribution systems, cables, conductors, and insulators and evaluate string efficiency and transmission methods	Analyze	20
CO4	Interpret different types of electrical loads and analyze their effects on power systems including load curves and tariffs.Identify substation equipment and busbar arrangements and explain methods and benefits of neutral grounding in electrical networks.	Evaluate, Create	20
CO5	Evaluate the economic aspects of power systems, including power factor improvement techniques, depreciation, and tariff structures. electrical power system considering sustainability and efficiency.	Evaluate, Analyze	20

Teaching and Evaluation Scheme:

Teaching Scheme					Examination Scheme				
L	**T**	**P**	**C**	**Hrs/Week**	**IE**	**Theory**	**CIA**	**Practical**	**Total Marks**
3	0	2	4	5	40	60	30	20	150

IE: Internal Evaluation Theory: Theory Exam (End Semester)

CIA: Continuous Internal Assessment Practical: Practical Exam (End Semester)

Detailed Syllabus:

Topic		Hrs.	% of Weightage
UNIT: 1	**Power Generation:** Steam power station Schematic arrangement, advantages and disadvantages, choice of site, efficiency of steam power station. Hydro power station Schematic arrangement, advantages and disadvantages, choice of site constituents of hydro power plant. Nuclear power station Schematic arrangement, advantages and disadvantages, selection of site.Gas turbine power plant: Schematic arrangement, advantages and disadvantages. Combined cycle plant. Study of different types of power plants contributing to sustainable mobility.	**15**	**30**
UNIT: 2	**Distribution systems:** Types of distribution systems, types of cables & their construction, Types of conductors for Overhead line, Types of insulators, string efficiency, comparison between Overhead & underground transmission, Loads: Types, Voltage and Frequency Dependence of Loads. Effect of variable load, Improving distribution system energy efficiency of and reducing losses.	**10**	**20**
UNIT: 3	**Substation and neutral grounding:** Classification of Substations, substation equipment's, Comparison, Bus bar arrangements Neutral grounding: necessity of neutral grounding, Methods for neutral grounding, Advantages of neutral grounding. study of substation and grounding system enhance sustainable.	**7**	**20**
UNIT: 4	**Power Factor Improvement** Power factor Improvement needs power factor improvement, Techniques of power factor improvement, Most economical power factor. Cost of electrical energy, methods of determining Depreciation improving lifecycle sustainability of power factor improvement.	**8**	**20**
UNIT: 5	**Tariff:** Tariff, Characteristics of tariff, Types of tariffs. Sustainability in power system.	**5**	**10**
		45	**100**

List of Practical:

Sr No	Topic	Hrs
1	Schematic Study of a Thermal Power Plant	2
2	Schematic Study of a Hydro Power Plant	2
3	Schematic Study of a Nuclear Power Plant	2
4	Schematic Study of a Gas turbine Power Plant	2
5	Hydro-Electric Site Selection Analysis	2
6	Comparison of Nuclear Reactor Types	2
7	Combined Cycle Power Plant Layout	2
8	Substation Single Line Diagram (SLD)	2
9	Overhead Line Insulator Classification	2
10	Underground Cable Layer Analysis	2
11	Comparison of busbar arrangement.	2
12	Neutral Grounding Methodologies	2
13	Study of methods of determining Depreciation improving lifecycle sustainability of power factor improvement.	2
14	Power Factor Economics	2
15	Tariff & Depreciation Case Study	2
		30

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks in Percentage					
Remember	Understand	Apply	Analyze	Evaluate	Create
20	10	20	30	10	10

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may very slightly from above table.

Reference Books:

1. Electrical power by S.L.Uppal, Khanna Publishers
2. Principles of power system by V.K.Mehta, S.Chand.
3. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 2012.
4. Power system engineering by D.P.Kothari and I.J.Nagrath, Mcgraw hill
5. Electrical Power system by C.L.Wadhwa, 5th Edition

Teaching Learning Method

- Chalk and Board teaching
- Multimedia presentations (PPT/animations) for clear conceptual understanding.
- Industrial visits for practical understanding.
- Expert talk from industrial and academic experts.
- Online NPTEL/SWAYAM video lectures.
- Incorporation of SDG-oriented case studies and sustainable design practices.

Course Outcomes Mapping:

CO No.	Course Outcome (CO)	POs/ PSOs Mapped	Cognitive Level (RBT)	Knowledge Category	Class Sessions (Lecture)
CO1	Explain the layout, working principles, and environmental considerations of various power plants including thermal, hydro, nuclear, gas, and renewable sources.	PO1,PO2, PSO1	Remember, Understand	Procedural	15
CO2	Compare and analyze the advantages, disadvantages, and efficiency parameters of different power generation systems.	PO1, PO2, PO4 ,PSO1	Remember, Analyze	Conceptual	10
CO3	Classify various types of distribution systems, cables, conductors, and insulators and evaluate string efficiency and transmission methods.	PO1, PO2, PO4, PSO2	Analyze	Analytical	7
CO4	Interpret different types of electrical loads and analyze their effects on power systems including load curves and tariffs.	PO1, PO2, PO3, PSO2	Evaluate, Create	Conceptual	8
CO5	Evaluate the economic aspects of power systems, including power factor improvement techniques, depreciation, and tariff structures. electrical power system considering sustainability and efficiency.	PO1, PO2, PO3, PSO2	Evaluate, Analyze	Analytical	5

Mapping of COs with POs & PSOs:

CO	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	3	0	0	0	0	0	0	0	0	0	3	0
CO2	3	3	0	2	0	0	0	0	0	0	0	3	0
CO3	3	3	0	2	0	0	0	0	0	0	0	3	3
CO4	3	3	2	0	0	0	0	0	0	0	0	0	3
CO5	3	3	2	0	0	0	0	0	0	0	0	0	3

3: High, 2: Medium, 1: Low,0 → No significant correlation

Sustainable Development Goals (SDG) Integration

This course integrates principles of sustainable engineering by emphasizing efficient Here's a structured Sustainable Development Goals (SDG) Integration for your Electrical Power Systems course, aligned with the given Course Outcomes and focused on efficiency, environmental impact, and sustainable energy systems..SDG 7 SDG 9 SDG 12 SDG 13

(Sustainable Cities and Communities), and SDG 12 (Responsible Consumption and Production).

SDG Mapping with Course Outcomes

CO	Course Outcome	Relevant SDGs	Justification
CO1	Explain the layout, working principles, and environmental considerations of various power plants including thermal, hydro, nuclear, gas, and renewable sources.	SDG 7 SDG 13	Improves efficiency in energy generation systems
CO2	Compare and analyze the advantages, disadvantages, and efficiency parameters of different power generation systems.	SDG 7 SDG 12	Reduces energy consumption through efficient motor control
CO3	Classify various types of distribution systems, cables, conductors, and insulators and evaluate string efficiency and transmission methods.	SDG 9 SDG 12	Enhances power distribution efficiency and infrastructure
CO4	Interpret different types of electrical loads and analyze their effects on power systems including load curves and tariffs.	SDG 7 SDG 12	Identifies and reduces losses to minimize environmental impact
CO5	Evaluate the economic aspects of power systems, including power factor improvement techniques, depreciation, and tariff structures. electrical power system considering sustainability and efficiency.	SDG 7, SDG 12 SDG 13	Supports sustainable machine selection and efficient industrial operation