Course Syllabus
Gyanmanjari Diploma Engineering College
Semester-3

Subject: Generation and Transmission of Electrical Power - DETEE13204

Type of course: Major

Prerequisite: Basic Understanding of Electrical power

Rationale:

This course has been designed to impart in-depth knowledge of Generation and transmission of electrical power. The Generation and Transmission of Electrical Power course is crucial for diploma-level electrical students, forming the foundation of their understanding of the power industry. In today's world, with rising energy demand and sustainability concerns, grasping power generation and transmission concepts is essential. This course equips students with skills to analyze, design, and optimize power systems for reliable electricity delivery. Understanding power generation and transmission is increasingly important with renewable energy integration and grid advancements.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	Theory Marks		Practical Marks		CA	
				ESE	MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Unit No.	Course content	Hrs	% Weightage
1.	**Introduction to energy sources** • Energy : Classification • Renewable and non-renewable, Conventional and non-conventional, Commercial and non commercial. • Operating principle and working of wind, solar, geo-thermal, fuel-cell, bio-gas and tidal power plants.	6	10%
2.	**Thermal Power Station** • Energy conversion process for thermal power station with plant layout • Selection criteria for site of thermal power station, Line diagram of thermal power station (TPS) • Different cycles of TPS, Major equipment and auxiliaries of TPS. • Load curve and load duration curve, Base load and peak load power plants, Safe Practices of TPS • Pollution generated by thermal power stations and methods to reduce them. • TPS in India.	12	20%
3.	**Hydro Power Station** • Energy conversion process for hydro-power station (HPS) with plant layout, Auxiliaries • Selection of site for HPS, Major features of HPS • Classification of HPS: based on head, Storage and pondage, Plant Layout • Types of hydro turbines, Difference between Generators for Thermal Plant and Hydro Plants. • Advantages of Hydro Power Plants and their effect on ecology/environment. • Hydro power stations in India.	10	20%
4.	**Nuclear Power Station:** • Energy conversion process for nuclear power station (NPS): Nuclear fusion and fission, Chain reaction, Selection of site for NPS • Working of nuclear power station • Various types of reactors, Special precautions for NPS • Advantages and disadvantage of NPS • Nuclear power stations in India.	10	20%

5.	**Elements of Transmission Line** • Introduction • Line conductor – materials, types and their trade name. • Line supports – requirements, types and specification of different tower structures: RCC poles, Steel poles, Lattice steel towers. • Ground clearance, Sag calculation (for level supports only), effect of ice, wind and temperature on Sag, Sag template, Stringing chart. • Numerical problems on Sag. • Methods of laying underground cable. • Comparison between overhead transmission lines & underground cables.	12	20%
6.	**Phenomena of Transmission Line** • Transposition, Skin effect, Ferranti effect and Proximity effect. • Performance evaluation of short and medium transmission lines (π & T Model): sending end voltage, sending end current, sending end power factor, voltage regulation, transmission efficiency & Numerical problems .	10	10%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Power Plant Analysis** Students have to visit Power Station & Prepare a Report.(No. of Student per team - 03)	10
2	**Power Plant Design** Student teams design Virtual Model of Any power Plant in Virtual Lab.(No. of Students per team – 03)	10
3	**Power Play** Students have to Draw substation layout and describe the function of all components.(No. of students per team - 03)	10
Total		30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	40%	20%	10%	0	0

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 vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Apply the principles of physical sciences to understand the working of conventional and non-conventional power plants and Learn fundamental operation of Thermal Power Stations.
CO2	Interpret the basic concepts of electrical power generation & understand the working of Hydro Power Plant.
CO3	Understand energy conversion process and Operation of Nuclear Power Station.
CO4	Analyze the performance of transmission lines and its topologies. Illustrate the different types of insulators, underground cables and effects.

List of Practical:

Sr. No	Descriptions	Unit No	Hrs
1.	Draw the line diagram of Thermal Power Station (T.P.S.) and main cycles & explain working of T. P. S.	1	2
2.	Visit a nearby T.P.S. and prepare its technical report.	1	2
3.	Prepare and interpret load curve for given data/data collected from nearby power station.	1	2
4.	Identify the routine maintenance parts of the large hydro power plant.	2	2
5.	Draw the schematic diagram of Nuclear power station & explain the function of each component.	3	2
6.	Draw and interpret schematic diagram of Diesel Power Station and explain the following. (a) Fuel system (b) Air inlet system (c) Water cooling system (d) Lubricating system (e) Engine starting system.	3	2
7.	To draw different types of transmission towers.	4	2
8.	To study and Collects various types of cable.	4	2
9.	Solve problems on string efficiency and sag	4	2
10.	Demonstrate the transmission line Insulators & supporting structure and prepare a report.	4	2
11.	To study various types of insulators and calculation of string efficiency.	5	2
12.	To calculate the losses and efficiency of a medium transmission line a) using nominal Π model b) using nominal T model.	5	2
13.	To calculate the losses and efficiency of a Short transmission line.	5	2

14.	To calculate the losses and efficiency of a long transmission line.	5	2
15.	Prepare technical report on substation Maintenance.	5	2
	TOTAL		30

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

[1] R. K. Rajput – "Power Plant engineering-, Laxmi Publication
[2] J B Gupta. A course in Power Systems: S K Kataria &sons.
[3] https://ekumbh.aicte-india.org/dbook.php
[4] Electrical Power system by V.K.Mehta
[5] Hadi Saadat, "Power System Analysis", Mc Graw Hill.
[6] C.L. Wadhwa, "Electric Power Systems", New Age Intl. (P) Ltd.