



SILVER OAK UNIVERSITY

College of Technology (01)

Diploma in Electrical Engineering

Subject Name: Electrical Power Generation

Subject Code: 1010082216

Semester: 3rd

Prerequisite: Basics of Electrical Engineering

Objective: The various power plants need highly skilled technicians who are capable of operating various control equipment in normal and abnormal conditions. Efforts are made to develop essential skills like operate, maintain and troubleshoot various equipment in different power plants. Also, the skills to observe safety can be developed in the students by this course while handling electrical systems.

Teaching and Examination Scheme:

Teaching Scheme					Evaluation Scheme				Total Marks
L	T	P	Contact Hours	Credits	Theory		Practical		
					CIE (TH)	ESE (TH)	CIE (PR)	ESE (PR)	
3	0	2	5	4	40	60	20	30	150

Content:

Unit No.	Course Contents	Teaching Hours	Weightage %
1	<p>Unit – I Thermal Power Station</p> <p>Energy conversion process for thermal power station with plant layout Selection criteria for site of thermal power station Line diagram of thermal power station; Different cycles of thermal power station Major equipment and auxiliaries of thermal power station Load curve and load duration curve Terms and factors related to power plant Base load and peak load stations Coal based thermal power stations in Gujarat</p>	8	25

2	<p>Unit – II Hydro Power Station</p> <p>Energy conversion process for hydro-power station (HPS) with plant layout Selection of site for HPS Classification of HPS: based on head, Storage and pondage type, Plant Layout, types of water turbines Auxiliaries of HPS Major features of HPS Hydro power stations in Gujarat</p>	8	20
3	<p>Unit – III Solar Power Plant</p> <p>Solar constants, Measurement of solar radiations Solar Energy Conversion CSP generators, construction and working principle construction of a solar PV Systems: Solar cell, Module, Panel and array Types of solar PV system</p> <ol style="list-style-type: none"> i. Stand –Alone Solar PV system ii. Grid-Interactive solar PV system iii. Hybrid Solar PV system <p>Grid connection issues of solar power plants Solar power plants in Gujarat</p>	8	20
4	<p>Unit – IV Wind Power Plant</p> <p>Anemometer and wind vane Site selection, wind speed, wind direction and its relationship with wind power Wind turbine types and their construction Drag and lift principle of rotation of the wind turbine rotor.</p> <p>Geared WPPs, direct drive WPPs and Hybrid WPPs Stall control, pitch control and active stall control of WPPs.</p> <p>Squirrel cage Induction Generators(IG), wound rotor IG, doubly fed IG, Wound rotor synchronous generator Permanent magnet synchronous generator Direct-drive and geared small wind turbines Major wind farms in Gujarat.</p>	8	20
5	<p>Unit – V Captive power plant and other renewable energy sources</p> <p>Single line diagram, energy conversion process, advantages, disadvantages and limitations of DG sets Single line diagram, energy conversion process, advantages, disadvantages and limitations of Gas based power plants Biomass electrical energy conversion process. Ocean energy electrical conversion systems Geothermal electrical energy conversion systems</p>	6	15

Course Outcome:

Sr. No.	CO statement	Unit No	Weightage
CO-1	Describe the working of Thermal power plants using single line diagram and state the functions of the major equipment and auxiliaries of plant. Explain with block diagrams and identify the appropriate site for it.	1	25
CO-2	Describe the working of Hydro power plants using single line diagram and state the functions of the major equipment and auxiliaries of plant. Explain with block diagrams and identify the appropriate site for it.	2	20
CO-3	Describe the working of Solar Power Plants using single line diagram and state the functions of the major equipment and auxiliaries of each plant. Prepare economic analysis for Commercial/ Industrial/ Residential PV energy conservation systems	3	20
CO-4	Describe the working of Wind Power Plants using single line diagram and state the functions of the major equipment and auxiliaries of each plant. Prepare economic analysis for Commercial/ Industrial Wind Energy conservation systems, Compare various generating systems of Wind farm.	4	20
CO-5	Acquire knowledge about captive power plant and other renewable energy sources like biomass, ocean energy, geothermal energy etc.	5	15

Teaching & Learning Methodology:

Lectures with discussions, question and answer sessions, informal quizzes, video sessions where students have an opportunity to clear concepts and doubts. E – Resources for the virtual learning environment. Practical sessions for developing skills which are required in occupation. Occasional Flipped classroom exercise for students for development of presentation skills.

- **List of Experiments/Tutorials:**

1. Interpret the line diagram of Thermal Power Station (T.P.S.) and main cycles & explain working of T. P. S.
2. Prepare technical report of visit to a nearby T.P.S./Prepare a report on thermal power stations in Gujarat by collecting data from Internet
3. Study on load curve preparation and its interpretation.
4. Prepare technical report of visit to a nearby H.P.S./Prepare a report on Hydro power stations in Gujarat by collecting data from Internet.
5. Visit the website of MNRE/GEDA and prepare a report.
6. Solar insolation measurement using Optical **pyranometer**
7. Solar cell/module/Array modelling, I-V char and performance analysis
8. PV module design and output analysis
9. Energy Conversion in Wind. (Prototype Wind Mill of 500W)
10. Case studies of Commercial/ Industrial/ Residential PV energy conservation systems and their economic analysis
11. Visit of Wind farm. Analysis of various aspects of wind farm

- **Major Equipment/ Instrument:**

- Model of various equipment used in power plants/ power plants
- Solar module.
- Optical **pyranometer**
- Storage batteries – charging/discharging kit.
- 2 kW concentrated solar power (CSP) system
- 1 kW direct-drive small wind turbines
- 5 kW geared small wind turbine

- **List of Open-Source Software/learning website:**

- www.energyshouldbe.org/
- www.power-genindia.com/
- www.indiastat.com

- **Books Recommended:**

1. A Text book of Power System Engineering, A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar, Dhanpat Rai Publication
2. Renewable Energy Technologies, Solanki, Chetan S. , PHI Learning, New Delhi, 2011
3. Wind Power Technology, Earnest, Joshua, PHI Learning, New Delhi, 2013
4. Renewable Energy Sources for Sustainable Development, N.S. Rathore and N. L. Panwar, New India Publishing Agency, New Delhi
5. Wind Power in Power System, Thomas Ackermann, John Willey & Sons, 2005

6. Renewable Energy Resources, J. Twidell and T. Weir, E & F N Spon Ltd, London, 1999
7. Electric Power Generation: Transmission and Distribution, S. N. Singh, PHI Learning, New
8. Electrical Power, Dr. S.L. Uppal
9. Electrical Power System, Mehta, V.K. S. Chand and Company Bew Delhi, 2011.