

Branch Name:	Electrical Engineering
Program Code:	ET403
Course Name:	SOLAR AND WIND ENERGY SYSTEM
Course Code:	2ET4030604
Pre-requisite Course:	

Course Objectives:

1. To study about concentrated solar power (CSP) and solar photovoltaic (PV) power plants,
2. To Verify the grid compatibility of the power from wind and solar power plants.
3. To study the grid integration issues of wind and solar power plants.
4. To study constant and variable speed of the wind power plants.
5. To verify the installations there by minimizing the downtime.

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture	Tutorial	Practical	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	-	2	4	60	40	20	30	150

DETAILS OF COURSE CONTENTS:

Unit	Topics and Sub-topics	Total Hours	% Weightage
1	Solar Power Plant Performance 1.1 Solar Thermal Power Plants: Working of a typical Concentrated Solar Power (CSP) plant. 1.2 Maintenance procedure of CSP systems. 1.3 Explain the working principle of a Type-D direct- drive WPP. 1.4 Solar photovoltaic (PV) Power Plants: Working of a typical Solar PV Power plant. 1.5 Types of Batteries for solar PV system. 1.6 Maintenance procedure of typical Solar PV Power plant	10	25
2	Constant Speed Wind Power Plant 2.1 Type-A WPP (Wind Power Plants), Working Principle, Starting methods. 2.2 Type-B WPP: Working Principle, Different Types. 2.3 Compare the major differences in the maintenance of Type-A and Type-B WPPs.	10	25

3	Variable Speed Wind Power Plant. 3.1 Type-C WPP: Working principle, Back- to-Back control, Maintenance procedure of Type-C WPPs. 3.2 Type-D Geared WPP: Working principle, Maintenance procedure of Type-D Geared WPPs. 3.3 Type-D direct-drive WPP: Working principle, Maintenance procedure of Type-D Geared WPPs.	10	25
4	Wind and Solar Power Quality 4.1 Local impact of wind power on the grid. 4.2 System wide impact of wind power on the grid. 4.3 Power Quality of solar PV systems. 4.4 Power quality of CSP solar plant. 4.5 Power quality of solar PV power plant.	06	15
5	Grid Connection of Wind and Solar Power Plants 5.1 Grid interface issues of wind power. 5.2 Grid operational issues of wind power. 5.3 Grid connection of CSP plants. 5.4 Grid connection of solar PV power plants 5.5 Wind- solar hybrid systems, Maintenance of solar PV and wind solar Hybrid system	06	10

LIST OF REFERENCES:

Sr. No.	Title of Book	Author	Publication
1	Solar Photovoltaic: Fundamentals, Technologies and Application	Solanki, Chetan Singh	PHI Learning, New Delhi, 2009
2	Solar Energy	S.P. Sukhatme, J. K. Nayak	Tata McGraw, New Delhi, 2010.
3	Wind power technology	Earnest, Joshua	PHI Learning, new Delhi, 2014

LIST OF LEARNING WEBSITES

1. www.google.com
2. www.youtube.com

LIST OF PRACTICAL:

SR NO	PRACTICALS/EXPERIMENTS
1	Assemble a solar PV cell, module, array system with and without battery connection
2	Dismantle a solar PV cell, module, array system with and without battery connection
3	Connect the solar PV modules in series and parallel.
4	Test the solar PV tracking system.
5	Test the effect of Light and temperature intensity on the solar PV system.
6	Identify the various parts of a squirrel cage induction generator (SCIG) commonly used in Type-A WPPs.

7	Identify the various parts of a Type-B WPP.
8	Identify the various parts of a Type-C WPP.
9	Identify the various parts of a Type-D geared WPPs.
10	After viewing the video of Type-D geared WPP identify the parts which require preventive maintenance.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Maintain concentrated solar power (CSP) and solar photovoltaic (PV) power plants.	3 Applying, 2 Understanding
CLO2	Check the grid compatibility of the power from wind and solar power plants.	2 Understanding, 3 Applying
CLO3	Resolve the grid integration issues of wind and solar power plants.	3 Applying, 4 Analyze 6 Creating
CLO4	Maintain constant and variable speed of the wind power plants.	1 Remembering, 2 Understanding
CLO5	Maintain the installations there by minimizing the downtime.	5 Evaluating, 3 Applying

Mapping of CLOs with Pos & PSOs

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	H				H			L		L			M	L	L
CLO2	L				H								M	L	L
CLO3	M					L							M		H
CLO4					L			L					M		H
CLO5					L							M	L		

H: High, M: Medium, L: Low