

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING AND TECHNOLOGY (DIPLOMA PROGRAMMES)									
Programme	Diploma Engineering				Branch/Spec.	ElectricalEngineering			
Semester	VI				Version	1.0.0.0			
Effective from Academic Year		2020-21			Effective for the batch Admitted in			July 2018	
Subject code	1EE2606		Subject Name		WIND AND SOLAR ENERGY				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	4	0	1	0	5	Theory	40	60	100
Hours	4	0	2	0	6	Practical	30	20	50

Course Learning Outcomes:
<ul style="list-style-type: none"> • Maintain constant speed wind power plants. • Maintain variable speed wind power plants. • Maintain concentrated solar power (CSP) and solar photovoltaic (PV) wind power plants, • Check the grid compatibility of the power from wind and solar power plants. • Resolve the grid integration issues of wind and solar power plants.

Theory syllabus				
UNIT	Unit Content	Unit Learning Outcomes	Marks	Hrs
Unit – I Constant Speed Wind Power Plant	1a. Type-A WPP (Wind Power Plants), Working Principle, Different topologies, Starting methods, Maintenance procedure 1b. Type-B WPP: Working Principle, Different Types, Maintenance procedure	1.1 Explain the working principle of Type-A WPP. 1.2 Describe the starting methods of stall and pitch controlled type A WPPs 1.3 Explain the working principle of Type-B WPP. 1.4 Compare the major differences in the maintenance of Type-A and Type-B WPPs.	10	10
Unit – II Variable Speed Wind Power Plant.	2a. Type-C WPP: Working principle, Working Principle Back- to-Back control, Maintenance procedure of Type-C WPPs	2.1 Explain the working principle of Type-C WPP 2.2 Describe the working principle of a back-to-back power electronic	14	14

	<p>2b. Type-D Geared WPP: Working principle, Maintenance procedure of Type-D Geared WPPs</p> <p>2c. Type-D direct-drive WPP: Working principle, Maintenance procedure of Type-D Geared WPPs</p>	<p>controller used in Type-C WPPs</p> <p>2.3 Explain the working principle of Type-D geared WPP.</p> <p>2.4 Explain the need for direct drive WPPs</p> <p>2.5 Explain the working principle of a Type-D direct-drive WPP.</p>		
Unit – III Solar Power Plant Performance	<p>3a. Solar Thermal Power Plants: Working of a typical Concentrated Solar Power (CSP) plant</p> <p>3b. Maintenance procedure of CSP systems</p> <p>3c. Explain the working principle of a Type-D direct-drive WPP</p> <p>3d. Solar photovoltaic (PV) Power Plants: Working of a typical Solar PV Power plant.</p> <p>3e. Types of Batteries for solar PV system.</p> <p>3f. Maintenance procedure of typical Solar PV Power plant</p>	<p>3.1 Explain the concept and construction of solar thermal power plants.</p> <p>3.2 Describe the performance of a typical CSP plant</p> <p>3.3 Describe the maintenance procedure of a typical CSP plant</p> <p>3.1 Explain the concept and construction of solar PV power plants.</p> <p>3.2 Describe the performance of a typical solar PV power plant.</p> <p>3.3 List the types of batteries</p> <p>3.4 Describe the features required of a battery for solar PV system</p> <p>3.5 Explain the significance of solar PV tracking.</p> <p>3.6 Describe Installation , testing & the maintenance procedure of a typical solar PV power plant.</p>	14	14
Unit - IV Wind and Solar Power Quality	<p>4a. Local impact of wind power on the grid.</p> <p>4b. System wide impact of wind power on the grid.</p> <p>4c. Power Quality of solar PV systems</p>	<p>4.1 Describe the phenomenon of local impact of wind power on the grid</p> <p>4.2 Suggest ways to</p>	10	10

	<p>4d. Power quality of CSP solar plant.</p> <p>4e. Power quality of solar PV power plant</p>	<p>handle these local impacts safely</p> <p>4.3 Explain the phenomenon of system wide impact of wind power</p> <p>4.4 Suggest ways to handle these system wide impacts safely</p> <p>4.5 Differentiate the features of the power obtained from the solar PV and CSP power plant.</p>		
<p>Unit – V</p> <p>Grid Connection of Wind And Solar Power Plants</p>	<p>5a. Grid interface issues of wind power.</p> <p>5b. Grid operational issues of wind power.</p> <p>5c. Grid connection of CSP plants.</p> <p>5d. Grid connection of solar PV power plants</p> <p>5e. Wind- solar hybrid systems Maintenance of solar PV and wind solar Hybrid system</p>	<p>5.1 State the grid interface issues of wind power and methods to resolve them.</p> <p>5.2 State the grid operational issues of wind power and methods to resolve them</p> <p>5.3 State the method(s) of integrating into the grid the power obtained from solar PV power plants with sketches.</p> <p>5.4 Describe with sketches and labels the concept of a grid connected wind solar hybrid system.</p> <p>5.5 Describe the maintenance procedure of a typical grid connected wind-solar PV hybrid system.</p>	12	12

List of Practical	
1	Identify the various parts of a squirrel cage induction generator (SCIG) commonly used in Type-A WPPs.
2	Identify the various parts of a Type-B WPP.
3	Identify the various parts of a Type-C WPP.

4	Identify the various parts of a Type-D geared WPPs.
5	After viewing the video of Type-D geared WPP identify the parts which require preventive maintenance.
6	Assemble a solar PV cell, module, array system with and without battery connection
7	Dismantle a solar PV cell, module, array system with and without battery connection
8	Connect the solar PV modules in series and parallel.
9	Test the solar PV tracking system.
10	Test the effect of Light and temperature intensity on the solar PV system.

List of Instruments/Equipments/ Trainer Board	
1	PV Cell
2	Ammeter
3	Voltmeter
4	Watt meter
5	SCIG
6	Photometer

List of Text Books			
1	Wind power technology	Earnest, joshua	PHI Learning, new Delhi, 2014
2	Solar photovoltaic: A lab training module	Solanki, Chetan singharora, brij M., vasinghpatil Mahesh B.	Cambridge university Press, new Delhi , 2009

List of Reference Books			
1	Solar and Wind Energy	Catherine	Syrawood Publishing House
2	Solar photovoltaic: A lab training module	Solanki, Chetan singharora, brij M., vasinghpatil Mahesh B.	Cambridge university Press, new Delhi , 2009

Link of Learning Resources	
	I. http://www.awea.org/Resources/contect.aspx?ItemNumbar=900 II. http://www.windpowerwiki.dk III. http://www.kidwind.org/teach IV. http://www.fao.org/docrep/010/ah810e/AH810E11.htm V. http://www.renewables-made-in-germany.com/en/renewables-made-in-germany-start/solar-energy/solar-thermal-energy/overview.html