18EEP14	WIND AND SOLAR ENERGY SYSTEMS	L	T	P	C
		3	0	0	3

Course Objectives:

1.	Understand the concepts of power generation through Wind and Solar Power
2.	Learn optimal extraction of renewable power and their integration to grid

Unit I	PHYSICS OF WIND POWER	9	+	0

History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions

Unit II	WIND GENERATOR TOPOLOGIES	9	+	0

Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control.

Unit III	THE SOLAR RESOURCE	9	+	0

Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

Unit IV	SOLAR PHOTOVOLTAIC	9	+	0

Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms.Converter Control.

Unit V	GRID INTEGRATION ISSUES	9	+	0

Overview of grid code technical requirements. Fault ride-through for wind farms – real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.

Total (45+0)= 45 Periods

Course Outcomes:

Upon completion of this course, the students will be able to:

CO1	:	Understand the physics behind the wind and solar power generation
CO2	:	Implementation of optimal extraction techniques in renewable power generation
CO3	:	Apply power electronics to renewable power optimization
CO4	:	Understand integration techniques used, power quality issues and their mitigation
CO5	:	Device methods to create an approximate energy conversion systems.

Text Books:

1.	Mohan, Net al. “Power Electronics: Converters, Application and Design", Wiley India (P) Ltd, New Delhi, 2008.
2.	Bimbhra, P.S, "Power Electronics ", Khanna Publishers, New Delhi, 4thEdition, 2018.

Reference Books:

1.	T. Ackermann, “Wind Power in Power Systems”, John Wiley and Sons Ltd., 2012, 2nd edition.
2.	G. M. Masters, “Renewable and Efficient Electric Power Systems”, John Wiley and Sons, 2013
3.	S. P. Sukhatme, “Solar Energy: Principles of Thermal Collection and Storage”, McGraw Hill, 2008.
4.	H. Siegfried and R. Waddington, “Grid integration of wind energy conversion systems” John Wiley and Sons Ltd., 2006
5.	G. N. Tiwari and M. K. Ghosal, “Renewable Energy Applications”, Narosa Publications, 2004.

6.	J. A. Duffie and W. A. Beckman, “Solar Engineering of Thermal Processes”, John Wiley & Sons, 2013, 4th edition
7.	Rashid M.H., “Power Electronics: Circuits, Devices and Applications ", Pearson, 3rd Edition, 2013.
E-Reference	
1	www.onlinecourses.nptel.ac.in
	www.class-central.com

CO/PO Mapping

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	1	0	1	1	1
CO2	1	1	1	1	1	1	1	1	0	1	1	1
CO3	1	1	1	1	1	1	1	1	0	1	1	1
CO4	1	1	1	1	1	1	1	1	0	1	1	1
CO5	1	1	1	1	1	1	1	1	1	1	1	1