FUNDAMENTALS OF WIND POWER TECHNOLOGY

OPEN ELECTIVE - IV

VIII Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A5AE68	**OEC**	3	0	0	3	30	70	100

COURSE OBJECTIVES
1. To learn how wind is generated and possible ways of extracting the same.
2. To estimate the resource potential.
3. To learn the operation of a wind electric generator and wind turbine.

UNIT-I	INTRODUCTION TO WIND ENERGY

Background, Motivations, and Constraints, Historical perspective, Wind speed variation -Modern wind turbines, Components and geometry.

UNIT-II	WIND CHARACTERISTICS AND RESOURCES

General characteristics of the wind resource, Atmospheric boundary layer characteristics, Wind data analysis and resource estimation.

UNIT-III	AERODYNAMICS OF WIND TURBINES

Forces from wind, Lift and drag forces - Airfoils, 1-D Momentum theory, Ideal horizontal axis wind turbine with wake rotation, Blade element theory -General rotor blade shape performance prediction.

UNIT-IV	WIND TURBINE DESIGN AND CONTROL

Brief design overview - Introduction - Wind turbine control systems -Typical grid-connected turbine operation -Basic concepts of electric power- Power transformers.

UNIT-V	ENVIRONENTAL AND SITE ASPECTS

Overview- Wind turbine siting - Installation and operation- Wind farms- Overview of wind energy economics- Electromagnetic interference-noise.

Text Books:

1. Emil Simiu& Robert H Scanlan, "Wind effects on structures - Fundamentals and Applications to Design", John Wiley & Sons Inc New York, 2019.
2. Ahmad Hemami, "Wind Turbine Technology", Cengage learning,Cananda, 2012.

Reference Books:

1. Tom Lawson, "Building Aerodynamics", Imperial College Press London, 2001.
2. G P Russo, "Aerodynamic Measurements: From Physical Principles to Turnkey Instrumentation", Woodhead publishing, 2011.

COURSE OUTCOMES
1. Exemplify the historical development of wind turbine, its components and classifications
2. Interpolate the characteristics of winds and atmospheric boundary layers.
3. Outline the methods to measure the performance of wind turbines using different theories.
4. Demonstrate the wind turbine and its sub system design required for the operation of wind turbine
5. Evaluate the environmental factors which infer the operation of wind farms and methods for sustainable operations.