

<b>COURSE CODE:</b> 1154EE122	<b>COURSE TITLE: WIND ENERGY TECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE CATEGORY:**

University Elective

**PREAMBLE :**

Wind energy is the fast-growing renewable source for electricity generation. This course presents a broad overview of wind energy technology.

**PREREQUISITE COURSES:**

Basic Electrical Engineering

**RELATED COURSES:**

Renewable Energy sources, Electrical Machine Design

**COURSE EDUCATIONAL OBJECTIVES :**

- To learn about Power extraction from wind energy
- To distinguish the components and design of wind tower
- To understand working principle of induction generator, synchronous generator

**COURSE OUTCOMES :**

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

<b>CO Nos.</b>	<b>Course Outcomes</b>	<b>Knowledge Level (Based on revised Bloom's Taxonomy)</b>
CO1	Express the relation between speed and power	K2
CO2	Classify the components of wind tower	K2
CO3	Demonstrate the design features of wind tower	K2
CO4	Explain the principle of operation of Types of generator	K2
CO5	Understand operation and control of wind power	K2

**CORRELATION OF COs AND POs**

<b>COS</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>
<b>CO1</b>	L				L				L	M		
<b>CO2</b>	L								L	M		
<b>CO3</b>	H		H					M	L	M		
<b>CO4</b>	L							M	M	M		
<b>CO5</b>	L		M		M			H	M	M		

<b>COURSE CONTENT :</b>		
<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Speed and Power Relations, Power Extracted from the Wind, Rotor Swept Area, Air Density, Global Wind Patterns, Wind Speed Forecasting, Wind Resource in India		
<b>UNIT II</b>	<b>WIND TURBINE COMPONENTS</b>	<b>9</b>
System Components: Tower, Turbine Blades, Yaw Control, Pitch Control, Gearbox, Safety brakes, Generator, Transformer, Anemometer		
<b>UNIT III</b>	<b>TOWER DESIGN</b>	<b>9</b>
System Design Features: Number of Blades, Rotor Upwind, Downwind, Horizontal axis wind turbines, Vertical axis wind turbines, Spacing of the Towers		
<b>UNIT IV</b>	<b>TYPES OF GENERATORS</b>	<b>9</b>
Types of Generator: Induction generator, Synchronous generator, Fixed and variable speed operations, Grid integration		
<b>UNIT V</b>	<b>CONTROL OF WIND POWER</b>	<b>9</b>
Maximum Power Operation: Constant Tip-Speed Ratio Scheme, Peak Power Tracking Scheme; System Control Requirements: Speed and Rate Control		
<b>TOTAL: 45 PERIODS</b>		
<b>TEXTBOOKS:</b>		
<ol style="list-style-type: none"> <li>1. Mukund R. Patel "Wind and Solar Power Systems: Design, Analysis, and Operation" -CRC Press (1999)</li> <li>2. Sathyajith Mathew, "Wind Energy Fundamentals, Resource Analysis and Economics" Springer (2006)</li> </ol>		
<b>REFERENCE BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. S.N.Bhadra, D.Kastha,S.Banerjee,"Wind Electrical Sytems",Oxford University Press,2010.</li> <li>2. Ion Boldea, "Variable speed generators", Taylor &amp; Francis group, 2006.</li> <li>3. E.W. Golding "The generation of Electricity by wind power ", Redwood burn Ltd., Trowbridge,1976.</li> <li>4. N. Jenkins," Wind Energy Technology" John Wiley &amp; Sons,1997</li> </ol>		