



# SILVER OAK UNIVERSITY

College of Technology (01)  
 Diploma in Electrical Engineering  
 Subject Name: Wind Power Technology  
 Subject Code: 1010082237

Semester: 4th

**Prerequisite: Engineering Science (Electrical)**

**Objective:** To Explain the qualitatively how the terrain influences the wind resource, calculate and analyse wind resource and energy production for a wind turbine from wind speed distribution, wind shear and power curve by and large describe and motivate the design of typical wind turbines explain the main differences between horizontal and vertical axis wind turbines regarding design and properties make some dimensioning calculations for wind turbines describe typical control methods for wind turbines, as well as control problems make a simple economic analysis of a wind turbine facility give examples of rules (grid code) for connecting wind turbines to an electric grid give an account of how wind turbines influence the environment and are influenced by the environment, as well as make some calculations related to environmental impact.

**Teaching and Examination Scheme:**

Teaching Scheme					Evaluation Scheme				Total Marks
L	T	P	Contact Hours	Credits	Theory		Practical		
					CIE (TH)	ESE (TH)	CIE (PR)	ESE (PR)	
3	0	2	5	4	40	60	20	30	150

**Content:**

Unit No.	Course Contents	Teaching Hours	Weightage %

1	<p><b>Unit – I</b></p> <p><i>History:</i> early wind power, technical development, influence of society and science</p> <p><i>Winds:</i> physical background, energy content, variation in time and in space, geographical resource distribution, influence of terrain, measurement methods, statistical analysis</p>	6	15
2	<p><b>Unit – II</b></p> <p><i>Turbines:</i> free flow, principles of drag and lift, aerodynamics, design of turbine blades, horizontal and vertical axis wind turbines, Betz' and Glauert's turbine theories, the BEM method</p> <p><i>Mechanics:</i> static and dynamic loads (oscillations), rotor dynamics, solid mechanics, mechanical modelling, aeroelasticity</p>	8	20
3	<p><b>Unit – III</b></p> <p><i>Electric generation:</i> synchronous/ asynchronous generators, winding/ permanent magnetized generators, constant/ variable speed, transformers, power electronics, power converters</p> <p><i>Design:</i> horizontal and vertical axis wind turbines, blades, control mechanisms, drive train, tower, nacelle, foundation, choice of materials, manufacture, adaptation to different climates</p>	8	25
4	<p><b>Unit – IV</b></p> <p><i>Control:</i> control targets, system modelling, control strategies (pitch and stall regulation), hardware</p> <p><i>Systems:</i> wind power parks, transports, erection, grid connection, operation, maintenance</p>	8	20
5	<p><b>Unit – V</b></p> <p><i>Economy:</i> financing, investment, costs during the life time of a wind turbine, value of wind energy, business and market overview</p> <p><i>Society:</i> environmental issues, law, forms of government support, technical aspects of environment</p> <p>Small scale wind power: technology, economy, paths of</p>	8	20

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**Course Outcome:**

Sr. No.	CO statement	Unit No	Weightage
CO-1	State the different types of Wind mills, Explain the Need, importance and scope of Wind Energy resources.	1	15
CO-2	Describe the working System components and their functions. Calculating output and dimensioning of Wind Mill systems. Explain Examples of DFIG - systems globally.	2	20
CO-3	Describe the working of Wind Power Plants using single line diagram and state the functions of the major equipment and auxiliaries of each plant.	3	25
CO-4	Describe the working of Prepare economic analysis for Commercial/ Industrial/ Residential wind energy conservation systems	4	20
CO-5	Acquire knowledge about How large-scale deployment of active wind energy is possible in India and globally.	5	20

**Teaching & Learning Methodology:**

Lectures with discussions, question and answer sessions, informal quizzes, video sessions where students have an opportunity to clear concepts and doubts. E – Resources for the virtual learning environment. Practical sessions for developing skills which are required in occupation. Occasional Flipped classroom exercise for students for development of presentation skills.

● **List of Experiments/Tutorials:**

1. Familiarization with different Wind energy gadgets.
2. Simulation study on Wind Energy Generator.
3. Introduction to Wind Turbines System
4. Introduction to the Vernier Energy Sensor
5. Wind Turbine Output: The Effect of Load

6. Exploring Wind Turbine Blades
7. Blade Design: Pitch, Area, Quality, Mass, Materials

- **List of Open-Source Software/learning website:**

- [www.energyshouldbe.org/](http://www.energyshouldbe.org/)
- [www.power-genindia.com/](http://www.power-genindia.com/)
- [www.indiastat.com](http://www.indiastat.com)

- **Books Recommended:**

1. A Text book of Power System Engineering, A Chakrabarti, M. L Soni, P. V. Gupta, U. S. Bhatnagar, Dhanpat Rai Publication
2. Renewable Energy Technologies, Solanki, Chetan S. , PHI Learning, New Delhi, 2011
3. Renewable Energy Sources for Sustainable Development, N.S. Rathore and N. L. Panwar, New India Publishing Agency, New Delhi
4. Renewable Energy Resources, J. Twidell and T. Weir, E & F N Spon Ltd, London, 1999
5. Electric Power Generation: Transmission and Distribution, S. N. Singh, PHI Learning, New
6. Electrical Power, Dr. S.L. Uppal
7. Electrical Power System, Mehta, V.K. S. Chand and Company Bew Delhi, 2011.