Open Elective

WIND ENERGY AND DESIGN ASPECTS	
Course Code: EEOE04	**Credits: 3:0:0**
Pre – requisites: Nil	**Contact Hours: 42L**
Course Coordinator: Dr. Sridhar. S	

Course content

Unit I

Wind resources Assessment: Introduction, estimation of power production, evaluation of sites, wind data for prospective sites, feasibility study, micro- siting of wind power plants, visual impact, pitfalls.

Components of wind power plants: rotor, Nacelle, Towers, Electric Substation, Tower foundations.

Types of wind power plants: Types of axis, stand – alone and grid connected WPPs, upwind and downwind WPPs, blade count, power ratings of WPPs, aerodynamic power regulation method, types of electrical generators in WPPs, constant speed and variable speed WPPs, geared, direct drive and semi-geared/ hybrid WPPs, WPP with single gearbox and multiple generators.

Unit II

Specifications of wind power plants: General data, rotor, hub, lightning protection, pitching system, breaking system, drive train, electrical generator, electrical system, electronic controller, yaw system, nacelle, tower, specific power of WPP, standards and specifications.

Choice of wind turbines: Wind turbines options, size of wind turbines, types of wind turbines, wind turbines tailored to wind climate, nominal power vs rotor diameter, IEC wind classes, configuration, grid compatibility, suppliers.

Working of wind power plants: physical principle of modern wind turbine, wind turbine rotor blade characteristics, hub and main shaft functions, working of geared WPP, working principle of direct drive WPP, semi-geared/ hybrid WPP working principle, breaking of WPP, yawing, cable untwisting, electric substation and grid

Unit III

Grid integration of wind power plants: Introduction, functions of an electric power system, functional requirements of WPPs in an electric grid, embedded generation, types of WPP and wind farm grid connections, integration issues, operational issues, siting WPPs for effective grid integration, grid integration issues in India, challenges

for grid integration, wind power integration standards, supergrid strategy.

Wind power and environment: Introduction, impact of wind power on environment, benefit of wind power for environment, land demand, local impacts, visual impact on the landscape,

Unit IV

Wind power policy: Introduction, permission inquiry, conflicting interests, permission process, wind power politics, wind power on the power market, support schemes for renewable energy, evaluation, independent power producers, competition on equal terms, energy subsidies, policy recommendations.

Wind power planning: Introduction, targets for wind power development, areas of national interest, positive planning, regional and municipal planning, planning tools, secondary generation planning, planning methods.

Unit V

Operation and maintenance issues of wind power plants: Introduction, availability of WPPs, general WPP maintenance, unscheduled maintenance, unscheduled maintenance levels, scheduled maintenance, tower maintenance, SCADA for WPP applications, condition monitoring systems, WPP maintenance costs, warranty and insurance.

Text books:

1. Joshua Earnest, Tore Wizelius "*Wind Power Plants and Project Development*", PHI Learning Private Limited, 2011.
2. G. D. Rai, "*Non-Conventional Energy Sources*", Khanna Publications.

Reference Books:

1. Bibek Samantaray & Kaushik Patnaik, "*A study of wind energy potential in India*", 2010.
2. "Ministry of New and Renewable Energy (MNRE)", Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects, September 2013.
3. Dr. Gray. L. Johhanson, "*Wind Energy Systems*", 2001.
4. B. H. Khan, "*Non-Conventional Energy Sources*", TMH, 3rd edition.