



Module Specification

Module name: RE8M1 – Wind energy Generation and Transmission

Programme (Energy/ICT): Energy

ECTS: 6

Type Bachelor/Msc : Master

Module name: Wind energy Generation and Transmission

Scope and form: To train specialists in wind energy generation and transmission.

Form: Elective; face to face.

Duration (weeks; Hours/week): 15 weeks; 4.5 hours/week (3 hours of lectures and 1.5 hours of laboratory classes; 60-70 hours of self-study time).

Type of assessment: Supervised projects (50%); Laboratory assessment (25%); Final exam (25%)

Qualified Prerequisites: Basic knowledge of mechanics; good knowledge on electrical circuit analysis and electrical machines.

General course objectives:

This course presents the basis to understand the origin of the wind and the technologies associated with wind turbines, and also the concepts related with the analysis of the wind turbines functioning, both operation and maintenance.

Topics and short description:

- Main aspects and analysis of the wind resource: atmospheric concepts, measurement, statistics, prediction, wind models. Effects of solar power on wind flow patterns, storage.
- Wind turbines technologies: generator, blades, gearbox, electronic configuration of network connection etc.
- Wind farm construction.
- Operation and maintenance of wind farms: filtering, treatment and storage of data; power curve measurement, control production.
- Analysis of economic feasibility of wind installations.
- Basis of modelling, system identification and estimation techniques.
- Environmental impact of wind farms: visual impact, noise, turbine break, lightning strike, electromagnetic effects, disassembly. Dangers posed by windfarms to migrating birds.

Learning outcomes:

Knowledge	Skills	Competences
Characteristics of wind resources: measurement and analysis	Able to use the measurement of wind resources and to analyze the results	Ability to use the evaluation techniques of wind energy resources, and to extract conclusions



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Structure and operation of a wind turbine	Able to select the appropriate turbine for a specific wind farm	Ability to evaluate wind turbine technologies
Structure and operation of a wind farm	Able to evaluate the production of wind turbines and to determine anomalies in their operation	Ability to analyze the production of a wind farm
Basic aspects of feasibility	Analyses the economic feasibility of wind farms	Ability to evaluate the economic feasibility of wind farms
Environmental impact	Evaluates environmental aspects inherent to the wind farms	Ability to analyze and to assess the social and environmental impact

Module recommended literature:

- T. Burton, N. Jenkins, D. Sharpe. *Wind Energy Handbook*. John Wiley & Sons, imp. 2011
- J. F. Manwell, J. G. McGowan and A. L. Rogers. *Wind energy explained: theory, design and application*. Chichester (England): John Wiley & Sons, imp. 2008
- T. E. Kissell. *Introduction to Wind Principles*. Prentice Hall, imp. 2010
- European Wind Energy Association. *Wind Energy – The Facts: A Guide to the Technology, Economics and Future of Wind Power*. Routledge, imp. 2009
- P. Jamieson. *Innovation in Wind Turbine Design*. John Wiley & Sons, imp. 2011
- T. Ackermann. *Wind Power in Power Systems*. John Wiley & Sons, imp. 2012

Remarks:

Special Considerations: Generically none for this module but should be commented on by the institution delivering the module.