REM master basic syllabus

Title:
EE9X2 Wind Energy and Distributed Energy Resources

Credit value:
5 ECTS

Mandatory/Optional:
Compulsory

Semester:
1

Lecturer/s:
David McMillan, Julian Feuchtwang

University:
University of Strathclyde

Department:
Department of Electronic and Electrical Engineering

Rationale:
This module gives an overarching understanding of the principles of wind power generation. It will cover the wind resource and principles behind wind turbine design. It also provides students with an overview of design issues related to the connection to the wider power system.

Objectives:
1. To explain the nature of the wind resource and its assessment, and the design principles behind turbines which aim to capture the energy and convert it to electricity.
2. To provide understanding of all stages of the life-cycle of a wind farm from initial proposal through building, operating and decommissioning.

Skills: *(according to the list of skills provided)*

Subject skills	REM Master Skills						
	L2.1	L2.2	L2.3	L2.4	L2.5	L2.6	L2.7
L3.1. Students understand the nature of the wind resource	X					X	X
L3.2. Students acquire the ability to describe the Danish model of a wind turbine	X	X	X			X	X
L3.3. Students acquire the carry out calculation describing the aerodynamics of a wind turbine rotor	X	X				X	X
L3.4 Students develop the ability to discuss the broad range of factors that influence decision at all stages of the wind farm cycle	X	X			X	X	X
L3.5 Students are able to calculate estimated energy yields for a particular site	X					X	X

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Teaching and learning methods:

Description of the methodology: lectures, lab, group presentations…

The teaching method is based on a series of lectures where the lecturer explains the main concepts through power point presentations and worked out examples on the board. The students are also presented with a variety of issues of practical nature during the lectures. To support the learning process part of the modules covers tutorial-like sessions where the students are put to the challenge of working together and addressing problems of slight higher technical complexity.

Allocation of student time:

	Attendance (classroom, lab,…)	**Non attendance (lecture preparation, self study…)**
Lectures	22 hours	22 hours
Tutorials	12 hours	12 hours
Lab	8 hours	16 hours
Assignment	9 hours	9 hours
Private study	0	15 hours

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Assessment:

Basic description of the assessment methodology

Assessment Matrix:

Subject skills	**Assessment method**					
	Exam	**Presentation**	**Home work**	**Report**	**…**	**…**
L3.1.	100%					
L3.2.	100%					
L3.3.	100%					
L3.4	60%			40%		
L3.5	60%			40%		
...						

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Programme:

Lesson 1	***Learn about wind characteristics: atmospheric boundary layer, wind shear, power law, Weibull distribution, turbulence characterisation, energy density, site characteristics, anemometry, energy yield calculation*** *Distribution (5 h theory + 3 h tutorials)*
Lesson 2	***Introduction to rotor aerodyanmics*** *Distribution (5 h theory + 3 h tutorials)*
Lesson 3	***Rotor design*** *Distribution (6 h theory + 3 h tutorials)*
Lesson 4	***Wind farm life cycle analyis*** *Distribution (6 h theory +3 h tutorials)*

Resources:

Classrooms, Blackboard, laptop, projector, audio, computer room, laboratory, security issues,…

- *A classroom, equipped with a blackboard and audio-visual resources (laptop/computer with Matlab/Simulink installed and Internet connection + projector), for the lectures. A blackboard and a projector may be sufficient if the lecturer uses her/his own laptop.*

Bibliography:

Basic textbooks, deepening bibliography, Internet addresses of interest, specific journals, etc…

1. Wind Energy Explained; J F Manwell, J G McGowan and A L Rogers, Wiley. (ISBN 0 471 49972 2)
2. Wind Energy Handbook; T Burton, D Sharpe, N Jenkins and E Bossanyi, Wiley. (ISBN 0 471 48997 2)
3. 'Embedded Generation'; N. Jenkins, R. Allan, P. Crossley, D. Kirschen, G. Strbac, IET. (ISBN-10: 0852967748, ISBN-13: 978-0852967744)
4. Wind power plants: fundamentals, design, construction and operation;R. Gasch, J Twele;Springer, 2nd ed. 2012 (ISBN 978-3642229381)
5. Wind Energy Essentials: Societal, Economic, and Environmental Impacts; Richard P. Walker, Andrew Swift; Wiley, 2015 (ISBN: 978-1-118-87789-0)

Further comments: