REM master basic syllabus

Title:
NM968 Physical model testing for offshore renewables

Credit value:
5 ECTS

Mandatory/Optional:
Mandatory

Semester:
1

Lecturer/s:
Sandy Day

University:
University of Strathclyde

Department:
Naval Architecture, Ocean and Marine Engineering

Rationale:

This course addresses laboratory-based testing and field trials for assessment of performance and survivability, instrumentation technologies, data acquisition and analysis of Uncertainty and experiment design, in the context of a highly time- and cost-limited campaigns. The course will include lectures, hands-on demonstrations and mini-projects, taking full advantage of the range of internationally leading facilities available within the consortium.

Objectives:
To provide students with

1. knowledge and understanding of the different types of laboratories which may be used for offshore renewables testing.
2. understanding on the different scaling laws which may apply from lab-scale or intermediate-scale field-trials to full scale
3 knowledge on the basic approaches to data analysis and be able to estimate the levels of uncertainty of their measurements.

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. understand different types of laboratories used in renewables testing (and instrumentation technologies)	X	X				X	X
L3.2. Understanding of scaling laws	X	X				X	X
L3.3. Be aware of techniques to choose efficient set of tests	X	X				X	X

Teaching and learning methods:

Laboratory and field trials supported by lectures in the classroom and tutorial sessions.

Allocation of student time:

	Attendance (classroom, lab,…)	**Non attendance (lecture preparation, self study…)**
Lectures	12 hours	48 hours
Tutorials	6 hours	24 hours
Supervised practical work	12 hours	
Assignments	20 hours	
Private study		50 hours

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Assessment:

Four written submissions (submitted in groups) and a presentation (one for each group). Each written submission and the presentation will contribute 20% to the final assessment.
Submissions will be on the following subjects:

1) Instrumentation, calibration and uncertainty analysis
2) Dynamic response, power capture and scaling for OWC WEC fixed in regular waves
3) Mass properties, motion capture and dynamic response of floating structures in regular and random waves

Assessment Matrix:

Subject skills	**Assessment method**					
	Exam	**Presentation**	**Coursework**	**Report**	**…**	**…**
L3.1.		20%	80%			
L3.2.		20%	80%			
L3.3.		20%	80%			

Programme:

Lesson 1	***Lab testing: device testing in wave tanks, towing tanks, flumes, and wind tunnels; similarity, extrapolation to full scale, and particular scaling challenges for lab testing of marine renewable devices; material and structural testing of components; experiment design. Guidelines and standards.*** *Distribution (3 h theory + 2 h tutorials)*
Lesson 2	***Field Trials: environmental monitoring, instrumentation and data transfer challenges, site selection and choice of scale.*** *Distribution (3 h theory + 1 h tutorials)*
Lesson 3	***Instrumentation: measurement of fluid velocity, water surface elevation, pressure, force, displacement, velocity and acceleration, non-intrusive measurement techniques including PIV, LDA, and motion capture, and ultrasonics; measures of performance linearity and repeatability, calibration.*** *Distribution (3 h theory + 2 h tutorials)*
Lesson 4	***Data acquisition and analysis: data sampling, filtering, processing, statistical analysis; sources of uncertainty, bias and precision, accumulation of uncertainty.*** *Distribution (3 h theory + 1 h tutorials)*

Resources:

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

For the formal classroom lectures a classroom is required 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…

Literature and guidelines will be provided to register students on Myplace.

Further comments: