



Syllabus

Specialisation Ocean Energy IST Lisbon

Title	Content	ECTS credits	Person responsible
<p>Ocean Energy Resources Module: 6 ECTS credits</p>	<p>Module Content</p> <ul style="list-style-type: none"> • Introduction to the ocean environment <ul style="list-style-type: none"> ○ Ocean circulation and stratification ○ Ocean habitat ○ Ocean economy • Ocean surface waves <ul style="list-style-type: none"> ○ Wave measurement ○ Linear wave theory ○ Wave spectrum ○ Wave energy resource • Ocean tidal currents <ul style="list-style-type: none"> ○ Current measurement ○ Current turbulence ○ Current energy resource • Site selection and characterization for ocean energy systems 	6	Prof. A. Sarmiento
<p>Modelling and Control of Ocean Energy Systems Module: 6 ECTS credits</p>	<p>Module Content</p> <ul style="list-style-type: none"> • Wave energy systems <ul style="list-style-type: none"> ○ Types of wave energy converters ○ Linear wave-structure interactions ○ Frequency domain analysis ○ Hydrodynamic coefficients and their computation ○ Time domain analysis ○ Phase control ○ Arrays ○ Model testing techniques • Marine current turbines <ul style="list-style-type: none"> ○ Types of marine current turbines ○ Hydrodynamic models (BEM, Lifting line, IBEM) ○ Hydrofoil data and analysis ○ Cavitation and strength 	6	Prof. J.A.F. Campos

	<ul style="list-style-type: none"> ○ Design criteria ○ Multiple turbine interaction ● Other types of energy systems ○ Ocean Thermal Energy Conversion (OTEC) ○ Energy from salinity gradient 		
<p>Ocean Energy Systems Technologies Module: 7.5 ECTS credits</p>	<p>Module Content</p> <ul style="list-style-type: none"> ● Power take-off systems <ul style="list-style-type: none"> ○ Air turbines, ○ Water turbines ○ High pressure hydraulic systems ○ Electrical generation ○ Energy storage ● Mooring and anchoring systems. ● Farm layout ● Offshore electrical grid and connection systems ● Operation and maintenance of ocean energy devices ● Offshore operations ● Maritime safety issues 	7.5	Prof. L.M.C. Gato
<p>Economics, Policy and Environment Module: 4.5 ECTS credits</p>	<p>Module Content</p> <ul style="list-style-type: none"> ● Economic analysis <ul style="list-style-type: none"> ○ Cost ○ Financing mechanisms ○ Economic evaluation ○ Life-cycle assessment ● Policy issues <ul style="list-style-type: none"> ○ Socio-economic impact ○ Licensing & permitting ○ Environmental impact assessment 	4.5	Prof. A. Sarmento

<p>Project Module: 6 ECTS credits</p>	<p>Module Content</p> <ul style="list-style-type: none"> • Resource characterization • Site selection • Conceptual system development • Licensing procedure • Environmental impact • Economic analysis 	<p>6</p>	<p>Prof. José Maria André</p>
---	--	----------	-------------------------------

Laboratory

Module-2: Modelling and Control of Ocean Energy Systems:

- Wave Flume of the Civil Engineering Department of IST: Characterization of systems of regular and irregular 2D waves. Energy spectra: Duration 3 h.
- Wave Flume of the Civil Engineering Department of IST: Characterization of a floating body response RAO in a system of regular 2D waves: Duration 3 h.

Module-3: Mechanical and Electrical Equipment:

- a) Fluid Mechanics Laboratory of the Mechanical Engineering Department of IST: Testing of an air turbine for use in OWC systems: Duration 3 h.
- b) Electrical Machinery Laboratory of the Electrical and Computer Engineering Department of IST: laboratory practice on electrical generators: Duration 3 h.

Programme management:

Prof. José Alberto Falcão de Campos: M.Sc. organization & master steering committee.