

Module Code	CE7J06
Module Name	J6: Wave Energy
ECTS Weighting¹	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Prof. Biswajit Basu (basub@tcd.ie) Lecturer(s): Prof. Biswajit Basu (basub@tcd.ie)
<u>Module Learning Outcomes</u> with reference to the <u>Graduate Attributes</u> and how they are developed in discipline	<p>On successful completion of this module, students should be able to:</p> <p>LO1. Carry out assessment of wave energy, applying wave equations and wave theory.</p> <p>LO2. Carry out simplified analysis using linear wave theory.</p> <p>LO3. Carry out nonlinear wave analysis.</p> <p>LO4. Analyse oscillating body systems.</p> <p>LO5. Analyse fixed and floating wave energy devices.</p> <p>LO6. Analyse mooring systems.</p> <p>LO7. Carry out the basic design of wave energy power systems.</p> <p>LO8. Calculate resource and potential outputs for wave energy systems.</p> <p>LO9. Articulate the social and environmental aspect of wave power systems.</p> <p>Graduate Attributes: levels of attainment</p> <p>To act responsibly - Enhanced</p> <p>To think independently - Enhanced</p> <p>To develop continuously - Enhanced</p> <p>To communicate effectively - Enhanced</p>
Module Content	<p>To introduce the students about the theory, technology and engineering associated with wave, hydro-power, tidal and ocean energy. The topics covered are:</p> <ul style="list-style-type: none"> • Introduction to wave energy resource • Hydrodynamics – Theoretical and numerical, model testing • Controls • Oscillating water column – Fixed, Floating • Oscillating body systems – single, multiple, pitching , many body • Overtopping devices • Power equipment

- Moorings

The aims of the module are:

1. To foster problem solving and critical thinking skills by requiring students to apply the theory learnt on wave energy to real life projects and engage in discussions with other experts.
2. To enable students to communicate well in engineering contests in relation to ocean energy, both when discussing about projects, plans and problems, and when writing, reporting and communicating about these.
3. To achieve a pro-active engagement in wave energy problems.
4. To enable students to identify, formulate, analyse and solve engineering problems by applying the theory of ocean energy both analytically and computationally.
5. To solve real world engineering problems by carrying out analysis using real data such as those available from tank tests or sea trials.
6. To solve real world engineering problems by applying the theory and employing software packages such as WecSim, Nemoh and DynaMOOC.

Teaching and Learning Methods

- Lectures
- Tutorials
- Labs

Assessment Details²

Please include the following:

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

Assessment Component	Assessment Description	LO Addressed	% of total	Week due
Examination	3 hours written examination	LO1-9	80%	
3 Coursework/project work (2 Theoretical assignment - 6% each, Computer assignment – 8%)	Coursework and project work during the semester	LO1-5, 7,8	20%	4,7,11

Reassessment Requirements	None						
Contact Hours and Indicative Student Workload²	<table border="1"> <tr> <td>Contact hours: 33</td> </tr> <tr> <td>Independent Study (preparation for course and review of materials): 47</td> </tr> <tr> <td>Independent Study (preparation for assessment, incl. completion of assessment): 45</td> </tr> </table>				Contact hours: 33	Independent Study (preparation for course and review of materials): 47	Independent Study (preparation for assessment, incl. completion of assessment): 45
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Independent Study (preparation for course and review of materials): 47							
Independent Study (preparation for assessment, incl. completion of assessment): 45							
Recommended Reading List	<p>Ocean wave energy conversion (1981) McCormick, Wiley, New York. Power from sea waves (1995) Ross, OUP, Oxford. Wave energy conversion (2003) Brooke, Elsevier, Amsterdam. Wave and Tidal Power (2011) Gerdes, Greenhaven Press, Detroit. Costal & Offshore Engineering (2011) Reid, Chadwick and Flemming.</p>						
Module Pre-requisite	Mechanics (1styear), Fluid Mechanics (2 nd or 3 rd year), Maths (1 st and 2 nd year -Complex numbers, Linear Ordinary Differential Equations), MATLAB						
Module Co-requisite							
Module Website							
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.							
Module Approval Date							
Approved by							
Academic Start Year	1 st September 2024						
Academic Year of Date	2024/2025						