University of Plymouth

Faculty of Science and Engineering
School of Biological and Marine Sciences

Programme Specification

MSc Marine Renewable Energy (MRE) [4148]

September 2017
1. **MSc Marine Renewable Energy**

   **Final award title:** Master of Science in Marine Renewable Energy, on completion of 180 credits not encompassing the engineering pathway
   or
   Master of Science in Marine Renewable Energy (Engineering), on completion of 180 credits encompassing the engineering pathway

   **Intermediate award title(s):**
   Post Graduate Certificate on completion of 60 credits
   Post Graduate Diploma on completion of 120 credits

   **UCAS code** N/A
   **JACS code** F730 (50%), H221 (50%)

2. **Awarding Institution:** University of Plymouth
   **Teaching institution(s):** University of Plymouth

3. **Accrediting body:**
   Institution of Mechanical Engineers ([http://www.imeche.org/](http://www.imeche.org/))
   Royal Institution of Naval Architects ([http://www.rina.org.uk/](http://www.rina.org.uk/))
   Institute of Marine Science and Technology ([http://www.imarest.org/](http://www.imarest.org/))

   Date of re-accreditation: Expected April 2017 for September 2017 cohort onwards

4. **Distinctive Features of the Programme and the Student Experience**

   The UK government is committed to a target of 15% of our energy sourced from renewables by 2020. This target is equivalent to a seven-fold increase in UK renewable energy consumption from 2008 levels: the most challenging of any EU Member State. It can therefore be anticipated that the renewable energy sector will continue to experience a rapid expansion in capacity. University of Plymouth continues to have a unique ability to capitalise on its reputation for marine teaching and research to deliver masters graduates whose skills, knowledge and innovation can help drive this expansion.

   In 2007, the Universities of Plymouth and Exeter, with financial backing from the South West Regional Development Agency (SWRDA), combined to form the Peninsula Research Institute in Marine Renewable Energy (PRIMaRE). PRIMaRE, which continues in an expanded form also including the Universities of Bath, Bristol, and Southampton provides the research support for Wave Hub ([www.wavehub.co.uk](http://www.wavehub.co.uk)), a test facility for prototype wave energy devices off the North
Coast of Cornwall which is fully functional and is receiving its first test wave energy converter in June 2014. As part of the PRIMaRE initiative, six new academic staff were employed at University of Plymouth in 2008 to contribute to the development of the marine renewable energy subject area through their research expertise. Two staff were employed in marine science, two in engineering and two in social science and business. These now well established staff provide University of Plymouth with a strong and unique staff cohort who can continue to offer the first Masters programme in marine renewable energy which draws on all these subject areas.

These Masters programmes are fully cross-disciplinary comprising expertise from engineering, marine science, economics, law and policy. This aligns with the ‘whole system’ approach indentified as the number 1 recommendation in the UK Energy Research Centre report, ‘A whole system approach which considers engineering, environmental and socio-economic factors is needed’ (http://tinyurl.com/Final-Report-Marine-Energy)

The distinctiveness of the programme specifically relates to Plymouth’s international reputation for obtaining coastal marine measurements (e.g. waves, currents and tides) and producing graduates that combine practical with numeracy skills. This novelty is borne out by the wide range of dissertation topics which include: physical modelling of mooring loads; tidal stream resource characterization for Guernsey; cetacean risk assessment tool; social attitudes analysis for promoting public participation in project planning; impacts on benthic organisms; and critical analysis of MRE funding in the developing world.

The programmes successfully produce graduates with the broad range of knowledge to be key participants in the global expansion of the Marine Renewable Energy sector. Graduates from the programmes have found stimulating roles for a wide range of employers including device developers (JT ‘11 is Operations Engineer at Pelamis Wave Power), specialist consultants (CD ‘12 is a Junior Associate at BVG Associates), service providers (RH is a mechanical design engineer at Mojo Maritime), project developers (SC ‘13 is Marine Coordinator at Tidal Lagoon Swansea Bay), and research organizations (CG is completing his PhD at the University of Highlands and Islands).

The programmes have the following unique selling points:
- the first multidisciplinary Marine Renewable Energy Masters degrees in the world. They have successfully recruited students from around the world and delivered the education necessary to place them in such industry leading organisations as OpenHydro, Pelamis, Marine Energy Matters, RegenSW, RWE Npower Renewables, Clean Earth Energy, Babcock, and MoJo Marine.
- responds to a pressing need for trained individuals to help maintain the UK as the global leader in the development and implementation of MRE
• are consistent with University and Faculty policy as represented by PRIMaRE and the university commitment to the Southwest Marine Energy Park to develop the southwest as a centre for MRE
• will capitalise on existing and planned MRE facilities in the University and the South West: e.g. the COaST laboratories, Wavehub; the research vessel RV Falcon Spirit; the High Performance Computing (HPC) cluster
• will capitalise on ongoing and proposed University of Plymouth research as funded by RCUK, Interreg, Horizon2020 and other funding streams (eg. FLOWBEC, QBEX, Marinet, Ofelia, SOWFIA, SQUID, XMED, MERiFIC, Atlantic Cloud)
• represents a major University of Plymouth contribution to the promulgation of sustainable technologies in the context of global climate change

5. Relevant QAA Subject Benchmark Group(s)
There is no Masters-level marine benchmark group, the closest subject area that has one being Chemistry:
http://www.qaa.ac.uk/ASSURINGSTANDARDSANDQUALITY/SUBJECT-GUIDANCE/Pages/Master's-degree-benchmark- statements.aspx

For the marine undergraduate programmes the relevant benchmark group is ‘Earth Sciences, Environmental Sciences and Environmental Studies’ and we interpret here with the SEEC level 7 descriptors (p14):


And the Masters’ descriptor of the QAA ‘Masters’ Degree Characteristics’ document (p16): http://www.ehea.info/Uploads/SubmitedFiles/5_2013/113542.pdf
6. Programme Structure

The first semester of the MSc is 100% coursework assessed. The second semester modules are either 100% coursework assessment or 50/50 exam coursework split. The modules employing the latter strategy do so largely to satisfy accreditation requirements.

Semester 1: 3 x 20 credit core modules
Semester 2: 3 x 20 credit option modules from a choice of 5
Summer: 60-credit dissertation

<table>
<thead>
<tr>
<th>TIMING</th>
<th>MODULES</th>
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</thead>
<tbody>
<tr>
<td><strong>Semester 1</strong></td>
<td><strong>MAR 513</strong> Research Skills &amp; Methods (15 weeks) Core 20 credits</td>
</tr>
<tr>
<td>15 weeks (Including 12 weeks of taught material before Christmas and a 3 week block on project work after Christmas)</td>
<td><strong>MAR 526</strong> Introduction to Marine Renewable Energy (12 Weeks) Core 20 credits</td>
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<tr>
<td></td>
<td><strong>MAR 527</strong> Economics, Law &amp; Policy for Marine Renewable Energy (12 Weeks) Core 20 credits</td>
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<tr>
<td></td>
<td><strong>MAR 524</strong> MSc Dissertation (All Year) Core 60 credits</td>
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<tr>
<td></td>
<td>Preparation for dissertation (3 weeks in Semester One)</td>
</tr>
<tr>
<td><strong>Semester 2</strong></td>
<td><strong>Option Module</strong> (12 Weeks) 20 credits</td>
</tr>
<tr>
<td>12 weeks taught</td>
<td><strong>Option Module</strong> (12 Weeks) 20 credits</td>
</tr>
<tr>
<td>3 weeks on research project</td>
<td><strong>Option Module</strong> (12 Weeks) 20 credits</td>
</tr>
<tr>
<td></td>
<td>Research for dissertation (3 weeks in Semester Two)</td>
</tr>
<tr>
<td></td>
<td>Work on dissertation until hand in date through the summer</td>
</tr>
<tr>
<td></td>
<td><strong>MSc 180 credits</strong></td>
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</table>

Semester 2 Option modules – choice of 3 from 5
1. MAR512  Assessment of Coastal Resources & Impacts
2. MAR528  Mechanics of Marine Renewable Energy Structures
3. MAR507  Economics of the Marine Environment
4. MAR529  Marine Planning
5. MATH523  Modelling Coastal Processes

**Engineering Accreditation:**

Students with an undergraduate engineering degree who wish to take advantage of the accreditation for continuing education for chartered engineer status will be required to take the modules in the diagram below.
<table>
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</table>
| **Semester 1**  
15 weeks  
( Including 12 weeks of taught material before Christmas and a 3 week block on project work after Christmas) | **MAR 513**  
Research Skills & Methods  
(15 weeks)  
Core 20 credits  
**MAR 526**  
Introduction to Marine Renewable Energy  
(12 Weeks)  
Core 20 credits  
**MAR 527**  
Economics, Law & Policy for Marine Renewable Energy  
(12 Weeks)  
Core 20 credits  
**MAR 524**  
MSc Dissertation  
(All Year)  
Core 60 credits  
Preparation for dissertation (3 weeks in Semester One) |
| **Semester 2**  
12 weeks taught  
3 weeks on research project | **MAR 512**  
Assessment of Coastal Resources and Impacts  
(12 Weeks)  
Core 20 credits  
**MAR 528**  
Mechanics of Marine Renewable Energy  
(12 Weeks)  
Core 20 credits  
**MATH523**  
Modelling Coastal Processes  
(12 Weeks)  
Core 20 credits  
Research for dissertation (3 weeks in Semester Two)  
Work on dissertation until hand in date through the summer |

**MSc 180 credits**

This physical science/engineering selection is the only pathway which has been accredited by the relevant professional engineering bodies. Students who have completed this pathway will have their graduation certificates annotated with Master of Science in Marine Renewable Energy (Engineering).

It is possible for students to transfer between MSc and MRes pathways prior to the end of Semester 1 with the agreement of the Programme Leader. Students wishing to transfer should endeavour to discuss this with their program manager at the earliest opportunity in the first semester. If the transfer between pathways is agreed by the Programme Leader, this will be notified to, and affected by the Faculty administrator. It should be noted that not all requests will be granted as some students may be deemed suitable for the MSc but unsuitable for an extensive period of self-directed research that is required by the MRes pathway.

**7. Programme Aims**

The overarching aim of this programme is to produce masters-level students with the knowledge and skills required to pursue a professional career or to carry out further research in the Marine Renewable Energy sector.

Specifically, the programme is intended to:

**A1** Develop an understanding and awareness of the political framework, policy, planning, technological and scientific issues surrounding and at the limits of knowledge of the Marine Renewable Energy sector.
A2 Stimulate the acquisition of the conceptual abilities to contribute to the development and critical evaluation of specific Marine Renewable Energy technologies.

A3 Provide postgraduates with the skills necessary to assess the environmental impact of Marine Renewable Technologies and to manage the associated planning requirements.

A4 Develop the employability skills of direct relevance to the MRE industries and research organisations also comprising a commitment to their continuing professional development.

A5 Produce alumni with the necessary high level skill set to pursue further academic research or scholarship in Marine Renewable Energy.

8. Programme Intended Learning Outcomes

8.1. Knowledge and understanding
On successful completion graduates should have developed:

1. A systematic understanding of knowledge and a critical awareness of current problems and new insights at the limits of knowledge in renewable and marine renewable energy [A1, A2, A3];

2. A comprehensive understanding of either design methodologies and/or observation [A2, A3, A4].

8.2. Cognitive and intellectual skills
On successful completion graduates should have developed conceptual understanding that enables them to:

1. Evaluate critically current research and advanced scholarship in MRE [A2, A5];

2. Evaluate methodologies and develop critiques of them [A3, A4];

3. Propose new hypotheses [A2, A5];

4. Demonstrate originality in their application of knowledge [A2, A4];

5. Demonstrate a practical understanding of how established techniques of research are used to create and interpret knowledge [A1, A2, A3].

8.3. Key and transferable skills
On successful completion graduates should have developed the ability to:

1. Deal with complex issues both systematically and creatively [A2, A5];

2. Make sound judgements in the absence of complete data [A1, A3];

3. Communicate their conclusions clearly to specialist and non-specialist audiences [A3, A4].

8.4. Employment related skills
On successful completion, graduates should have developed the qualities and transferable skills necessary for employment requiring:

1. The exercise of initiative and personal responsibility [A1, A4];
2. Decision-making and management in complex and unpredictable situations [A3, A4, A5];
3. The independent learning ability required for continuing professional development [A1, A2, A5];
4. The ability to continue to advance their knowledge and understanding, and to develop new skills to a high level within the MRE context [A1, A2, A5]

8.5. Practical skills
On successful completion graduates should have developed the:
1. Capacity for self-direction and originality in tackling and solving problems [A2, A4];
2. Ability to act autonomously and in teams in planning and implementing tasks at a professional or equivalent level [A3, A4].

9. Admissions Criteria, including APCL, APEL and DAS arrangements
This programme primarily aims to recruit science and engineering graduates, although applications will be considered from well-qualified graduates in other disciplines with relevant experience.

Application will be through the usual system for application to Masters degrees within the University. Candidates require an appropriate background in science or engineering to honours degree level (normally 2:2 or above), or equivalent. Candidates are required to submit transcripts of supporting documents such as first degree. Non UK qualifications may be crosschecked with universities and by consulting the ENIC –NARIC network. Relevant work experience may be taken into consideration. Candidates are also required to demonstrate their proficiency in English (e.g. GCSE, AS Level, A Level, IB, Cambridge Proficiency Certificate level 4-5, Oxford Higher Certificate, International Certificate Conference (ICC Stage 3 Technical), IELTS scores 6.5.

Candidates with MSci, MEng, MGeol etc that are classed as 4-year undergraduate degrees are suitable applicants as these degrees are not deemed equivalent, by the ELQ criteria, to 180-credit Masters level degrees.

University of Plymouth is fully compliant with the National SENDA requirements for the accommodation of disabled students within its degree programmes. All applications will be assessed on academic criteria as described above. Once accepted the students will be put into contact with the Disability ASSIST Services who will liaise with the course leader to identify actions, which need to be taken. Where necessary alternatives to fieldwork will be provided.

The course has run since 2010 and has proven track record of recruiting from a truly international cohort of students with half of the 2013-14 cohort coming from outside the UK EU or overseas.
10. Progression criteria for Final and Intermediate Awards
The MSc in Marine Renewable Energy award requires a minimum of 180 credits and is categorised into grades:

**MSc/MRes with Distinction:**
This award is achieved by a student gaining an overall average mark on the programme of study of 70% and above, and the mark for the dissertation/major project module is not less than 70%.

**MSc/MRes with Merit:**
This award is achieved by a student gaining an overall average mark on the programme of study of between 60% and 69.99%, and the mark for the dissertation/major project module is not less than 60%.

**MSc/MRes:**
This award is normally achieved by a student gaining an overall average mark between 50% and 59.99%.

To pass a module requires a student to achieve at least 40% in both the exam and coursework elements and at least 50% in the overall module mark, or 50% overall if a coursework only module.

**Exit award titles:**
- **Post Graduate Certificate** on completion (≥50%) of 60 credits.
- **Post Graduate Diploma** on successful completion (≥50%) of 120 credits.

11. Exceptions to Regulations
None

12. Transitional Arrangements
It will be possible for part time students or students who failed modules from the former MSc Marine Renewable Energy to complete their studies within the framework of the new scheme as there are only minor alterations to the programme. In all cases the pending changes to the Marine Renewable Energy scheme will be discussed with part time applicants and advice will be given by the programme leader on the selection of first year modules that will be compatible with the new scheme.
13. Mapping:

### 13.1 Programme Intended Learning Outcomes vs. Modules

<table>
<thead>
<tr>
<th>Modules (core modules in bold)</th>
<th>Aims</th>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>A systematic understanding of knowledge and a critical awareness of current problems and new insights at the limits of knowledge in renewable and marine renewable energy [A1, A2, A3];</td>
<td>A1, A2, A3</td>
<td>☒</td>
<td>☒</td>
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<tr>
<td>A comprehensive understanding of either design methodologies and/or observation [A2, A3, A4].</td>
<td>A2, A3, A4</td>
<td>☒</td>
<td>☒</td>
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</table>

**Knowledge and Understanding [sect. 8.1]**

**Cognitive and intellectual skills [sect. 8.2]**

- Evaluate critically current research and advanced scholarship in MRE [A2, A5];
  - A2, A5 | ☒ | ☒ | ✓ | ✓ | ✓ | ✓ |
- Evaluate methodologies and develop critiques of them
  - A3, A4 | ☒ | ☒ | ✓ | ✓ | ✓ | ✓ |
- Propose new hypotheses
  - A2, A5 | ☒ | ☒ | ✓ | ✓ | ✓ | ✓ |
- Demonstrate originality in their application of knowledge
  - A2, A4 | ☒ | ☒ | ✓ | ✓ | ✓ | ✓ |
- Demonstrate a practical understanding of how established techniques of research are used to create and interpret knowledge
  - A1, A2, A3 | ☒ | ☒ | ✓ | ✓ | ✓ | ✓ |

*Modules core for Engineering pathway accreditation*
### 13.2 Assessment against Modules (Mixed Coursework and Exam)

#### Modules (Core modules in bold)

<table>
<thead>
<tr>
<th>Modules</th>
<th>Aims</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAR513 Research Skills &amp; Methods</td>
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<tr>
<td>MAR526 Introduction to Marine Renewable Energy</td>
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<tr>
<td>MAR527 Economics, Law &amp; Policy for Marine Renewable</td>
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<tr>
<td>MAR512 Economics of the Marine Environment.</td>
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<tr>
<td>*MAR528 Mechanics of Marine Renewable Energy Structures</td>
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<td>*MATH523 Modelling Coastal Processes</td>
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<tr>
<td>MAR507 Economics of the Marine Environment.</td>
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<tr>
<td>MAR524 MSc Dissertation</td>
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#### Formative

<table>
<thead>
<tr>
<th>Tutorials</th>
<th>A1, A2, A3</th>
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</thead>
<tbody>
<tr>
<td>Use of specialist equipment or software</td>
<td>A4, A5</td>
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</table>

#### Summative

<table>
<thead>
<tr>
<th>Data Analysis &amp; Presentation (incl. written and oral)</th>
<th>A1, A2, A3</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Scientific Writing, Professional Reports &amp; Dissertations</td>
<td>A1, A2, A3</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Planning &amp; Research Proposals</td>
<td>A5</td>
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</tr>
<tr>
<td>Group/team work</td>
<td>A4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use of specialist equipment or software</td>
<td>A4, A5</td>
<td></td>
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</table>

*Modules core for Engineering pathway accreditation
### 13.3 Programme Intended Skills vs. Aims

#### Modules (core modules in bold)

<table>
<thead>
<tr>
<th>Modules (core modules in bold)</th>
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<td>MAR524 MSc Dissertation</td>
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</table>

#### Key and transferable skills [sect. 8.3]

- Deal with complex issues both systematically and creatively
- Make sound judgements in the absence of complete data
- Communicate their conclusions clearly to specialist and non-specialist audiences

#### Employment related skills [sect. 8.4]

- Exercise of initiative and personal responsibility
- Decision-making and management in complex and unpredictable situations
- Independent learning ability required for continuing professional development
- Ability to continue to advance their knowledge and understanding, and to develop new skills to a high level within the MRE context

#### Practical skills [sect. 8.5]

- Capacity for self-direction and originality in tackling and solving problems
- Ability to act autonomously and in teams in planning and implementing tasks at a professional or equivalent level

*Modules core for Engineering pathway accreditation*