Plymouth University

Faculty of Science and Environment
School of Marine Science and Engineering

Programme Specification

MSc Hydrography (HYD) [2218]

September 2015
1. **MSc Hydrography**

**Final award title:** Master of Science in Hydrography on completion of 180 credits

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

**UCAS code** N/A

**JACS code** F720

2. **Awarding Institution:** Plymouth University

**Teaching institution(s):** Plymouth University

3. **Accrediting body:**
- FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors ([http://www.iho.int/srv1/](http://www.iho.int/srv1/))
- Royal Institution of Chartered Surveyors ([www.rics.org/](http://www.rics.org/))
- Chartered Institution of Civil Engineering Surveyors ([www.cices.org/](http://www.cices.org/))

Continuity of accreditation by the RICS, follows submission of an annual Threshold Return and reportage through an annual University/RICS Partnership meeting. Accreditation by the other accrediting bodies – FIG/IHO/ICA, CICES and IMarEST - are all due for re-accreditation meetings and/or applications during 2015.

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

This programme provides a comprehensive knowledge and understanding of the scientific and technological basis of hydrography, relevant to research, development and policy needs within the exploration and management of marine resources, construction and archaeology.

**Hydrography** is the branch of applied sciences which deals with the measurement and description of the physical features of oceans, seas, coastal areas, lakes and
rivers, as well as with the prediction of their change over time, for the primary purpose of safety of navigation and in support of all other marine activities, including economic development, security and defence, scientific research, and environmental protection (http://www.iho.int/srv1/index.php?option=com_content&view=article&id=299&Itemid=289, June 2014)

Hydrography has been crucial to the development of world trade and to the offshore expansion in the search for hydrocarbons. The skills of the hydrographer also underpin the geophysical, topographical and spatial needs of the emerging marine renewables energy sector.

Whilst hydrography was initially deemed the domain of the military, civilian courses have been run by Plymouth University and its forerunners in support of commercial industrials since the late 1970s, primarily and initially in tandem with the demand for experienced hydrographers to support the requirements of the emerging offshore hydrocarbon industries and the quest for oil and gas. The early Postgraduate Diploma and its subsequent development into a Masters in 1995, was one of a very few international civilian courses to have carried the FIG/IHO/ICA Category A recognition, which it has now held continually for more than 25 years.

This well established programme has continued to be developed in response to expressed commercial needs and graduates are sought after throughout the industry on a global basis. It can provide the foundation for a career in hydrographic research and development, port and/or offshore/nearshore surveying and environmental support. Students develop an understanding of the present state of knowledge relating to hydrography in the fields of marine geophysics, oceanography, acoustics, geodesy, and marine resource management. They also consider the wider aspects of hydrography and the implications for data capture, data management, processing, and information systems.

Plymouth benefits from the local marine environment and the programme places great emphasis on learning via original practical research. Students experience a variety of techniques and methods of data collection and analysis relevant to careers in hydrography. As well as benefiting from close links with industry, students gain an appreciation of the relationships between the different areas of study as the programme is composed from a number of different disciplines. Finally, students gain the knowledge and skills to enable them to design, develop and implement a research project at postgraduate level or to graduate into industry, where they may
have the basic skills to commission survey activities, undertake data acquisition and present to a client the as found geospatial information.

As a commendation, many of the senior and middle managers within the national and international hydrographic sector are Plymouth University alumni. Graduate destinations include: Sales Manager – Hydrography for Kongsberg Maritime, in Aberdeen; Geodetic Consultant to Exxon, Shell Expro and other hydrocarbon producers; Hydrographer designate to the South African Navy; Hydrographer Hong Kong Hydrographic Office; Lecturer in Hydrography at Otago University (NZ); Senior Hydrographer at Boskalis; Training Officer at Sonardyne. Many graduates have joined the likes of DOF Subsea, EGS Survey, Gardline GeoSciences, Subsea 7 and a number of Fugro regional offices, incl. Perth (Australia), Abu Dhabi, Azerbaijan, Houston, and Aberdeen.

The course resultanty and in addition has the following unique selling points:

- Plymouth has a long association with marine science and navigation, which is reflected in the many marine organisations based in the city such as the Marine Biological Association, the Plymouth Marine Laboratory and the National Marine Aquarium. Plymouth is also the home port of the nation’s Royal Naval Hydrographic fleet and the location of their Hydrographic School, which today trains hydrographic and meteorological officers from a significant number of the world’s navies.

- In addition, on the civilian side, we have links to the major players in global hydrography, with a number of equipment manufacturers, suppliers and operators, including the national Hydrographic Office. Many of these have provided project ideas, support and the availability of equipment for the task.

- Each year a significant number of graduates approach the end of their studies, with a guaranteed offer of employment ahead of final examinations.

- Within the programme there is a high focus on practical fieldwork, data acquisition and its processing and analysis. This also extends to the availability of a fleet of vessels, including the university’s flagship vessel RV Falcon Spirit, for data acquisition within dissertation projects.
• Plymouth University has invested heavily in state-of-the-art instrumentation, compatible with industrial usage.

• This is a long established (evolved since 1970s), well-respected programme with professional recognition; most notably that of being FIG/IHO/ICA Category A accredited, which is a particular attraction for both home and international students

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’ (p16):
http://www.ehea.info/Uploads/SubmitedFiles/5_2013/113542.pdf
6. Programme Structure

The MSc programme includes a mix of continual assessment and formal examination.

**MSc route:**

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

<table>
<thead>
<tr>
<th>TIMING</th>
<th>MODULES</th>
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<tbody>
<tr>
<td><strong>Semester 1</strong></td>
<td><strong>MAR 513 Research Skills &amp; Methods</strong> (15 weeks) Core 20 credits</td>
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<tr>
<td>15 weeks</td>
<td><strong>MAR 520 Hydrography</strong> (12 Weeks) Core 20 credits</td>
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<tr>
<td>(Including 12 weeks of</td>
<td><strong>MAR 521 Acoustic &amp; Oceanographic Surveying</strong> (12 Weeks) Core 20 credits</td>
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<tr>
<td>taught material before</td>
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<tr>
<td>Christmas and a 3 week</td>
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<tr>
<td>block on project work</td>
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<tr>
<td>after Christmas)</td>
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<td></td>
<td>Preparation for research project (3 Weeks)</td>
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<tr>
<td><strong>Semester 2</strong></td>
<td><strong>MAR 522 Survey Project Management</strong> (12 Weeks) Core 20 credits</td>
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<tr>
<td>12 weeks taught</td>
<td><strong>MAR 523 Digital Mapping</strong> (12 Weeks) Core 20 credits</td>
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<tr>
<td>3 weeks on research</td>
<td><strong>Option Module</strong></td>
</tr>
<tr>
<td>project</td>
<td>(12 Weeks) 20 credits</td>
</tr>
<tr>
<td><strong>MAR524</strong></td>
<td><strong>MSc Dissertation</strong></td>
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<tr>
<td><strong>Summer</strong></td>
<td><strong>MAR524 MSc Dissertation</strong></td>
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<td></td>
<td>60 credits</td>
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<td><strong>MSc 180 credits</strong></td>
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All core modules are shared with the MSci Ocean Science programme.

**Semester 2 Option modules – choice of 1 from 5**

1. MAR 507 Economics of the Marine Environment
2. MAR 530 Managing Marine Ecosystems
3. MAR 529 Marine Planning
4. MAR 517 Coastal Erosion & Protection
5. MAR 518 Remote Sensing & GIS
Semester 1 (3x20 credit modules):

1. **Research Skills & Methods** (20 credits) is a shared module.

   The module aims to equip students with the practical skills and contextual framework for conducting high quality research. Students are trained in generic research skills with an emphasis on the practical development of computing, communication, writing and oral presentation skills. The context of research (ethics, health and safety, COSHH, funding, rules and controls, careers) is also included. This module is shared with MSc/MRes Applied Marine Sciences and MSc/MRes Marine Renewable Energy and is compulsory for new PhD students who do not already have a Master’s degree.

   The module aims to give students a practical appreciation of the planning and management of a research project in the academic and industrial environment. Students are equipped with the practical and theoretical skills required to carry out a major research project. In this module students will analyse data that they have collected during practical work at sea, developing new computer programming skills. Students identify with school research groups in formulating their project. The last three weeks of this semester 1 (after Christmas) will be devoted to developing project ideas and the production of a 6-page project proposal.

2. **Hydrography** (20 credits). This module is shared with the MSci Ocean Science programme.

   It focusses on practical work afloat centred on a bathymetric survey and supported by lectures on key topics - electromagnetic waves & acoustic waves, measurement techniques, computational processes and reference frames, supported by practical work with survey software to develop an understanding of methods employed and practical limitations in all aspects of positioning for hydrographic surveying.

   It aims to review the scientific principles upon which marine spatial data capture and management is founded and identify the parameters contributing to the definition and computation of position through electro-magnetic or acoustic signals.

   In summary of module content it covers the theory of classical and current survey techniques; horizontal and vertical datums; the geoid; spheroids; projections. Tidal analysis and prediction for bathymetry. Electromagnetic and acoustic signal propagation and use; GNSS, Geodesy. Field activities include levelling, traversing & intersection; GNSS positioning; reconnaissance and planning; establishing a tide
gauge, obtaining & analysing tidal measurements Data is then brought back to the laboratory where it is used to populate a Geographic Information System with marine science data alongside an assessment of the errors introduced.

3. **Acoustic & Oceanographic Surveying** (20 credits). This module is shared with the MSci Ocean Science programme.

This module provides an introduction to deep-sea physical oceanography and dynamical processes relevant to estuaries and coastal waters. The module also provides the underpinning acoustic theory to enable students to appreciate sonar survey task. A range of relevant practical data collection techniques and exercises are included within the module.

The module aims to appraise the basic principles of oceanographic and sedimentological processes and their measurement; to critically compare data observations with relevant theory; to articulate a practical understanding of the theory of acoustics and seismology; and to facilitate an introduction to acoustic and seismic instrumentation and to develop an understanding of the processes of relevant data acquisition and underwater measurement.

In summary of module content, the taught course content demonstrates and critically appraises processes relevant to the circulation of seawater, the action of waves and currents in coastal zones, cohesive sediment transport processes, and relevant sampling techniques. The module also provides the underpinning acoustic theory to enable students to appreciate the transmission and behaviour of sound underwater and to select appropriate instrumentation to the survey task. The practical aspect of the course will develop the students’ competencies in fieldwork, acoustic and environmental data collection, and the synthesis of large databases.

**Second semester (3x20 credit modules including two core and a choice of one module from 5):**

Students must complete the two core modules, Survey Project Management and Digital mapping, plus one optional module from a choice of 5 modules in the second semester followed by a 60-credit Dissertation for submission in mid-September.

4. **Survey Project Management** (Core module, 20 credits). This module is shared with the MSci Ocean Science programme.
A central element of this module is the undertaking of survey planning through from survey tender, costing and project undertaking and reportage, to a review of the place of survey within wider project undertakings, ethics and the legislative framework surrounding activities.

The module aims to provide opportunities to assess and practice management and practical skills through the planning, execution and presentation of survey results, through the completion of a ‘mock’ geophysical survey project; development of an understanding of the role of the surveyor within project teams undertaking marine engineering and construction projects. It allows the student to appraise survey activities and operations within legislative frameworks and to critically evaluate survey ethics and professionalism within the workplace.

In summary of module content, this module builds upon the skills acquired within semester one, reviewing industrial approaches to the management of survey projects and data acquisition. The module is delivered in two parts, one relating to survey contracting and project management, with an associated survey project undertaking, whilst secondly reviewing the role of surveyors within a broader range of projects, professional ethics and the law of the sea.

The first part of the module takes students through the application of ‘Best Practices’ and ‘Survey Specifications’, quality assurance and validation of survey projects. Survey planning and costing is pursued further through a tendering exercise, which is consolidated by the completion of a digital survey, during a fieldweek, and subsequent completion of survey reports and presentation of the surveyed data, thus simulating the conduct and completion of a ‘real-life’ survey contract.

Professionalism addresses the liability of the surveyor, the application and observance of the Law of the Sea, nearshore, environmental and heritage legislation.

5. Digital Mapping (Core module, 20 credits). This module is shared with the MSci Ocean Science programme.

This module considers the information flow through a system for hydrographic survey from data acquisition to the final product and the means of assurance of data quality throughout. To critically examine the influences of user interaction on the processing of data at the various stages.
The module aims to provide an understanding of digital data acquisition, formats, exchange, protocols and management as employed in the survey environment.

In summary of module content, it assesses on-line acquisition and quality control in hydrographic survey: system requirements; communications between devices; data preparation and definition, computational parameters, presentation, error identification and quality estimators. During processing it assesses the post-processing of acquired data: reprocessing, correction and reduction of information, display and editing, quality control and presentation of hardcopy output. In addition, the production of digital information: digital ground modelling, volume calculations, data structures, interpolation, visualisation, error modelling and uncertainty.

6. **Option** (20 credits) from:

Option 1. MAR 507 Economics of the Marine Environment
Option 2. MAR 530 Managing Marine Ecosystems
Option 3. MAR 529 Marine Planning
Option 4. MAR 517 Coastal Erosion and Protection
Option 5. MAR 518 Remote Sensing & GIS

**Option 1 - Economics of the Marine Environment** (20 credits). [MSci option] Using an Ecological economics perspective this module aims to provide a critical overview of economic activities in the marine environment, their associated problems and potential economic solutions. The module will enable students to: develop their knowledge and understanding of how the marine environment and its resources can be valued in monetary and non-monetary terms; evaluate the use of economic tools and incentives in solving over-exploitation and misuse of the marine environment; and develop problem solving skills using a problem based learning approach.

**Option 2 - Managing Marine Ecosystems** (20 credits). [MSci option] This module will discuss the characteristics of a range of marine ecosystems. It will explore the threats to which these ecosystems are exposed and consider the mechanisms available for their management and conservation. Using case studies, contemporary research, and practitioner input, the module will evaluate the key factors necessary to effectively manage marine ecosystems.

**Option 3 - Marine Planning** (20 credits). This module evaluates the emergence and practice of marine planning in UK waters. It will explore the techniques available for developing marine plans and demonstrate the role which may be played by geographic information systems and other tools. Through lectures, field visits and
case studies, it will also develop the learner’s knowledge of the marine environment as required for marine planning.

**Option 4 - Coastal Erosion & Protection** (20 credits). [MSci option] This module provides an understanding of nearshore hydrodynamics (breaking waves and currents), sediment transport and coastal evolution. Hard and soft engineering methods of coastal protection are covered, with an emphasis on how improved understanding of the natural processes can be used to improve coastal evolution models. Students work in teams to carry out a large, case study, modelling exercise. These student teams then present their work and obtain formative feedback before going on to complete detailed individual written reports to a professional standard.

**Option 5. Remote Sensing & GIS** (option, 20 credits). [MSci option] This module introduces the principles and techniques of remote sensing and Geographical Information Systems (GIS) and demonstrates their application in marine science. Lectures cover the spectral response of the water column, the gathering, processing and interpretation of satellite data and issues surrounding data availability and accuracy in GIS. Students undertake hands-on processing of remotely sensed data and tutorials using GIS packages in specialist remote sensing and GIS laboratories.

7. **Programme Aims**
The overarching aim of this programme is to produce masters-level students with the knowledge and skills required to pursue a research or professional career in the hydrographic sector, or within a marine science area.

Specifically, the programme is intended to:

**A1** Develop a comprehensive and detailed scientific knowledge and understanding of hydrographic data capture and an evaluation of survey errors.

**A2** Provide an advanced knowledge of hydrographic sensor capabilities and their limitations.

**A3** Acquire an appreciation of the linkages between physical, biological and anthropogenic aspects of marine environments and their associated measurement technologies.

**A4** Develop a portfolio of management and hydrographic specific skills required to assimilate and apply knowledge over a wide range of relevant disciplines and client requirements.

**A5** Provide postgraduates with the knowledge and skills required to effectively monitor and measure the marine environment in a safe and effective manner.
A6 Further develop one’s ability to effectively plan, execute and conduct complex, high-level hydrographic investigations including the rigorous analysis of data. A7 Enlighten and enable postgraduates to interpret complex information and datasets to a level that facilitates decisions related to the managing of marine development A8 Develop postgraduates capable of the dissemination of their work to the highest level. A9 Produce postgraduates capable of contributing to research and development teams; participating within hydrographic measurement, the exploitation of the marine environment and consultancy; within a professional environment.

8. **Programme Intended Learning Outcomes**

8.1. **Knowledge and understanding**

On completion of this course, graduates should have developed:

1. A systematic understanding of knowledge and a critical awareness of current survey requirements and new insights into a knowledge of the physical sciences of data capture [A1, A2, A3]
2. A comprehensive understanding of the marine environment, its measurement and the impact of the environment upon infrastructure development [A1, A2, A3]
3. A comprehensive understanding of observation, measurement, and analysis techniques applicable to hydrography and associated error budgets [A4, A5]
4. Demonstrate a practical understanding of how established techniques of measurement are used to create and interpret knowledge in geo-marine science and with respect to the seabed and/or sub-seabed structure [A4, A5, A6]

8.2. **Cognitive and intellectual skills**

On completion, graduates should have developed a conceptual understanding that enables them to:

1. Critically evaluate current measurement, research and advanced scholarship within hydrography [A1, A2, A3]
2. Evaluate methodologies and develop critiques of them [A4, A5, A6]
3. Propose new hypotheses for data acquisition, processing and visualisation [A6, A8]
4. Demonstrate originality in their application of knowledge [A6, A8]
8.3. **Key and transferable skills**
On successful completion graduates should have developed the ability to:
1. Deal with complex hydrographic issues both systematically and creatively [A6]
2. Make sound judgements in the absence of complete datasets [A7]
3. Communicate survey results clearly to specialist and non-specialist audiences. [A8]

8.4. **Employment related skills**
On completion, graduates should have developed the qualities and transferable skills necessary for employment requiring:
1. The exercise of initiative and personal responsibility for data management and capture [A6, A8, A9]
2. Decision-making and management in complex and unpredictable situations affecting data capture [A5, A6, A9]
3. The independent learning ability required for continuing professional development and application of survey ethics [A4, A7, A8]
4. The ability to continue to advance their knowledge and understanding, and to develop new skills to a high level within the hydrographic sector of industry [A4]

8.5. **Practical skills**
On successful completion graduates should have developed the:
2. Ability to act autonomously and in teams in planning and implementing tasks at a professional level [A5, A6, A9]
3. Ability to independently use specialist hydrographic and geophysical software and equipment [A5, A6, A9]

9. **Admissions Criteria, including APCL, APEL and DAS arrangements**
This programme primarily aims to recruit science, technologists and engineering graduates, although applications will be considered from well-qualified graduates in other disciplines with relevant experience and/or professionals with extended relevant experience in geospatial data acquisition and/or processing

Application will be through the usual system for application to Masters degrees within the University. Candidates require an appropriate background in science, technology or engineering to honours degree level (normally 2:2 or above) or equivalent.
Candidates are required to submit transcripts of supporting documents such as a 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.

Candidates wishing to top-up their degrees from the Postgraduate Diploma in Hydrographic Surveying, as offered via the Royal Navy FOST HMAS (Flag Officer Sea Training - Hydrography and Meteorology Advanced Survey) Course, at HMS Drake - as accredited within the Plymouth University Colleges partnership - may be liable for APCL of their accrued 120 credits and permitted to register directly for the 60-credit dissertation module, for a further award of MSc Hydrography, on the provision of submission of an acceptable 6-page project proposal document, alongside their application for APCL.

Candidates, having previously accepted an award of BSc Ocean Science (Exploration and Survey), who can demonstrate a minimum of 12-month’s related industrial employment in the fields of geophysical survey and ‘survey’ positioning, during the intervening period, may be exempt from completing the mandatory core hydrography modules within Semester One, namely MAR 520 and MAR521, but will be expected to attain an equivalent 40 Level-7 credits from elsewhere within the Marine Science Postgraduate scheme, before progressing to semester two modules, so as to register a total of 180 Level-7 credits. This would then allow for an enhancement and for differentiation from the lower MSci Ocean Science award.

Plymouth University 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 the late 1970s and has a proven track record of recruiting from a truly international cohort of students.

10. Progression criteria for Final and Intermediate Awards
The MSc in Hydrography award requires a minimum of 180 credits and is categorised into grades:

**MSc 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 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:**
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, where both are present, and at least 50% in the overall module mark, or 50% overall if a coursework only module.

**Exit award titles:**
- **Postgraduate Certificate** on completion (≥50%) of 60 credits.
- **Postgraduate 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 10-credit modules from the former MSc Hydrography scheme to complete their studies within the framework of the new scheme. In all cases the pending changes to the Hydrography scheme will be discussed with part time applicants and advice will be given by the programme leader on the selection of modules that will be compatible with the new
scheme. If a student fails a 10 credit module they will need to take the full 20 credit replacement but will only be charged for 10 credits.

### 2014/15 modules and 2015/16 replacements

<table>
<thead>
<tr>
<th>2014/15 modules (10 credits)</th>
<th>2015/16 modules (20 credits)</th>
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<tbody>
<tr>
<td>IMS5101 Research Skills</td>
<td>MAR513 Research Skills &amp; Methods</td>
</tr>
<tr>
<td>EAR5101 Research Methods</td>
<td>MAR513 Research Skills &amp; Methods</td>
</tr>
<tr>
<td>IMS5104 Methods in Hydrography</td>
<td>MAR520 Hydrography</td>
</tr>
<tr>
<td>IMS5105 Positioning &amp; Geodesy</td>
<td>MAR520 Hydrography</td>
</tr>
<tr>
<td>ENV5105 Oceanography &amp; Sedimentation</td>
<td>MAR521 Acoustic &amp; Oceanographic Surveying</td>
</tr>
<tr>
<td>IMS5106 Geophysical &amp; Acoustic Sensing</td>
<td>MAR521 Acoustic &amp; Oceanographic Surveying</td>
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## 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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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MAR513 Research Skills &amp; Methods</td>
<td>MAR521 Acoustic &amp; Oceanographic Surveying</td>
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<tr>
<td>MAR523 Digital Mapping</td>
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<td>MAR520 Hydrography</td>
<td>MAR518 Remote Sensing &amp; GIS</td>
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<td>MAR517 Coastal Erosion &amp; Protection</td>
<td>MAR520 Economics of the Marine Environment</td>
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<td></td>
<td>MAR530 Managing Marine Ecosystems</td>
<td>MAR524 MSc Dissertation</td>
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### Knowledge and Understanding [sect. 8.1]

<table>
<thead>
<tr>
<th></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 survey requirements and new insights into a knowledge of the physical sciences of data capture</td>
<td>A1, A2, A3</td>
<td>☐ ☐ ☐</td>
<td>☐ ☒ ☒ ☒ ☒</td>
</tr>
<tr>
<td>A comprehensive understanding of the marine environment, its measurement and the impact of the environment upon infrastructure development</td>
<td>A1, A2, A3</td>
<td>☐ ☐ ☐</td>
<td>☐ ☒ ☒</td>
</tr>
<tr>
<td>A comprehensive understanding of observation, measurement, and analysis techniques applicable to hydrography and associated error budgets</td>
<td>A4, A5</td>
<td>☐ ☐ ☐</td>
<td>☐ ☒</td>
</tr>
<tr>
<td>Demonstrate a practical understanding of how established techniques of measurement are used to create and interpret knowledge in geo-marine science and with respect to the seabed and/or sub-seabed structure</td>
<td>A4, A5, A6</td>
<td>☐ ☐ ☐</td>
<td>☐ ☒</td>
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### Cognitive and intellectual skills [sect. 8.2]

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<th>Aims</th>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>Evaluate critically current measurement, research and advanced scholarship within hydrography;</td>
<td>A1, A2, A3</td>
<td>☐ ☐ ☐</td>
<td>☐ ☒ ☒ ☒ ☒</td>
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<tr>
<td>Evaluate methodologies and develop critiques of them</td>
<td>A4, A5, A6</td>
<td>☐ ☐ ☐</td>
<td>☐ ☒</td>
</tr>
<tr>
<td>Propose new hypotheses for data acquisition, processing and visualisation</td>
<td>A6</td>
<td>☐ ☐</td>
<td>☐</td>
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<tr>
<td>Demonstrate originality in their application of knowledge</td>
<td>A6</td>
<td>☐ ☐</td>
<td>☐</td>
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### 13.2 Assessment against Modules

**Modules (Core modules in bold)**

<table>
<thead>
<tr>
<th>Aims</th>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td><strong>Formative</strong></td>
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<tr>
<td>Tutorials</td>
<td>A1, A2, A3</td>
<td>☐ ☐ ☐ ☐ ☐ ☐ ☐</td>
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<tr>
<td>Use of specialist equipment or software</td>
<td>A4, A5</td>
<td>☐ ☐ ☐ ☐ ☐ ☐ ☐</td>
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<tr>
<td><strong>Summative</strong></td>
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<tr>
<td>Data Analysis &amp; Presentation (incl. written and oral)</td>
<td>A1, A2, A3, A7, A8</td>
<td>☐ ☐ ☐ ☐ ☐ ☐ ☐</td>
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<tr>
<td>Scientific Writing, Professional Reports &amp; Dissertations</td>
<td>A1, A2, A3</td>
<td>☐ ☐ ☐ ☐ ☐ ☐ ☐</td>
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<tr>
<td>Planning &amp; Research Proposals</td>
<td>A6</td>
<td>☐</td>
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<tr>
<td>Group/team work</td>
<td>A9</td>
<td>☐ ☐ ☐</td>
</tr>
<tr>
<td>Use of specialist equipment or software</td>
<td>A4, A5</td>
<td>☐ ☐ ☐</td>
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### 13.3 Programme Intended Skills vs. Aims

#### Modules (core modules in bold)

<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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</thead>
<tbody>
<tr>
<td>MAR513 Research Skills &amp; Methods</td>
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<tr>
<td>MAR520 Hydrography</td>
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<tr>
<td>MAR521 Acoustic &amp; Oceanographic Surveying</td>
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<td>MAR 523 Digital Mapping</td>
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<td>MAR522 Survey Project Management</td>
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<td>MAR518 Remote Sensing &amp; GIS</td>
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<td>MAR517 Coastal Erosion &amp; Protection</td>
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<tr>
<td>MAR507 Economics of the Marine Environment</td>
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<td>MAR530 Managing Marine Ecosystems</td>
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<td>MAR529 Marine Planning</td>
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<tr>
<td>MAR524 MSc Dissertation</td>
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</table>

### Key and Transferable Skills [sect. 8.3]

- **Deal with complex hydrographic issues both systematically and creatively**
  - A6
- **Make sound judgements in the absence of complete data**
  - A6, A7
- **Communicate survey results clearly to specialist and non-specialist audiences**
  - A8

### Employment Related Skills [sect. 8.4]

- **Exercise of initiative and personal responsibility for data management and capture**
  - A9
- **Decision-making and management in complex and unpredictable situations affecting data capture**
  - A5, A9
- **Independent learning ability required for continuing professional development and application of survey ethics**
  - A4
- **Ability to continue to advance their knowledge and understanding, and to develop new skills to a high level within the hydrographic sector of industry**
  - A4

### Practical Skills [sect. 8.5]

- **Capacity for self-direction and originality in tackling and solving hydrographic problems**
  - A4, A5
- **Ability to act autonomously and in teams in planning and implementing tasks at a professional or equivalent level**
  - A9
- **Ability to independently use specialist hydrographic and geophysical software and equipment**
  - A5