

University of Plymouth

Faculty of Technology

Programme Specification

Programme titles

BEng (Hons.) Mechanical Engineering

**BEng (Hons) Mechanical Engineering with Composites (formerly known
as Composite Materials Engineering)**

BEng (Hons.) Marine Technology

Date of production: July 2005

Date of initial approval ... by (e.g. Approval Panel/ Faculty Board)

Brief description of programme

Engineers are essential for turning dreams or ideas into reality. Most moving manufactured objects have mechanical engineering input, so graduates develop a broad range of knowledge and skills. Many interesting and rewarding careers are available. Accreditation by professional bodies gives graduates a good start to obtaining Chartered Engineer status.

Distinctive features (including special features such as placements, part time, distance learning, fieldwork, typical careers)

Academic features of the scheme are that design is used as an integrating thread throughout the three stages. An important recent development is the introduction into stage one of a new module 'Design as a Generic Tool' which is intended to introduce students to the broad context of engineering. It is anticipated that this will help to develop motivation and prevent some weaker students getting 'bogged down' and consequently losing interest.

All students are encouraged to take a year's placement after year two (thick sandwich mode).

The opportunity of working in international design groups with competitive scholarships funding travel.

These courses prepare students for a very wide range of careers.

These courses are accredited by the following professional bodies:

IMechE - all three courses

IoM3 - Mechanical Engineering with Composites

IMarEST, RINA - Marine Technology

Chartered engineering status is available with an appropriate matching section.

Entry requirements for the programme and transfer between programmes

The overriding consideration in setting out these admission requirements is evidence that the student will be able to fulfil the objectives of the programme and achieve the standard required for the award.

Applicants should normally have reached the age of 18 by 31 December in the year in which they start on the programme. All applicants will be expected to have had a good general education and in particular to have demonstrated an adequate knowledge of the English Language and of Mathematics. Candidates must satisfy the minimum admission requirements for a Degree programme at the University of Plymouth which are in force at their time of application.

Admission to Stage 1

(i) Progression from Foundation Year

Students who have passed the Foundation Year and wish to proceed to Stage 1 will normally be required to have achieved marks in line with those specified by the relevant professional body. Students who pass the foundation year with lower marks will normally progress to a BSc or HND programme.

(ii) **GCSE Entrants**

The minimum entry qualification is normally:

- GCSE passes, at Grade C or above, in five subjects including Mathematics, Physics (or General Studies) and English; **plus**
- an 'A2' level in a Mathematical subject plus an 'A2' level Physics/Engineering/Technology subject;

Applicants are normally expected to have 240 or more 'A2' and / or 'AS' level 'points'.

Equivalents:

An 'O' level pass or a Grade 1 CSE pass will be accepted as the equivalent of a pass in the GCSE.

Two AS level passes will normally be accepted as the equivalent of one 'A' level pass. Four AS level passes may in some circumstances be acceptable in lieu of two 'A' level passes.

NOTE that an AS level in Mathematics will **not** normally be considered adequate preparation in Mathematics for entry into stage 1.

(iii) **BTEC OND/ND or ONC/NC Entrants**

The minimum entry requirement is normally:

- a pass in a BTEC Certificate or Diploma programme which includes five merit passes at level III including Mathematics and two Technology subjects.

(iv) **BTEC/HND Entrants**

The minimum entry requirement is normally a pass.

(v) **Advanced GNVQ**

A merit in Advanced GNVQ in Manufacturing providing that mathematics, with additional options and engineering science to at least BTEC level III merit standard have been passed, together with a firm recommendation from the GNVQ programme tutor. A merit in Advanced GNVQ in Engineering providing that mathematics with additional options and engineering science to at least BTEC level III merit standard, together with a firm recommendation from the GNVQ programme tutor.

(vi) **BSc(Hons)/BSc/HND Mechanical Design and Manufacture, Stage 1**

A good pass in Stage 1 of the above BSc(Hons)/BSc/HND, run in the Department may enable a student, should he wish, to be transferred into the 1st stage of this BEng course.

(vii) **Alternative Qualifications**

Qualifications deemed to be equivalent to the above will normally be accepted. These include pre-BTEC OND/ONC/HND/HNC qualifications, Foundation Year (pass to BEng (Hons) degree level) and approved overseas qualifications.

Mature students offering experience plus acceptable qualifications may also be considered.

Admission to Stages 2 and 3

Admission to Stages 2 and 3 of the programme is either by progression from the previous Stage of the programme or by direct entry.

A student who has achieved a high standard in an appropriate Higher National Diploma or BTEC Higher National Diploma, or who wishes to transfer from a programme elsewhere, may be allowed direct entry (as appropriate) to Stage 2 or, exceptionally, to Stage 3 of the programme. The achievements of candidates for direct entry must be such as to satisfy the Head of Department that the content of the previous Stages of the programme has been substantially covered by the exempting studies, and that the level of attainment indicates that the candidate can be reasonably expected to complete the programme satisfactorily.

Transfer Between the Courses

As the first 4 terms of the three courses are common, students may, subject to agreement with the course co-ordinator, change courses during this time.

Programme aims (aims need to match intended learning outcomes. Where aims are held in common across a suite of programmes, list these first and then indicate those which differentiate between programmes)

Common Aims

The Faculty of Technology shares the values of the University and supports its mission through the provision of a range of courses relevant to the theory and practice of engineering. The overarching aims of these courses are:

1. To be informative, challenging and establish a knowledge base suitable for a future career in Engineering.
2. To give students with a variety of entry qualifications an opportunity to realise their potential.
3. To enrich curriculum content and teaching quality through the professional and research expertise of staff and industrial links.

4. To encourage and support students whilst they develop and learn to apply technical and transferable skills that will facilitate life long learning and continuing professional development.
5. To produce Graduates who can make a significant contribution to their professional field or business.

Objectives - Learning Outcomes

In addition to the Faculty of Technology's Aims, these BEng (Hons) courses have specific objectives as shown below.

Objectives:

Graduates from these BEng (Hons) courses should be able to:

1. adopt an integrated approach to design, manufacturing, materials and engineering;
2. demonstrate appropriate knowledge of the applied science which underpins the practice of engineering;
3. apply analytical skill in using the principles of engineering science in the solution of problems;
4. apply practical skills in engineering measurement and experimentation;
5. use modern computer aided engineering tools;
6. specify processes and techniques used in engineering manufacture;
7. demonstrate an awareness of standards, codes, risk assessment and reliability;
8. display an awareness of the engineer's role in business and their responsibilities to society and the natural environment;
9. communicate effectively, clearly and concisely by written, verbal and graphical techniques;
10. work effectively in a team.
11. display a creative approach to engineering design;

Differentiating Features of the Individual Courses

In addition to the aims and objectives that are common to these three BEng (Hons) courses, students who have successfully completed the Mechanical Engineering course will be able to demonstrate in-depth knowledge of Manufacturing, Deformation, Failure Mechanisms and either of Thermal and Fluids or Control and Intelligent System Design.

The students who have successfully completed the Marine Technology course will be able to demonstrate an in-depth knowledge of Marine Engineering and Naval Architecture and those students who have successfully completed the Composite Materials Engineering Course will be able to display in-depth knowledge of the design and manufacture of components from composite materials.

Intended programme learning outcomes (knowledge, understanding and skills that make up the Graduate Attributes and Skills Profile. Where intended learning outcomes are held in common across a suite of programmes, list these first, then indicate those which differentiate the programmes.)

The overall learning outcome of these degree courses is that their graduates will be able to exercise their engineering, analytical, communication and creative skills at a level of competence generally to be expected of Chartered Engineers. A threshold level of competence is indicated by the award, with a spectrum of competence reflected in the degree classification of any individual graduate.

The specific intended learning outcomes in accordance with the UK Framework for Higher Education Qualifications of the Programme for each of the 3 award levels are as follows:

Certificate Level:

1. Knowledge of the underlying concepts and principles associated with mechanical engineering, marine technology and composite materials and an ability to evaluate, apply and interpret these.
2. An ability to present, evaluate, and interpret qualitative and quantitative data, to develop lines of argument and make sound judgments in accordance with basic theories and concepts of mechanical engineering, marine technology and composite materials.
3. Evaluate the appropriateness of different approaches to solving problems related to their field of engineering or work.
4. Communicate the results of their study/work accurately and reliably, and with structured and coherent arguments
5. Apply relevant CAE tools to solving design problems in mechanical engineering, marine technology and composite materials.
6. Undertake further training and develop new skills within a structured and managed environment.
7. Qualities and transferable skills necessary for employment requiring the exercise of personal responsibility.
8. Carry out laboratory investigations in mechanical engineering.

Intermediate Level:

1. Knowledge and critical understanding of the well established principles of mechanical engineering, marine technology and composite materials and the ways in which those principles have developed
2. Knowledge of the main methods of enquiry in mechanical engineering, marine technology and composite materials
3. An understanding of the limits of their knowledge, and how this influences analyses and interpretations based on that knowledge
4. Ability to apply underlying concepts and principles outside the context in which they were first studied
5. Ability to evaluate critically the appropriateness of different approaches to solving problems in mechanical engineering, marine technology and composite materials.

6. Use a range of established techniques to initiate and undertake critical analysis of information, and to propose solutions to problems arising from that analysis
7. Effectively communicate information, arguments, and analysis, in variety of forms, to specialist and non specialist audiences, and deploy key techniques of computer-aided engineering effectively
8. Apply relevant CAE tools to solving design problems in mechanical engineering, marine technology and composite materials.
9. Application of underlying concepts and principles in an employment context
10. Undertake further training, develop existing skills and acquire new competencies that will enable them to assume significant responsibilities within organisations
11. Qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and decision making.
12. Carry out experimental investigations in mechanical engineering, marine technology and composite materials engineering.

Honours Degree Level:

1. A systematic understanding of mechanical engineering, marine technology and composite materials, including acquisition of coherent and detailed knowledge, at least some of which is at, or informed by, the forefront of computer-aided engineering.
2. An ability to deploy accurately established techniques of analysis and enquiry within mechanical engineering, marine technology and composite materials.
3. An appreciation of uncertainty, ambiguity and the limits of knowledge
4. Apply the methods and techniques that they have learned to review, consolidate, extend and apply their knowledge and understanding, and to initiate and carry out design projects supported by CAE
5. Conceptual understanding that enables the student:
 - to devise and sustain arguments, and / or solve design problems, using ideas and techniques, some of which are at the forefront of computer-aided engineering; and
 - to describe and comment upon particular aspects of current research, or equivalent advanced scholarship, in mechanical engineering, marine technology and composite materials.
6. Critically evaluate arguments, assumptions, abstract concepts and data (that may be incomplete), to make judgments, and to frame appropriate questions to achieve a solution - or identify a range of solutions - to a problem
7. The ability to manage their own learning, and to make use of scholarly reviews and primary sources (e.g. refereed research articles and/or original materials appropriate to mechanical engineering, marine technology and composite materials.
8. Communicate information, ideas, problems, and solutions to both specialist and non specialist audiences
9. Apply relevant CAE tools to solving design problems in mechanical engineering
10. Qualities and transferable skills necessary for employment requiring:
 - the exercise of initiative and personal responsibility;
 - decision making in complex and unpredictable contexts and
 - the learning ability needed to undertake appropriate further training of a

professional or equivalent nature

11. Ability to undertake effective team-based design activities.

12. Plan and execute a significant individual piece of investigative work.

Refer to the Intended Learning Outcomes map in Appendix A for details of the modules that contribute to meeting the intended learning outcomes and the relationship to meeting the engineering benchmark for the honours degree award.

Link to subject benchmark(s)

Engineering, see attached table.

Teaching learning and assessment strategies (including any differences between levels)

A wide range of teaching strategies are adopted, including lectures, example classes, seminars, tutorials, group work and projects. Personal skills and creativity are developed through practical work and design projects. Communication skills in written, spoken and graphic forms are developed through a variety of exercises related to the modules. Presentations of work are also carried out. The assignments are designed to ensure that the students spend time both working independently and working collaboratively in teams.

For the majority of modules support materials are provided in electronic form, either on the student portal or on the publicly available School web pages, in order to facilitate convenient access by students. Furthermore, this permits display and printing of such materials in a form suited to the individual (in accordance with SENDA).

Because of the diversity of the subjects covered, a range of assessment methods is appropriate. An examination is not an appropriate way to assess projects or open-ended designs, hence these modules do not include formal examinations. An approach involving 'Engineering Assignments' also facilitates the development of numeracy, communication skills and (where appropriate) group working skills.

Stage 1

The emphasis in Stage 1 is on establishing the fundamental principles of the core disciplines necessary for the application of computing in engineering design work. The week prior to the start of the modular programme is for induction. This will be used to introduce both the professions relating to these courses and the particular courses. Students are also introduced to learning and study concepts and services provided by the University.

Considerable importance is attached to bringing students from different backgrounds up to the same mathematical level. A mathematical 'diagnostic test' is conducted during Induction Week, the results of which help the staff identify students with particular needs. Revision notes on selected topics are available and text books at the appropriate level are recommended to certain students. The standard text for Stage 1 modules now incorporates a number of 'Foundation Topics' which are written such that students can work through them at their own

pace. Students may also attend the weekly 'Mathematics Surgery' run by the School of Mathematics and Statistics.

Students are introduced to the concept of undertaking their own personal development planning (PDP) whilst studying in the University. This is supported by the Personal Development Planner on the student portal.

In particular stage 1 provides the opportunity for students to develop skills in mathematics; design and CAD; engineering science; manufacture and materials; business studies and quality and project management.

To encourage the development of a systematic approach to study, emphasis is placed on tutorial classes and strong personal tutor support is provided.

Stage 2

In addition to developing further the principles of engineering design, mechanics, thermo- and fluid dynamics, mathematics and business dynamics, the students start to study topics specific to their course title: Resistance and propulsion, the marine environment and specialist materials. Similar teaching strategies are adopted in Stage 2 as in Stage 1. The main differences are that greater emphasis is given to the practice of design and the application of theory, and that more reliance is placed on a student's self-motivation.

Stage 3

The design theme continues to be developed into a group design project this stage and there is a module on statistics and one of failure mechanisms and mechanics. In addition, there is also emphasis on self-managed work in the individual project. The other modules relate to the subject matter of the degree title. Detail is provided in the course structure table which accompanies this document.

Programme structure and pathways

The courses structure and module list are summarized in the accompanying tables.

Key: Cw = Coursework, Ex = Exam

Exemptions/ special academic regulations (as agreed at approval)

For the award of a BEng (Hons) students must pass their final year project with a mark of at least 40%.

Final Award title

BEng (Hons) Mechanical Engineering
BEng (Hons) Mechanical Engineering with Composites
BEng (Hons) Marine Technology

All level H

Intermediate Award title(s)

Certificate of Higher Education
(120 level 1 credits achieved)

Diploma of Higher Education
(240 credits achieved, including at least 120 at level 2)

Awarding Institution
Teaching Institution

University of Plymouth
University of Plymouth

Accreditation Bodies:

IMechE - all three courses
IoM3 - Mechanical Engineering with Composites
IMarEST, RINA - Marine Technology

UCAS code: Mechanical Engineering: H300
Mechanical Engineering with Composites: J510
Marine Technology: J610

JACS code

Appendix to programme specification

The mapping document showing intended programme outcomes at each level of the award linked to FHEQ, subject benchmark and the core modules where these are primarily demonstrated accompanies this document.