UNIVERSITY OF NEWCASTLE UPON TYNE

FACULTY OF SCIENCE, AGRICULTURE & ENGINEERING

DEGREE PROGRAMME SPECIFICATION

UNIVERSITY OF NEWCASTLE

1.	**Awarding Institution**	University of Newcastle upon Tyne
2.	**Teaching Institution**	University of Newcastle upon Tyne
3.	**Final Award**	M.Eng.
4.	**Programme Title**	Masters of Engineering in Mechanical Engineering (with Honours in one of seven named options) (Ref: Degree Programme Handbook: http://www.ncl.ac.uk/mech/undergrad/programme/)
5.	**Programme Accredited by:**	I.Mech.E., I.E.E., and for HJ3M only I.o.M^3
6.	**UCAS Code**	M.Eng. with Honours in:

Mechanical Engineering	H301
Mechanical & Automotive Eng.	H341
Mechanical & Design Engineering	H771
Mechanical & Manufacturing Eng.	HH37
Mechanical Eng. & Mechatronics	HH36
Mechanical & Materials Engineering	HJ3M
Mechanical Engineering (Europe)	H302
Foundation Year entry: (UCAS2004)	H305

7.	**QAA Benchmarking Group(s)**	Engineering Benchmark (Benchmark Statements, QAA, Gloucester, 2002)
8.	**Date of production/revision**	(January 2002) revised April 2004, October 2004

9. Educational Aims of the Programme

All of the M.Eng. programmes aim to:

- provide early exposure to engineering science, manufacturing, materials and design.
- specialise in the later stages, generally in a specified area of engineering, to enhance graduates' professional capability in their chosen field.
- meet the requirements of the relevant Accrediting Chartered Engineering Institutions.
- Provide a qualification which meets the designated learning outcomes at level 4(M-level) of the National Qualifications Framework and the QAA Benchmarks in Engineering

10. Intended Learning Outcomes; Teaching and Learning Strategies and Methods; Assessment

All programmes provide opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

A. Knowledge & Understanding

A.1. Comprehensive knowledge and understanding of mathematical methods appropriate to Mechanical Engineering and related fields;
A.2. Extensive knowledge of core Engineering science with greater depth in selected areas;
A.3. Principles of IT with specific applications to selected fields of study and awareness of developing technology;
A.4. Principles of Engineering Design including awareness of Codes of Practice;
A.5. Wide knowledge of Mechanical Engineering design and where appropriate design in other selected specialist fields;
A.6. Extensive knowledge of the properties and characteristics of engineering materials and components;
A.7 Understanding of management principles and business practices;
A.8 Professional and ethical responsibilities;
A.9. Manufacturing practice and awareness of requirements for safe operation.

Teaching/learning methods and strategies:

Acquisition of A.1 and A.2 is through a combination of lectures, tutorials, example classes, laboratory activities and coursework.
Outcome A.3 is achieved by lectures, tutorials and, where appropriate, hands-on computer exercises.
Acquisition of A.4 and A.5 is partly by lecture and tutorial, but depends on case studies, student investigations, group tasks and presentations. Individual studies to greater depth are frequently needed during the Stage 3 and 4 projects.
Outcome A.6 depends primarily on lectures and tutorial studies.
The broader professional outcomes, A.7, are taught by lectures and coursework studies.
Outcomes A.8 and A.9 are formally taught in lectures, but is also central to experimental project investigations.

B. Intellectual Abilities

B.1. The fundamental knowledge to select and apply appropriate mathematical methods for modelling and analysing relevant problems;
B.2. Use of scientific principles in the development of engineering solutions to practical and unfamiliar problems in selected fields of study;
B.3. Use of scientific principles in the modelling and analysis of engineering systems, processes and products;
B.4. Ability to recognise the capabilities and limitations of computer based methods for modelling and analysing problems in selected fields;
B.5. Analysis of systems, processes and components requiring engineering solutions including unfamiliar and incomplete data;
B.6. Creation of new processes or products through synthesis of ideas from a wide range of sources;
B.7. Commercial risk evaluation;
B.8. Generate ideas to produce solutions to problems through the integration and application of engineering knowledge and understanding;
B.9. Ability to undertake technical risk evaluation.

Teaching/learning methods and strategies

Where appropriate, B.1. is reinforced in lectures, but learning is principally in tutorials and assignments.
Outcomes B.2 – B.4. are initially encountered in lectures and practical classes, but are developed principally during the research project.
Acquisition of B.5. occurs through lectures and design studies and may form a major part of projects.
B.6. is introduced in lectures and developed through tutorials, design studies and the project.
Outcome B.7. is included in some optional lectures, but is primarily taught on an individual basis as part of the project supervision.

Assessment

Unseen and open-book examinations are used to assess intellectual abilities.
Assessed coursework provides further opportunities to demonstrate intellect and ability.
The project, which is assessed by dissertation and viva voce examination, provides final evidence of the levels attained.

C. Practical Skills

C.1. Skill in the use of appropriate mathematical methods for modelling and analysing engineering problems in selected fields;
C.2. Use of relevant test and measurement equipment;
C.3. Experimental laboratory work;
C.4. Use of engineering IT tools including assessment of limitations in particular cases;
C.5. Ability to design a system, component or process in selected fields;
C.6. Practical testing of design ideas through laboratory work or simulation with technical analysis and critical evaluation of results;
C.7. Ability to research information and develop and evaluate a range of new solutions;
C.8. Ability to apply engineering techniques taking account of industrial and commercial constraints;
C.9. Project Management including monitoring and adjusting a personal programme of work.

Teaching/learning methods and strategies

Outcomes C.1-C.3. are acquired principally through experience of the project.
Acquisiton of C.4. is initially through lectures, developed through hands-on exercises and assignments. Further individual learning may also form a significant part of the project.
C.5. is introduced through lectures and developed through case studies and design activities. It will frequently form a central part of the project.
Laboratory classes provide initial experience of C.6. and C.7., but the project forms the principal vehicle for their acquisition.
Outcome C.8. is introduced through lectures and developed by case studies. Some projects may require further individual learning in this area.
C.9. is introduced in lectures and developed through application to projects throughout the course.

Assessment

Outcomes C.1-C.8 are not explicitly assessed, but are necessary to complete successfully coursework and project requirements.

D. General Transferable Skills

D.1. Manipulation and sorting of data;
D.2. Presentation of data in a variety of ways for maximum impact;
D.3. Use of scientific evidence based methods in the solution of problems;
D.4. Use of general IT skills;
D.5. Use of creativity and innovation in problem solving;
D.6. Select appropriate data when working with limited or contradictory information;
D.7. Integrate presentational techniques for maximum impact;
D.8. Life long learning;
D.9. The Engineering approach to the solution of problems;
D.10. Time and resource management;
D.11. Teamwork and leadership.
D.12 Foreign language and related social skills

Teaching/learning methods and strategies

Outcomes D.1-D.7. may be introduced through examples in lectures. D.1-D.5 are developed further through assignments, laboratory exercises and design studies. Subsequently, the principal development of transferable skills occurs through involvement in the project.
D.8, D.9 and D.10 are implicit in much of the course, while D.11 is developed in group activities.
D.12. is taught in small groups in Newcastle and in a range of classes and by total immersion whilst overseas.

Assessment

Skills D.1-D.3 are essential to complete examination and assignments to a satisfactory standard.
Acquisition of D.4. and D.5. is demonstrated during the assessment of problems, case studies and the project.
Outcomes D.6 and D.7. are essential to complete satisfactorily the dissertation and project, which also requires command of outcomes D.1-D.5.
Where appropriate, D.12 is tested by written and oral examinations and presentations.

The above Learning Outcomes have been compared with the QAA Framework for Higher Education Qualifications Descriptor for a qualification at Masters (M) level. They are believed to meet or exceed the requirements of that Descriptor.

For each programme, some of the outcomes may be expressed more explicitly.

Mechanical Engineering

A.2. The scientific basis of a range of analytical tools with application in engineering, e.g. Finite Element Analysis and CFD.

B.2. Application of advanced analytical tools in the development of engineering solutions.

Mechanical & Automotive Engineering

A.2. Engineering science with particular reference to techniques appropriate to the automotive industry.

B.2. Applications, particularly those applicable to the automotive industry.

Mechanical & Design Engineering

A.3. Principles of IT with particular applications to design.

A.5. Both examples of generic Mechanical Engineering design and manufacture and in-depth exposure to particular fields, especially relating to power transmissions.

Mechanical & Manufacturing

A.7. Particular emphasis on management principles and business organisation.

B.4. Introduction to computer methods for business scheduling and organisation.

Mechanical & Mechatronics

A.2. Techniques of Mechanical and Electrical Engineering science, particularly those applicable to Mechatronic devices.

B.4. Ability to apply appropriate computer based methods for modelling and analysing problems in Robotics and Mechatronics.

Mechanical & Materials Engineering

A.2. Core engineering science, including an advanced knowledge and understanding in selected areas of Materials Science.

Mechanical Engineering (Europe)

A.2. Core engineering science, including experience of the approach at a partner European HEI.

D.12. Foreign language and related social skills, including experience of living and studying at a partner European HEI and, whenever possible, experience of business and workplace interaction with Engineering professionals in the host country.

11 Programme Features, Structure and Curriculum

The normal Undergraduate year is approximately 31 weeks, arranged in three terms and currently divided into two Semesters.

Every Honours student studies 120 credits in each Stage (or year). B.Eng. candidates conclude after Stage 3 (360 credits) and M.Eng. students after Stage 4 (480 credits). Candidates must complete one Stage before proceeding to the next; the only part-time study is limited provision for the repetition of failed modules.

The Ordinary degree allows for a reduced programme over three years: all candidates will have offered at least 300 credits before graduation.

There is a Faculty Foundation Year for candidates not adequately qualified to embark on Stage 1 of Degree Programmes.

Ref: Undergraduate Progress Regulations, Degree Programme Handbook: http://www.ncl.ac.uk/mech/undergrad/programme/

Stages 1 and 2 of all Honours programmes are common. Modules are compulsory, except for provision to study a European language.

Stage 1

Module code	Credit	Descriptive Title
EEE135	10	Electrical Engineering I
ENM105	20	Engineering Mathematics I
MMM111/123	15	Fundamentals of Thermofluid Dynamics
MMM114	10	Materials Science I
MMM122/162	20	Design I (inc study skills)
MMM151/124	15	Mechanics I
MMM159	10	Manufacturing Technology & Management
Either:		
ENG 101	10	Introductory Computing for Engineers
MMM120	10	Fundamentals of Engineering Modelling
Or:		
LC*	20	Modern European Language (French, German or Spanish)

A substantial mathematical base (A.1) is provided in ENM105, together with a range of modules providing core Engineering knowledge (A.2-A.4,A.5,A.6,A.7 and A.9). The more analytical subjects also address intellectual abilities (B.2,B.4) and transferable skills (D.2). Laboratory classes cover both practical (C.1,C.2,C.3,C.5) and transferable (D.1-D.6) skills. Design provides a first exposure to a wide range of learning outcomes, generally including elements of new knowledge (A.4-A.8) and a broad range of intellectual activities (B.1-B.6)

Stage 2

Module code	Credit	Descriptive Title
MMM225	20	Analytical & Statistical Techniques
EEE235	10	Electrical Engineering II
MMM231/261	15	Mechanics of Solids II
MMM232	20	Applications of Thermo-fluid Dynamics
MMM235/265	15	Engineering Design II
MMM251	10	Dynamics & Control II

MMM213	10	Manufacturing Technology
Either:		
MMM211	10	Materials Science II
MMM214	10	Manufacturing Systems & Professional Studies
Or:		
LC*	20 or 30	Modern European Language (totalling 130 credits for M.Eng.(Europe) candidates)

Stage 2 continues the approach established in Stage 1. Mathematical knowledge is developed for higher level study in MMM225. Technical modules extend both analytical and qualitative knowledge and engineering science (A.2,A.4,A.7,A.9,B.2). Design is also a significant theme and continues to develop learning outcomes, as in Stage 1.

Stages 3 and 4 of all M.Eng. programmes follow a common format, except for M.Eng.(Europe) where Stage 3 is based at a host HE Institution in the appropriate European country, or MEng (Automotive) students taking the Kettering stage 3 option
Ref: degree programme handbook http://www.ncl.ac.uk/mech/undergrad/programme
(Ref: M.Eng.(Europe) Year Abroad Supplementary Information: France, Germany, Spain)

Stage 3

Module Code	Credit	Descriptive Title
MMM392	30	Group Project III
ENG201	10	Introduction to Business Management
MMM331	10	Dynamics & Control III
and:		
	70	Compulsory modules relevant to the chosen Honours specialisation (See Appendix I)

Stage 3 contains a group design project, as befits the candidates' greater maturity and independence. The project addresses many learning outcomes including acquisition of new knowledge (A.3-A.9), intellectual abilities (B.1-B.7), practical skills (C.3-C.9) and transferable skills (D.1-D.7). Modules for a range of appropriate technical studies develop understanding to level 3 (A.1,A.2,A.4,A.7,A.8 and, where relevant, A.9) Management training also continues with ENG201 and, where the degree specialism warrants, further specialist modules.

Stage 4

Module Code	Credit	Descriptive Title
BUS310	10	Strategic Management & Organisational Theory
MMM498	40	Project
and:		
	70	Compulsory modules relevant to the chosen Honours specialisation (See Appendix I)

Stage 4 is designed to complete candidates' academic development as Chartered Engineers, which is endorsed by PSB Accreditation of the programmes. All students undertake an individual project, which enables them to demonstrate their achievement of the full range of learning outcomes of the course. Technical modules develop scientific knowledge to levels beyond Stage 3, consistent with the M-level

qualification.

See Appendix 2 for a matrix of the learning outcomes assessment strategy.

12 Criteria for Admission:

Admission offers normally conform to the UK Engineering Council "SARTOR" minimum requirements for M.Eng. and B.Eng with Chartered Engineer status (i.e. UK GCE A-level grades ABB and BCC respectively (both including Mathematics and excluding General Studies) for Stage 1 admission). In addition, the University recruits candidates with a wide range of equivalent qualifications based on its knowledge of SARTOR equivalents and other international qualifications. From March 2004 UKSPEC comes into effect. UKSPEC will not specify entry requirements, however, the school intends to continue with the existing SARTOR level entry qualifications.

A limited number of international qualifications and HND holders with appropriate subjects and grades may be considered for direct entry to Stage 2. Exceptionally, suitably qualified candidates may be taken into Stage 3 of the 4-year M.Eng. programme.

Engineering requires a wide range of attributes and abilities, so selection is not solely based on academic grades. Selectors seek evidence of motivation and commitment from the Personal Statement and Reference on UCAS forms and applicants are encouraged to attend for interview whenever possible.

All UCAS forms, including Late or Summer applications are considered, but the School does not normally take candidates through Clearing.

UK Engineering degrees are demanding and most have high drop-out rates. The School, therefore, assesses suitability by a "biodata" questionnaire: a technique widely used in industrial recruitment at professional and managerial level.

Notwithstanding adherence to SARTOR standards, the School is committed to widening access, particularly for "late developers". Links exist with the Engineering Access Course at Newcastle College and there is a Faculty Foundation Year (Stage 0) for those with insufficient science and mathematics to enter Stage 1 directly. Limited numbers of places may be available to Regional candidates through the University's "Partners Programme".

Unlike many other Universities, the School is committed to retaining its B.Eng. programme, both in recognition of the number of international students who wish to graduate after three years and to avoid exclusion of potentially good applicants who have not yet been able to demonstrate M.Eng. academic standards. The first two years of B.Eng. and M.Eng. are essentially common and any candidate passing Stage 2 "with a 60% average" may enter Stage 3 M.Eng..

13 Support for Students and their Learning:

Induction

The first week of the first term/semester is an Induction Week with no formal teaching. During this period all students will be given detailed programme information relating to their Stage and the timetable of lectures/practicals/labs/ tutorials/etc. In particular all new students will be given general information about the School and their course, as described in the Degree Programme Handbook. The International Office offers an additional induction programme for overseas students (see http://www.ncl.ac.uk/international/coming_to_newcastle/orientation.phtml).

During the Induction week, Diagnosys sessions are used to test basic maths and basic mechanics knowledge of Stage 1 students and where appropriate students are guided to attend remedial/revision support classes for mathematics during their first year.

Study skills support
Students will learn a range of Personal Transferable Skills, including Study Skills, as outlined in the Programme Specification.

Academic support
The initial point of contact for a student is with a lecturer or module leader, or their tutor (see below) for more generic issues. Thereafter the Degree Programme Director or Head of School may be consulted. Issues relating to the programme may be raised at the Staff/Student Committee, and/or at the Board of Studies.

Pastoral support
All students are assigned a personal tutor whose responsibility is to monitor the academic performance and overall well-being of their tutees. Details of the personal tutor system can be found at http://www.ncl.ac.uk/undergraduate/support/tutor.phtml. In addition the University offers a range of support services, including the Student Advice Centre, the Student Counselling Service, the Mature Student Support Service, and a Childcare Support Officer, see http://www.ncl.ac.uk/undergraduate/support/welfare.phtml.

Support for Special Needs
Support for students with special needs is provided as required and the University's Disability Support Service can be consulted where appropriate. For further details see http://www.ncl.ac.uk/undergraduate/support/disability.phtml.

Learning resources
The University's main learning resources are provided by the Robinson and Walton Libraries (for books, journals, online resources), and Information Systems and Services, which supports campus-wide computing facilities, see http://www.ncl.ac.uk/undergraduate/support/acfacilities.phtml.
All new students whose first language is not English are required to take an English Language test in the Language Centre. Where appropriate, in-sessional language training can be provided. The Language Centre houses a range of resources for learning other languages which may be particularly appropriate for those interested in an Erasmus exchanges. See http://www.ncl.ac.uk/undergraduate/support/langcen.phtml.

14 Methods for Evaluating and Improving the Quality and standards of Teaching and Learning:
(The information below is generic information which should be relevant to all programmes. Additional information of specific relevance to individual programmes should be added by the DPD and then this paragraph should be deleted)

Module reviews
All modules are subject to review by questionnaires which are considered by the Board of Studies. Changes to, or the introduction of new, modules are considered at the School Teaching and Learning Committee and at the Board of Studies. Student opinion is sought at the Staff/Student Committee and/or the Board of Studies. New modules and major changes to existing modules are subject to approval by the Faculty Teaching and learning Committee.

Programme reviews
The Board of Studies conducts an Annual Monitoring and Review of the degree programme and reports to Faculty Teaching and Learning Committee.

External examiner reports
External Examiner reports are considered by the Board of Studies under Reserved Business, in the absence of the student representatives. The Board responds to these reports through Faculty Teaching and Learning Committee.

Accreditation reports
This programme is accredited by the Institute of Mechanical Engineers and the Institute of Electrical Engineers. The MEng in Mechanical and Materials Engineering is also accredited by the Institute of Materials, Minerals and Mining.

Student evaluations
All modules, and the degree programme, are subject to review by student questionnaires. Informal student evaluation is also obtained at the Staff/Student Committee, and the Board of Studies.

Feedback mechanisms
Feedback to students is effected via the Staff/Student Committee and the Board of Studies.

Faculty and University Review Mechanisms
The Programme is subject to the University's Internal Subject Review programme, see http://www.ncl.ac.uk/internal/academic-quality/qualityhome.htm#2.

15 Regulation of Assessment:

Pass Marks
The pass mark, as defined in the University's Undergraduate Examination Conventions (http://www.ncl.ac.uk/calendar/university.regs/ugexamconv.html), is 40.

Course Requirements
Progression is subject to the University's Undergraduate Progress Regulations (http://www.ncl.ac.uk/calendar/university.regs/ugcont.html) and Undergraduate Examination Conventions (http://www.ncl.ac.uk/calendar/university.regs/ugexamconv.html). In summary, students must pass 120 credits at each Stage. Limited compensation down to 35 is possible at each Stage and there are resit opportunities, with certain restrictions.

Weighting of Stages
Modules taken at Stages 2, 3 and 4 Honours modules and the three stages contribute to the award of the final degree in the ratio 20%:35%:45%. For candidates graduating with Honours in Mechanical Engineering (Europe) and others spending all or part of stage 3 in an overseas HE Institution, Stages 2 and 3 each contribute 20% and Stage 4 contributes 60%.

Common Marking Scheme
The University employs a common marking scheme, which is specified in the Undergraduate Examination Conventions (http://www.ncl.ac.uk/calendar/university.regs/ugcont.html), namely

	Honours	**Non-honours**
<40	Fail	Failing
40-49	Third Class	Basic
50-59	Second Class, Second Division	Good
60-69	Second Class, First Division	Very Good
70+	First Class	Excellent

Role of the External Examiner

An External Examiner, a distinguished member of the subject community, is appointed by Faculty Teaching and Learning Committee, after recommendation from the Board of Studies. The External Examiner is expected to:

See and approve examination papers
Moderate examination and coursework marking
Attend the June Board of Examiners
Report to the University on the standards of the programme

16 Indicators of Quality and Standards:

Professional Accreditation Reports

These programme was accredited by the IMechE and IEE in May 2001. Accreditation is for 5 years and a re-accreditation visit is due in Spring 2006. The MEng(Hons) in Mechanical and Materials Engineering was accredited by the Institute of Materials, Minerals and Mining in May 2001 and a re-accreditation visit is due in Spring 2006.

Internal Review Reports

This programme is due for Internal Subject Review in Spring 2005
See the timetable at http://www.ncl.ac.uk/internal/academic-quality/schdlisr.doc

Previous QAA Reports

The Mechanical Engineering subject discipline at the University of Newcastle Upon Tyne received a QAA Subject Review in May 1993 and was judged to be Satisfactory.

17 Other Sources of Information:

The University Prospectus (see http://www.ncl.ac.uk/undergraduate/)

The Departmental Prospectus (see http://www.ncl.ac.uk/undergraduate/subjects/mecheng)

The University and Degree Programme Regulations (see http://www.ncl.ac.uk/calendar/pdf/uniregs.pdf and http://www.ncl.ac.uk/calendar/sae/school.html?school=MECH)

The Degree Programme Handbook (see http://www.ncl.ac.uk/mech/undergrad/programme)

QAA Subject Review Report Q22/93, May 1993.

Appendix 1

Stage 3 Compulsory modules relevant to the chosen Honours specialisation

MECHANICAL ENGINEERING H301

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
MMM300	10	5	Manufacturing Systems III
MMM301	10	5	Stress Analysis
MMM302	10	5	High Speed IC Engines
MMM332	5	5	Industrial Thermo-fluid Dynamics
MMM336/386	10	5	Computational Fluid Dynamics

MECHANICAL ENGINEERING (EUROPE) H302

	Credits	
MODULE NO.		**MODULE TITLE**
MMM360	40	Modern European Language III
MMM361	80	Engineering Applications

MECHANICAL AND AUTOMOTIVE ENGINEERING H341

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
CPE301	15		Materials & Tribology
MMM301	10	5	Stress Analysis
MMM302	10	5	High Speed IC Engines
MMM332	5	5	Industrial Thermo-fluid Dynamics
MMM336/386	10	5	Computational Fluid Dynamics

MECHANICAL AND DESIGN ENGINEERING H771

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
CPE301	15		Materials & Tribology
ENM309	5		Design of Experiments
ENM319	5		Optimisation
MMM301	10	5	Stress Analysis
MMM330/390	15		Sensors & Actuators
MMM338/388	10	5	Design for Production

MECHANICAL ENGINEERING AND MECHATRONICS HH36

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
CSC310		10	Real-time Systems
EEE335		10	Applied Electronics
ENM313		5	Numerical Methods
MMM320/380		15	Mechatronics Design
MMM330/390	15		Sensors & Actuators
MMM338/388	10	5	Design for Production

MECHANICAL AND MANUFACTURING ENGINEERING HH37

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
CPE301	15		Materials & Tribology
ENM309	5		Design of Experiments
ENM313		5	Numerical Methods
MMM300	10	5	Manufacturing Systems III
MMM301	10	5	Stress Analysis
MMM338/388	10	5	Design for Production

MECHANICAL AND MATERIALS ENGINEERING HJ3M

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
CPE300	5	5	Corrosion & Oxidation
CPE301	15		Materials & Tribology
CPE303	5	5	Reliability & Lifetime Prediction
ENM309	5		Design of Experiments
MMM301	10	5	Stress Analysis
MMM338/388	10	5	Design for Production

Stage 4 Compulsory modules relevant to the chosen Honours specialisation

MECHANICAL ENGINEERING H301

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
[2]CPE401		15	Joining Technology
CPE818	10		Business & Environmental Management
[1, 2]MMM401	10	5	Bioengineering
[3]MMM403	5	10	Thermal Power and Propulsive Systems
[2]MMM404	10	5	Design of Mechanical Power Transmissions

MECHANICAL ENGINEERING (EUROPE) H302

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
MMM300	10	5	Manufacturing Systems III
MMM301	10	5	Stress Analysis
MMM331	5	5	Dynamics & Control
[5]MMM402	10	5	Operation Management
[5]MMM406	5	10	Quality Assurance & Product Liability

MECHANICAL AND AUTOMOTIVE ENGINEERING H341

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
[2]CPE401		15	Joining Technology
CPE818	10		Business & Environmental Management
[3]MMM403	5	10	Thermal Power and Propulsive Systems
[2]MMM404	10	5	Design of Mechanical Power Transmissions
[2]MMM452/462	10	5	Manufacturing Technology 4

MECHANICAL AND DESIGN ENGINEERING H771

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
[2]CPE401		15	Joining Technology
[4]ENG402	5	5	Management of New Product Innovation
[1,2]MMM401	10	5	Bioengineering
[2]MMM404	10	5	Design of Mechanical Power Transmissions
[2]MMM452/462	10	5	Manufacturing Technology 4

MECHANICAL ENGINEERING AND MECHATRONICS – HH36

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
[6E]EE314	10		High Performance Embedded Systems
[6]EEE405		10	Image Processing & machine Vision
[6]EEE421	10		Distributed Control Systems
[1]MMM400	15		Automatic Control
[2]MMM405	5	5	Design of Mechanical Power Transmissions (short course)
[1]MMM437		15	Robotics

MECHANICAL AND MANUFACTURING ENGINEERING – HH37

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
[2]CPE 401		15	Joining Technology
CPE829		10	Energy Management
[5]MMM402	10	5	Operation Management
[5]MMM406	5	10	Quality Assurance & Product Liability
[2]MMM452/462	10	5	Manufacturing Technology 4

MECHANICAL AND MATERIALS ENGINEERING - HJ3M

	Credits		
MODULE NO.	**SEMESTER 1**	**SEMESTER 2**	**MODULE TITLE**
[2]CPE401		15	Joining Technology
CPE402	10		Sustainable Engineering
[7]CPE404	7.5	7.5	Advanced Materials & Processes
[7]CPE807	5		New Energy and Materials Technology
CPE818	10		Business & Environmental Management
[2]MMM452/462	10	5	Manufacturing Technology IV