PROGRAMME SPECIFICATION	

1	**Awarding Institution**	Newcastle University
2	**Teaching Institution**	Newcastle University
3	**Final Award**	MEng (Hons)
4	**Programme Title**	Master of Engineering in Mechanical Engineering with Honours in one of six named options
5	**UCAS/Programme Code**	Mechanical Engineering H301 Mechanical Engineering with Placement Year 1171U Mechanical and Low Carbon Transport Engineering H390 Mechanical and Low Carbon Transport Engineering with Placement Year 1172U Sustainable Transport Engineering H392 Sustainable Transport Engineering with Placement Year 1442U Mechanical Design and Manufacturing Engineering HH37 Mechanical Design and Manufacturing Engineering with Placement Year 1175U Mechanical Engineering with Mechatronics H3H6 Mechanical Engineering with Mechatronics with Placement Year 1173U Mechanical Engineering with Biomedical Engineering H3H8 Mechanical Engineering with Biomedical Engineering 1174U Mechanical Engineering with Energy H3H2 Mechanical Engineering with Energy with Placement Year 1315U Mechanical Engineering with Placement Year (Year 3) 1566U
6	**Programme Accreditation**	IMechE (2016)
7	**QAA Subject Benchmark(s)**	http://www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Subject-benchmark-statement-Engineering-.aspx
8	**FHEQ Level**	7
9	**Last updated**	May 2021

10 Programme Aims
These related degree programmes with a common core aim to: 1. Develop students knowledge, understanding and skills (including transferable skills), as

well as awareness and "know how", in the field of mechanical engineering specified below, so that as graduates they will be equipped to enter employment as professional engineers (progressing on to Chartered Engineer or equivalent status) or in other professional careers, providing the engineering industry and professions (in the UK and elsewhere) with employable and enterprising graduates, prepared for the assumption of technical, managerial and financial responsibilities and who have an appreciation of the value of education to the wider community.

2. Prepare students for engagement in life-long learning (eg professional CPD or further Higher Education) with capability in critical enquiry, research and knowledge acquisition through building deeper study on a base of general mechanical, materials and manufacturing engineering as follows:
   - ***Mechanical Engineering*** (H301):
     In contrast to the other named specialist streams below, the later stages of this degree deliver depth but in a range of different aspects of mechanical, materials and manufacturing engineering (including simulation, analysis, design and control software tools), in order to produce graduates capable of developing into senior roles in which they may be required to understand and manage a broad spectrum of engineering activities and systems.
   - ***Mechanical and Low Carbon Transport Engineering*** (H390) & **Sustainable Transport Engineering** (H392):
     The later stages of this degree focus on a range of aspects of mechanical, materials and manufacturing engineering appropriate to the future development of sustainable land-based transport technology (in particular automotive, rail and mass-rapid-transport) to meet the multi-disciplinary needs of specialist consultancies and vehicle designers as well as vehicle and vehicle component manufacturers.
   - ***Mechanical Design and Manufacturing Engineering*** (HH37):
     Throughout this degree there is an emphasis on the core engineering activity of innovative design, based on the ability to exploit and apply engineering science, within the constraints of (but exploiting the synergy between) materials and manufacture, for functional and sustainable solutions that meet customers' needs, thus developing a mix of skills appropriate to a range of manufacturing sectors.
   - ***Mechanical Engineering with Biomedical Engineering*** (H3H8):
     Building from and extending the basic mechanical, materials and manufacturing engineering core, the later stages of this degree introduce students to the application of engineering principles in the inter-disciplinary fields of biomedical engineering and healthcare, as well as in the wider social issues of accessibility, with experience of depth of study in a selection of fields (e.g. design of artificial joints, materials, human factors).
   - ***Mechanical Engineering with Mechatronics*** (H3H6):
     Building from the basic mechanical, materials and manufacturing engineering core, the later stages of this degree introduce students to precision engineering and instrumentation, electronic control, real-time computing, robotics and systems thinking for the design of innovative mechatronic products in an inter-disciplinary

engineering context.

- ***Mechanical Engineering with Energy***
  Building from the basic mechanical, materials and manufacturing engineering core, the later stages of this degree introduce students to resource assessment, energy management, renewable energy technologies, storage, heating and cooling, and grid systems for the use of energy in a more sustainable manner.

3. Gain an internationally recognised qualification which meets the requirements of the Framework for Higher Education Qualifications at Integrated Masters Level 7 with particular reference to the QAA Subject Benchmark Statement for Engineering (including Annex MEng degrees) and to the Engineering Council (UK) UKSpec.

4. For non-native speakers of English, extend their English language skills appropriate to engineering and industry through experience of life and study in a UK Higher Education institution.

5. Achieve the above in the contexts of the School, SAgE Faculty and University business plans, following the University's policies and procedures and conforming to the relevant sections of the QAA Code of Practice.

11 Learning Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas. The programme outcomes have references to the benchmark statements for Engineering and to Engineering Council UK (UK Spec Learning Outcomes).

Knowledge and Understanding

On completing the programme students should have:

A1 Knowledge and understanding of scientific principles and methodology necessary to underpin their education in mechanical and related engineering disciplines, to enable appreciation of its scientific and engineering context and to support their understanding of future developments and technologies in mechanical engineering and manufacturing. At Masters Level 7, a comprehensive understanding of the scientific principles of mechanical, manufacturing and related engineering disciplines.

A2 Knowledge and understanding of mathematical principles necessary to underpin their education in mechanical and related engineering disciplines. At Masters Level 7, a comprehensive knowledge and understanding of mathematical models relevant to the mechanical and related engineering disciplines, and an appreciation of their limitations.

A3 The ability to understand and apply Engineering principles to analyse key processes in manufacturing and mechanical and related engineering.

A4 Knowledge and understanding of commercial and economic context of mechanical engineering processes. At Masters Level 7, an understanding of concepts from a

range of areas including business and industry, sustainability and the environment, legal and finance.

A5 Knowledge of management techniques which may be used to achieve engineering and manufacturing objectives within the context of mechanical engineering processes. At Masters Level 7, knowledge and understanding of industrial management and business practices, and their limitations.

A6 Understanding of the requirement for mechanical engineering activities to promote sustainable development.

A7 Knowledge of characteristics of particular mechanical and related engineering equipment, processes or products. At Masters Level 7, understanding of current mechanical engineering and manufacturing practice and its limitations and some appreciation of development trends with knowledge and understanding of a wide range of engineering materials and components.

Intellectual Skills

On completing the programme students should have:

B1 Knowledge and understanding of scientific principles and methodology necessary to underpin their education in mechanical and related engineering disciplines, to enable appreciation of scientific and engineering context and to support understanding of future developments and technologies. At Masters Level 7, the ability to learn and work independently.

B2 The ability to apply mathematical methods, tools and notations proficiently in the analysis and solution of mechanical engineering problems. At Masters Level 7, the ability to learn new theories, concepts and methods for unfamiliar situations.

B3 Ability to apply and integrate knowledge and understanding of other engineering disciplines to support the study of mechanical and related engineering. At Masters Level7, an understanding of concepts from a range of areas including some outside engineering, and the ability to apply them effectively in mechanical engineering projects based on the, ability to use fundamental knowledge to investigate new and emerging mechanical engineering and manufacturing technologies.

B4 Ability to identify, classify and describe the performance of systems and mechanical components through the use of analytical methods and modelling techniques, At Masters Level 7, an understanding of the capabilities of computer based models for solving problems in engineering, and the ability to assess the limitations of particular cases.

B5 Understanding of and ability to apply a systems approach to mechanical engineering problems.

B6 Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues.

B7 Understand customer and user needs and the importance of considerations such as aesthetics. At Masters Level 7, ability to generate an innovative design for mechanical engineering systems, components or processes to fulfil new needs.

B8 Ensure fitness for purpose for all aspects of mechanical engineering problems including production, operation, maintenance and disposal. At Masters Level 7, ability to generate ideas for new engineering products or projects and develop and evaluate a range of new solution.

B9 Manage the engineering design process and evaluate outcomes. At Masters Level 7, wide knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations.

B10 Awareness of management and business practices, and how these may be applied appropriately to strategic and tactical issues in mechanical engineering and manufacturing. At Masters Level 7, the ability to make general evaluations of commercial risks through some understanding of the basis of such risks.

B11 Understanding of contexts in which mechanical engineering knowledge can be applied (i.e. operations and management, technology, product development). At Masters Level 7, ability to apply mechanical engineering techniques taking account of a range of commercial and industrial constraints.

Practical Skills

On completing the programme students should be able to:

C1 Apply quantitative methods and computer software relevant to mechanical and related engineering disciplines, to solve engineering problems. At Masters Level 7, understand the capabilities of computer based models for solving problems in mechanical engineering, with the ability to assess the limitations of particular cases.

C2 Identify and manage cost drivers in mechanical engineering and manufacturing. At Master Level 7, develop, monitor and update business, project and personal plans on an on-going basis to reflect changing operating environments.

C3 Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues. At Masters Level 7, apply mechanical engineering techniques taking account of a range of commercial and industrial constraints.

C4 Awareness of nature of intellectual property and contractual issues.

C5 Understand appropriate codes of practice and industry standards.

C6 Awareness of quality issues.

C7 Work with technical uncertainty.

Transferable/Key Skills

On completing the programme students should be able to:

D1 Understand customer and user needs and the importance of considerations such as aesthetics in mechanical and manufacturing engineering.

D2 Use creativity to establish innovation in manufacturing and mechanical and related

engineering disciplines.

D3 Understand the need for a high level of professional and ethical conduct in engineering. At Masters Level 7, understand differing team roles and be able to exercise leaderships.

D4 Relevant Mechanical engineering workshop and laboratory skills. At Masters Level 7, extensive knowledge and understanding of a wide range of engineering materials and components.

D5 Understanding use of technical literature and other information sources.

For students on the Placement Year programme:

D8 Reflect on and manage own learning and development within the workplace.
D9 Use existing and new knowledge to enhance personal performance in a workplace environment, evaluate the impact and communicate this process.
D10 Use graduate skills in a professional manner in a workplace environment, evaluate the impact and communicate the personal development that has taken place.

Teaching and Learning Methods

Key elements of professional graduate employability are that employers need to be sure that graduates are able to take individual responsibility for their own work without supervision, that they are capable of assimilating and organising complex information quickly and effectively and that they are self-learners, capable of keeping abreast of new developments without organisational support. Our approach to teaching and learning is designed to produce graduates who meet these criteria. From the outset, students will be expected to meet the basic professional requirement of taking responsibility for their own learning.

With engineering degrees lectures are extensively used to provide structure for each subject, to help to direct students' further reading and self study to convey how the underlying engineering science is applied to discipline specific problems, and to demonstrate approaches to problem-solving. Typically student self-study after lectures is supported by tutorial or problem classes, where advice is given on request to students who have issues arising from their application or understanding of the lecture material. Other types of classes include longer "hands-on" practical laboratory/workshop sessions, seminar/presentation activities, design project work and CAD/computer sessions where teamwork often features.

Over the common core course at Stages 1-2, there will be an average of around 20 contact hours per week, about half of which will be lectures, about a quarter tutorials supporting those lectures and about a quarter practical activities. During the course of Stage 1, to support the transition to University training, students must attend a regular weekly small group tutorial or seminar with their allocated Tutor and there are additional support classes in Semester 2 for students having difficulties. Stage 2 features industrial contact in design and manufacturing and input from industry on CVs and interviews for a professional career in engineering.

At Stages 3 and 4 there is a greater expectation that students will manage their own learning, with seminar classes in which students present material they have researched themselves and independent work on assignments more prevalent. This includes a team design project carried out with regional industry. At Stage 3 students undertake a major 30 credit individual project related to the specialist stream they are following. The Accrediting Institutions place a high importance on this project which must be passed to get an Honours Degree.

At Stage 4 there is a major 40 credit team project related to the students' specialist stream in which the teams also have to demonstrate their project management skills.

Assessment Strategy

Professional practice in industry demands the ability to bring methods and data together, apply problem-solving skills and demonstrate understanding under time constraints. To reflect this, the major end-of-course examination remains a valid assessment tool and forms an important element in our assessment strategy. However, there are equally many disciplines and skills where it is restrictive or inappropriate and engineering degrees are noted for the breadth of assessment tools that are used to obtain a balanced measure of the student. Spot or phase tests (including MCA) and short assignments feature in the early stages to help students structure their study and revision towards the synoptic end-of-course examinations. Laboratory/workshop, design and computing work are all best assessed through realistic assignments, with many of these being team assignments and involving oral or poster, as well as written reporting. In later stages application of major engineering software features in most main technical subject areas.

At Stage 1 the balance of assessment between end-of-course examination and various forms of in-course assessment is about 50:50, changing to about 70:30 in Stage 2, as students develop. However, at Stages 3-4 the greater importance of self-study and of major project work shifts the overall balance back again (depending on the specialisation stream followed).

Assessment of major project work at Stages 3-4 is particularly innovative. The traditional "mini PhD" thesis or dissertation with vivas has been replaced by a much broader and more challenging assessment more in line with the needs of industry and professional engineering, incorporating the maintaining of a contemporaneous logbook, a short report typical of business reports or technical journal papers, an oral presentation and a poster. At Stage 4 there will also be a team project management file.

12 Programme Curriculum, Structure and Features

Basic structure of the programme

There is a Faculty Foundation Year (120 credit Stage 0) for students not adequately qualified in Mathematics and/or science and/or English language to embark on Stage 1.

Stages 1 and 2 are a broadly-based course common to all BEng and MEng Honours streams with all modules compulsory. Students will study a broad range of applied mathematics, engineering sciences, design and manufacturing and management as well as IT skills. The School advises all MEng candidates that its Accreditors require an overall 60% average at Stage 2 to progress onto MEng Stage 3. Students not reaching this standard will be transferred to BEng Stage 3.

At Stage 3 all students have a 30 credit major individual project. To be awarded an Honours

degree it is necessary to pass this project without condonation or resit. Students follow a defined programme of modules appropriate to the specialist stream they have chosen. Students wishing to continue on to MEng require an overall average of 50% at Stage 3.

At Stage 4, all MEng students have a 40 credit major team project in which they also have to demonstrate project management skills. To be awarded an MEng degree it is necessary to pass this project.

Key features of the programme (including what makes the programme distinctive)

The normal Undergraduate academic year is approximately 31 weeks full time from September – June divided into two semesters, with vacation breaks at Christmas/New Year and Easter. Engineering Honours students study 120 credits (1 credit = 10 study hours, including timetabled contact hours and private study) in each Stage or academic year. Students must complete one Stage before proceeding to the next. Currently the only part-time study available is limited provision for the repetition of failed modules (only two attempts are permitted for any module).

The key feature is the structure of two common general years, followed by two years of specialisation. Whatever stream students enter on, providing they meet the Stage 2 MEng progression requirement they can choose any of the specialist streams, allowing them time to explore the different subjects before deciding on their specialisation.

Programme regulations (link to on-line version)

https://teaching.ncl.ac.uk/docs/regsdocs2021/documents/-RH301-H392.pdf

13 Support for Student Learning

Generic information regarding University provision is available at the following link.
https://www.ncl.ac.uk/ltds/assets/documents/qsh_progspec_generic_info.pdf

14 Methods for evaluating and improving the quality and standards of teaching and learning

Generic information regarding University provision is available at the following link.
https://www.ncl.ac.uk/ltds/assets/documents/qsh_progspec_generic_info.pdf

Accreditation reports
It is policy that our Undergraduate Mechanical Engineering degrees are externally CEng accredited by the Institution of Mechanical Engineers.

Re-accreditation was given by IMechE in 2016. Accreditation is for 5 years and the next re-accreditation visit is due in 2021.

15 Regulation of assessment
Generic information regarding University provision is available at the following link. https://www.ncl.ac.uk/ltds/assets/documents/qsh_progspec_generic_info.pdf

In addition, information relating to the programme is provided in:
The University Prospectus: http://www.ncl.ac.uk/undergraduate/degrees/#subject Degree Programme and University Regulations: http://www.ncl.ac.uk/regulations/docs/

Please note. This specification provides a concise summary of the main features of the programme and of the learning outcomes that a typical student might reasonably be expected to achieve if she/he takes full advantage of the learning opportunities provided.