

**Programme Specification**

**Title of Course:** BEng (Hons) Mechanical Engineering

BEng (Hons) Mechanical Engineering (Automotive Engineering)

**Date Specification Produced:** July 2017

**Date Specification Last Revised:** July 2018

This Programme Specification is designed for prospective students, current students, academic staff and potential employers. It provides a concise summary of the main features of the programme and the intended learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the teaching, learning and assessment methods, learning outcomes and content of each module can be found in the Course Handbook and Module Descriptors.

*Examples of completed programme specifications can be found on the* [*KU Programme Specification Archive*](http://www.kingston.ac.uk/programme-specifications/)

**SECTION 1: GENERAL INFORMATION**

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| **Title:** | BEng Mechanical Engineering (Automotive Engineering) |
| **Awarding Institution:** | Kingston University |
| **Teaching Institution:** | Kingston University |
| **Location:** | Roehampton Vale Campus, Kingston |
| **Programme Accredited by:** |  |

**SECTION2: THE PROGRAMME**

1. **Programme Introduction**

The Mechanical Engineering course is designed to equip students with the skills to work in many Engineering and related industries. Mechanical Engineers are found in a great many disciplines that require professional, intelligent and numerate individuals. This Course is designed to equip students with the ability to relate the knowledge and skills that they have learnt to the real-world contexts in which they may work in the future. Students are actively encouraged to take part in the hands-on activities hosted by the School, such as Formula Student, TT-Bike racing, Robotics Club, Design Challenge and the Engineering Society amongst others, as well as participating in various competitions.

The students on the Automotive Engineering pathway will have the unique opportunity to use state-of-the-art equipment, such as the Roehrig shock dyno, an engine test cell and a hydraulic dynamometer. The students will also have the opportunity to design and analyse parts, using industry standard CAD/CAE software; manufacture them, using the latest CNC machining and additive manufacturing methods (3D printing) in combination with industry standard CAM software; measure their strength, using contemporary tensile and fatigue testing machines. Furthermore, interested final year students may take an individual project and use one of the two wind tunnels to measure the flow around automotive components, using the state-of-the-art Laser Doppler Velocimetry technique.

The school is helped by its strong links with industry, local, national and international and these links influence the development of our programmes, working with our Industrial Advisory Board gives a forum where industry can inform us of the views of employers regarding the essential skills that they would want to see developed in a Kingston University undergraduate. To that end the school strongly encourages and supports all students in applying for positions in industry for an Industrial Placement year. This would normally take place between levels 5 and 6, the school emphasises the benefits to be obtained from an approved placement in industry in terms of future employability. An Industrial Placement comprises a period of at least 36 weeks with an approved employer.

In common with all engineering degrees at Kingston students will take a common set of four (30 credit) modules at level 4 and share a common module in each of levels 5 and 6. This allows all students to experience various engineering disciplines before deciding on an area of specialisation. Students chose their particular engineering pathway at the end of TB1 of the first year. Although students may have a firm idea of which branch of engineering they would like to study when they start exposure to a variety of branches in the first teaching block allows students to make a more informed choice. In addition, this structure provides valuable experience of working in interdisciplinary teams, an essential employability skill. Shared modules at levels 5 and 6 give further opportunities for interaction across engineering disciplines and associated group work on real world problems. A feature of the learning and teaching strategy is a focus on active learning sessions at the expense of traditional didactic lectures.

As well as discipline-specific skills, the more generic skills are also embedded within the programme. During the first year in modules such as Engineering Design and Professional Practice, students are encouraged to consider their chosen discipline in the light of the activities of the Professional Bodies. Again, in the level 5 Project Engineering and Management module the various careers within engineering are considered and students are encouraged to reflect on the paths open to them and to develop the skills and attributes employers are looking for in graduates. These include independent learning, ability to work in teams, time management skills, verbal and written communication skills. Part of the role of the Personal Tutor is to encourage students to develop these skills outside of the curriculum as well as within it through extracurricular activities such as volunteering, positions of responsibility within clubs and societies, student ambassadorship and sports activities.

Graduates develop careers in all branches of mechanical and related engineering industries in the UK and throughout the world; as contract and consulting engineers, within local authorities, utility, manufacturing and transport companies, government organisations and the defence industry. In many cases, students taking an industrial placement are able to secure employment with the placement organisation following graduation. The academic and key skills developed throughout this course also allow graduates to follow careers in other professions such as ICT, finance, accountancy and teaching. In addition, a number of graduates will progress to MSc courses in Mechanical Engineering and related specialist areas before continuing their career in industry or research

Technology enhanced learning such as videos, discussion forums and e-learning will be used together with the best traditional methods to provide a “blended learning” experience. In particular learning is supported by Kingston University’s excellent e-learning environments: VLE system which can be easily accessed both on and off campus. Electronic submission and feedback is widely used on the programme to enable students to submit work and receive feedback from off campus

The BEng (Hons) is offered as a three-year full-time or four-year sandwich course with an industrial placement taken between level 5 and 6.

1. **Aims of the Field/Course**

The general aim of the course is:

* To equip graduates with the engineering, design, management, business and personal skills required to become professional Mechanical Engineers, as well as enabling them to follow careers in related professional disciplines.

More specific aims of the course are:

* To produce graduates with a breadth and depth of knowledge and a thorough comprehension of the key aspects of Mechanical Engineering (Automotive Engineering).
* To allow students to develop analytical and problem-solving skills and an ability to evaluate evidence and assumptions to reach sound judgements and communicate these effectively.
* To provide graduates to industry who have a creative approach to the solution of design problems and the requisite technical skills to realise these solutions.
* To equip students with the research skills required for postgraduate study and the employability skills required for work in the Mechanical and related engineering industries.
* To furnish graduates with a firm grasp of sustainability and ‘Health and Safety within the context of their discipline.
* To provide graduates who have the reflective skills to recognise the need to continually develop themselves in order to exercise their Professional judgement.
1. **Intended Learning Outcomes**

The field/course provides opportunities for students to develop and demonstrate knowledge and understanding specific to the subject, key skills and graduate attributes in the following areas. The programme outcomes are referenced to the QAA subject benchmarks for Engineering (2015) and the Framework for Higher Education Qualifications in England, Wales and Northern Ireland (2008), and relate to the typical student.

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| **Programme Learning Outcomes** |
|  | **Knowledge and Understanding**On completion of the course students will be able to: |  | **Intellectual Skills**On completion of the course students will be able to |  | **Subject Practical Skills**On completion of the course students will be able to |
| A1 | Demonstrate knowledge and understanding of the core mechanical engineering subjects of statics, dynamics, materials, thermodynamics, fluid mechanics and design | B1 | Apply fundamental theoretical principles that underpin engineering and specifically mechanical and automotive engineering | C1 | Use workshop and laboratory equipment safely for manufacture and experimental investigation  |
| A2 | Demonstrate knowledge of electrical and electronic systems, control and manufacturing | B2 | Use mathematics as a tool for solving complex problems, communicating results, concepts and ideas  | C2 | Undertake practical work and analyse the data obtained for use in planning and design  |
| A3 | Show a knowledge of broader technical and non-technical engineering subjects | B3 | Think creatively and imaginatively to solve design problems  | C3 | Use a range of technical equipment and instruments, gaining a basic understanding of their underlying technology |
| A4 | Relate management and business applications to mechanical engineering | B4 | Manage projects, people, resources and time taking account of legal and statutory requirements, risk, safety, quality and reliability | C4 | Use computer technology to assist with information retrieval, management and problem solving |
| A5 | Demonstrate their understanding of the importance of Health and Safety in the engineering industry | B5 | Demonstrate a positive attitude to learning that encourages continuing professional development throughout their careers | C5 | Comply with Health and Safety regulations within the work place and as they apply to mechanical design |
| A6 | Relate all their studies to a knowledge and understanding of sustainability and the environmental impact of their industry | B6 | Recognise the importance of professional bodies and the professional conduct expected of Chartered Engineers |  |  |
| A7 | Demonstarte knowledge of automotive related technologies and the principles associated with these |  |  |  |  |

**Table 1 – BEng (Hons) Mechanical Engineering Programme Learning Outcomes**

In addition to the programme learning outcomes identified overleaf, the programme of study defined in this programme specification will allow

students to develop a range of Key Skills as follows:

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| **Key Skills** |
| **Self Awareness Skills** | **Communication Skills** | **Interpersonal Skills** | **Research and information Literacy Skills** | **Numeracy Skills** | **Management & Leadership Skills** | **Creativity and Problem Solving Skills** |
| Take responsibility for own learning and plan for and record own personal development | Express ideas clearly and unambiguously in writing and the spoken work | Work well with others in a group or team | Search for and select relevant sources of information | Collect data from primary and secondary sources and use appropriate methods to manipulate and analyse this data | Determine the scope of a task (or project) | Apply scientific and other knowledge to analyse and evaluate information and data and to find solutions to problems |
| Recognise own academic strengths and weaknesses, reflect on performance and progress and respond to feedback | Present, challenge and defend ideas and results effectively orally and in writing | Work flexibly and respond to change | Critically evaluate information and use it appropriately | Present and record data in appropriate formats | Identify resources needed to undertake the task (or project) and to schedule and manage the resources | Work with complex ideas and justify judgements made through effective use of evidence |
| Organise self effectively, agreeing and setting realistic targets, accessing support where appropriate and managing time to achieve targets | Actively listen and respond appropriately to ideas of others | Discuss and debate with others and make concession to reach agreement | Apply the ethical and legal requirements in both the access and use of information | Interpret and evaluate data to inform and justify arguments | Evidence ability to successfully complete and evaluate a task (or project), revising the plan where necessary |  |
| Work effectively with limited supervision in unfamiliar contexts |  | Give, accept and respond to constructive feedback | Accurately cite and reference information sources | Be aware of issues of selection, accuracy and uncertainty in the collection and analysis of data | Motivate and direct others to enable an effective contribution from all participants |  |
|  |  | Show sensitivity and respect for diverse values and beliefs | Use software and IT technology as appropriate |  |  |  |

1. **Entry Requirements**

The minimum entry qualifications for the programme are:

From A levels: 112 points to include A2 mathematics at grade B plus two suitable science subjects.

BTEC National: Distinction, Distinction, Merit (DDM) from an engineering-related BTEC Extended Diploma including Distinctions for Mathematics and Further Mathematics.

Access Diploma: 134 points at level 3 including Distinctions in Maths, Mechanics and science modules.

Plus: GCSE (A\*-C) minimum of 5 subjects including English Language and Mathematics.

A minimum International English Language Testing System (IELTS) score of 6.0 (min 5.5 in Speaking, Writing, Listening and Reading) or equivalent is required for those for whom English is not their first language.

Direct entry to level 5 of the BEng is permitted provided they have studied to an equivalent to Kingston Engineering Level 4 at another institution.

We will consider a range of alternative qualifications or experience that is equivalent to the typical offer. Applications from international students with equivalent qualifications are welcome..

1. **Field/Course Structure**

This programme is offered in full-time, part-time and sandwich modes, this leads to the award of BEng (Hons) Mechanical Engineering. Intake to both modes of study is normally in September.

Entry is normally at Level 4 with A-level or equivalent qualifications (See section D). Transfer from a similar course is possible at Level 5 with passes in comparable Level 4 modules – but is at the discretion of the course team.

**E1. Professional and Statutory Regulatory Bodies**

N/A

**E2. Work-based learning, including sandwich courses**

All students are encouraged to make use of the opportunity to enhance their learning and personal development by undertaking an industrial placement after the second year of their programme. All placements are reviewed to ensure that they provide a relevant experience in which students can apply their learning in a practical situation. Students have the responsibility for securing an industrial placement; placements are not guaranteed. All students on the course receive support from the placement specialists (Talent Preparation Officers) within the Careers and Employability Service team in securing a position and while in the workplace.

This allows students to reflect upon their own personal experience of working in an applied setting, to focus on aspects of this experience that they can clearly relate to theoretical concepts and to evaluate the relationship between theory and practice. Historically many sandwich placements are reasonably well remunerated.

**E3. Outline Programme Structure**

Each level is made up of four modules each worth 30 credit points. Typically, a student must complete 120 credits at each level. All students will be provided with the University regulations and specific additions that are sometimes required for accreditation by outside bodies (e.g. professional or statutory bodies that confer professional accreditation). Full details of each module will be provided in module descriptors and student module guides.

To be awarded a BEng (Hons) Mechanical Engineering degree or BEng (Hons) Mechanical Engineering with Automotive Engineering pathway, students must pass all 360 credits. A student is eligible for the award of an unclassified bachelor degree if they successfully complete 300 credits of the programme. BEng (Hons) Mechanical Engineering with Automotive Engineering pathway students must take ME5021 plus ME6021 and they must carry out Individual and Group projects (EG5014, EG6023 and ME6014) in their specialist areas.

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| **Level 4** (all core) |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |
| Engineering Design and Professional Practice | EG4010 | 30 | 4 | 1&2 |
| Engineering Mechanics, Structures and Materials | EG4011 | 30 | 4 | 1&2 |
| Engineering Mathematics and Computing Applications | EG4012 | 30 | 4 | 1&2 |
| Fluid Mechanics and Engineering Science | EG4013 | 30 | 4 | 1&2 |

Progression to level 5 requires passes in all four modules to give 120 credits at level 4

Students exiting the programme at this point, who have successfully completed 120 credits, are eligible for the award of Certificate of Higher Education in Mechanical Engineering.

**BEng (Hons) Mechanical Engineering**

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| **Level 5** (all core) |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |
| Thermofluid & Mechanical Systems 2 | ME5011 | 30 | 5 | 1&2 |
| Electronic Systems, Control & Computing | ME5012 | 30 | 5 | 1&2 |
| Engineering Design, Materials & Manufacture 2 | ME5013 | 30 | 5 | 1&2 |
| Project Engineering and Management | EG5014 | 30 | 5 | 1&2 |

Progression to level 6 requires passes in all four modules to give 120 credits at level 5.

Students exiting the programme at this point, who have successfully completed 120 credits, are eligible for the award of Diploma of Higher Education in Mechanical Engineering.

**BEng (Hons) Mechanical Engineering (Automotive Engineering)**

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| **Level 5** (all core) |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |
| Electronic Systems, Control & Computing | ME5012 | 30 | 5 | 1&2 |
| Engineering Design, Materials & Manufacture 2 | ME5013 | 30 | 5 | 1&2 |
| Project Engineering and Management | EG5014 | 30 | 5 | 1&2 |
| Automotive Systems I | ME5021 | 30 | 5 | 1&2 |

Progression to level 6 requires passes in all four modules to give 120 credits at level 5.

Students exiting the programme at this point, who have successfully completed 120 credits, are eligible for the award of Diploma of Higher Education in Mechanical Engineering.

**BEng (Hons) Mechanical Engineering**

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| **Level 6** (all core) |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |
| Business and Project Management and Group Design Project | EG6023 | 30 | 6 | 1&2 |
| Thermofluid & Mechanical Systems 3 | ME6016 | 30 | 6 | 1&2 |
| Mechatronics, Dynamics & Control | ME6012 | 30 | 6 | 1&2 |
| Individual Project (BEng/MEng) | ME6014 | 30 | 6 | 1&2 |

**BEng (Hons) Mechanical Engineering (Automotive Engineering)**

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| **Level 6** (all core) |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |
| Business and Project Management and Group Design Project | EG6023 | 30 | 6 | 1&2 |
| Mechatronics, Dynamics & Control | ME6012 | 30 | 6 | 1&2 |
| Individual Project (BEng/MEng) | ME6014 | 30 | 6 | 1&2 |
| Automotive Systems II | ME6021 | 30 | 6 | 1&2 |

1. **Principles of Teaching, Learning and Assessment**

The BEng course in Mechanical Engineering (Automotive Engineering) has been designed, taking into account the Kingston University Curriculum Design Principles, to help develop students into graduates that are professional, thoughtful, creative, resilient, proactive, globally aware and independent, equipping them to be lifelong learners.

**Development of Independent learning through the course**

The learning, teaching and assessment strategy of the course is aimed at supporting progression in curriculum content and skills development through the levels of study. At level 4 there is a clear structure and guidance for students’ learning with an emphasis on the acquisition of fundamental engineering knowledge and skills (e.g. Mathematics and IT in EG4012 **Engineering Mathematics and Computing**, practical skills (EG4011 and EG4013) and the initial development of key employability skills (EG4010). This provides a solid foundation for students to undertake deeper study in a specific engineering discipline at level 5. At level 5 there will be an increased expectation of independent study, supported by a reduced emphasis on the use of traditional lectures. At level 6 students will be expected to take greater ownership of their independent study with academics taking on more of a supervisory role of student independent study, this is exemplified in the individual and group project modules **EG6023 Business and Project Management and Group Design Project and ME6014 Individual project.**

Module guides set out clear expectations for guided independent learning. Students will be directed to reading and Technology Enhanced Learning (TEL) packages to prepare for individual topics or sessions and also to problem sets or exercises to consolidate and test their learning afterwards. This will be introduced at level 4.The Virtual Learning Environment (VLE) at Kingston will support learning throughout the course through a variety of TEL objects such as videos, screencasts, on-line MCQs, discussion boards and interactive teaching packages. It will also deliver teaching material such as lecture notes/presentations, problems sets and worked examples. This helps support an inclusive approach as studentscan access learning material at their convenience and work through it at their own pace with the opportunity to pause and rewind as they wish.

**Integrated first year and interdisciplinary collaboration**

All engineering students at Kingston University take a common set of four (30 credit) modules. This allows all students to experience various engineering disciplines before deciding on an area of specialisation. Due to a specialist strand in TB2 for one of the modules, students are expected to pick the chosen engineering pathway at the end of TB1. Although students may have a firm idea of which branch of engineering they would like to study when they start (e.g. civil and infrastructure) exposure to a variety of branches in the first teaching block will allow students to make a more informed choice. The opportunity to study and work with students from different branches of engineering is a distinct feature of the course at Kingston and is extended into the second year when all students take a common level 5 module. In **EG4010** **Engineering Design and Professional Practice** students will be introduced to the principles and importance of group work. Project-based learning (PBL) is employed requiring interdisciplinary teams to design, build and present solutions to small scale engineering challenges, the outputs of these will be part of the summative assessment. Interdisciplinary group work will be further developed at level 5 in **EG5014 Project Engineering and Management** where students are taught about group project management in TB1 and then will spend much of TB2 working on a more complex challenge that will comprise 60% of the module assessment. In this module students are likely to tackle a live, real-world problem supplied by a well known company or organisation. This will give the students an opportunity to talk about how they have worked with an external company on an engineering problem as part of a team, when they apply for an industrial placement. At level 6, students will consolidate their group working skills in **EG6023** when undertaking a group design project in their own engineering discipline, using the team working skills learned in earlier years.

**Focus on active learning and enhancing student engagement**

A feature of the learning, teaching and assessment strategy in the School of Engineering is that many instructional lectures have been replaced by collaborative, problem solving or enquiry-based learning workshops and tutorials. These require students to prepare for, and participate in, the classroom activities, rather than passively listening to the lecturer. Students are expected to engage with the guided learning to prepare for these teaching sessions and consolidate their learning after the session. These interactive sessions also provide students with opportunities for peer learning, group work and presentation practice. In these sessions, the lecturer facilitates learning by supporting students in creating their own knowledge and understanding. Lecturers may also introduce and summarize key concepts with short mini-lectures.

Project based Learning (PBL) is introduced in **EG4010** and developed further in **EG5014 and ME6014**.These collaborative activities encourage students to draw on their own set of experiences and cultural backgrounds when tackling real world challenges. The Flipped classroom approach is introduced across the two engineering science based modules (EG4011, EG4013) and the maths/computing module EG4012. Here the curriculum (lecture content) of a small topic is delivered via on-line materials (screencasts, videos or study packs) and then developed and applied in workshops.

Active and collaborative learning is also incorporated in traditional lectures which may have question-and-answer sessions, brief student discussions, and clicker activities integrated into the lecture. These methods ensure that valuable contact time is focussed on the application and critical analysis of knowledge and the development of key skills such as problem solving, communication, and group-work.

The high percentage use of active learning sessions in the teaching hours is aimed at improving student engagement, creativity, confidence and self-reliance. The course endeavours to further secure student engagement by making students feel part of a community and increasing their sense of belonging which supports improved retention and progression. This is achieved by providing opportunities to interact with staff and students both socially and academically. In addition to the active learning sessions and group work this is achieved through: the PT scheme, field work, industrial visits, extra-curricular seminars, research internships, course representative system, student ambassador work, peer mentoring, PAL civic engagement and outreach opportunities etc. This is also achieved through encouraging the students to take part in the hands-on activities hosted by the School, such as Formula Student, TT-Bike racing, Robotics Club, Design Challenge and the Engineering Society etc.

**Development of employability skills**

The progressive development of a range key employability skills is another feature of the course as exemplified in teamwork/groupwork as discussed above. Regarding communication skills, at level 4 the focus is on writing individual practical reports (**EG4013 Fluid Mechanics & Engineering Science**) using a standard format and style, and encouraging students to orally communicate the outcomes of small group exercises in the active learning sessions in **EG4010 and EG4011 (Engineering Mechanics, Structures & Materials)**. At level 5 students will be required to produce a substantial written group report and present their individual findings in **EG5014** and in other modules such as ME5011 and ME5012individual laboratory reports on more challenging topics. To help development of these skills students will be required to submit a draft of a report for **EG4011** to the Support for Academic Success Centre for feedback and to discuss this with their personal tutor. At level 6 in the Individual Project module **ME6014** students will be taught how to synthesise and critically review information from a variety of sources and report this and their research results in a formal research report and an oral presentation.

To complement the development of employability skills within the curriculum, Personal tutors will encourage students to engage in a range of extra-curricular activities such as student representation, part-time work, sports and recreation, society membership,  volunteering; student ambassadorship, leadership and mentoring; cultural and creative activities;   academic and professional collaboration; placement activity; enterprise activity; Careers and Employability events and opportunities. Activity in these areas is recognised by the university’s Kingston Award Scheme. Careers and Employability Service offers a range of events, including Careers Uncovered fairs, which include employers coming to campus to promote internship, placement and graduate opportunities, and spotlight on engineering networking activities where employers and alumni are invited on campus to talk about career pathways.

**Hands-on Practical work**

Hands on practical experience in workshops and laboratories is fundamental in developing practical skills as well as enhancing data collection and analysis skills. Students will have the opportunity to work in laboratories and workshops in most of their modules. Practical work is closely related to the taught content to provide context for the theoretical work. At level 4 students are introduced to basic measurement and manufacturing processes and how to apply these in a laboratory and testing environment **EG4010** and at level 5 the focus is on measurement of a variety of parameters. This is delivered through supervised practical sessions with experiment protocols. At level 6 students and expected to select and apply requisite practical skills in their own independent research work in ME6014 the individual project module

**Research Informed Teaching**

The majority of the course team are either research active in engineering or are involved in industry related professional activities, through KTPs or other forms of direct involvement with industry. These activities played a major part in informing the course design and content, as did the direct input from industry through the activities of the Industrial Advisory Board.

Most of the teaching staff are also actively involved in the various Research Centres and/or Research Groups of the Faculty, or otherwise following interest areas of their own. These activities take them into, amongst other areas, materials research both coatings and compound, fire and explosion research both cause and prevention, dynamics and control research and on through sustainable power generation to electric vehicle technology with particular success in the development of the zero emissions electric motorbike. The modules at levels 6 and 7 are mainly taught and managed by academic staff who are engaged in research in various areas and include their research findings in addition to well established principles, for example in the modules **ME6016** and **ME6021** the areas such as structures, materials including composites, structural dynamics, model testing, rotating machinery and research in Fluid Mechanics and CFD is taught and discussed.

Students are encouraged to develop their own research skills which are a fundamental part of the curriculum throughout all levels of the programme. They are often encouraged, through project work, to work with research active staff on elements of live projects, and these research skills enable students to determine, distinguish and present appropriate evidence in an argument, which is of great value to employers.

Academic staff are also engaged widely with the research and development of ideas in teaching and learning in Higher Education and in wider pedagogic issues which will then feed through to support learning in lectures and other forms of student engagement in the programme, both formal and extra-curricular. As parts of pedagogic research, computing resources in fundamental subjects such as Maths and Mechanics/Physics have been developed and been embedded into the VLE system. The use of an Electronic Voting System in the class room for summative and formative assessments is another example of pedagogic research undertaken by the teaching staff. This reflective, evidence-based professional practice by academic staff serves as an exemplar to students in their future professional practice.

**Assessment for Learning**

The assessment strategy has been designed to help students to learn and prepare them for employment, rather than just as a tool to measure their learning. The assessment is designed to be authentic, inclusive and transparent. The assessment tasks focus on the real world-engineering activities that enhance students’ employability e.g. in design challenge activities in **EG4010,** and **ME5013** and also in **EG5014** and **EG6023**. All modules have explicit formative assessments to provide opportunities for practice and the chance to use ‘feed forward’ to help students improve their work in subsequent summative assessments (**EG6023 and ME6014**). Examinations are still used as they are an effective way of assessing basic knowledge and understanding, and professional bodies expect to see examinations covering key curriculum content. However, the strategy recognises that other assessment methods are better suited to assessing higher level problem solving skills. This is reflected in the decreasing use of examination from levels 4&5 to level 6. The use of a well-balanced range of assessment methods is a key part of our inclusive assessment strategy. Group and teamwork assessment is instrumental in developing and recognising this important employability skill.

**Engineering curriculum**

Level 5 of the core programme builds on the fundamental knowledge and skills gained at Level 4. It focuses on knowledge and understanding of the engineering principles underpinning Mechanical technologies. The Fluid Mechanics and Thermodynamics and Analytical methods extend the knowledge of students in Thermo-fluids at level 4 to applications in Power Engineering, Aerospace vehicles, and Energy systems, resulting in fundamental knowledge for design and optimisation of vehicle components, power-plants and various other Engineering systems. The mathematical skills and knowledge required to solve and analyse the related equations and complex data for the purpose of improving efficiency and optimising processes will be taught in this module. The module involves the use of wind tunnel laboratories to enhance the students learning experience through Learning-By-Doing. Staff encourage students to develop curiosity and a desire to learn for life using active learning techniques. The problem-based and inquiry-based group work fosters collaborative thinking and develops attributes expected of a Mechanical graduate.

The Engineering Mechanics, Structures & Materials and Thermofluid & Mechanical Systems 2 & 3 introduce the application of Mechanical Engineering principles to different engineering materials, structural and dynamics analysis. The modules enhance the development of students’ analytical, problem-solving, critical thinking and laboratory skills. They provide an understanding of how the principles of structures and materials science determine the configuration, performance and stability of Mechanical systems. They also develop the software modelling skills of analysing composite structures using FEM techniques. The modules involve the use of laboratory experiments in the areas of structures, composites and vibrations.

The Automotive Engineering pathway includes Automotive Systems I & II to cover design and analysis of automotive systems, materials and processes used in manufacturing automotive components, as well as emerging electric, hybrid and alternative fuel vehicle technologies.

The Electronic systems, control and computing modules (EG4012, ME5012 and ME6012) are designed to broaden students’ knowledge and understanding of the fundamental of electronics and control systems used in industries. In Mechatronics, Dynamics & Control, rigid body as well as flexible body Dynamics are taught at a more advanced level with the use of computational tools such as MATLAB which are widely used in industry with application in design and analysis of Mechanical systems.

The Engineering Project Management Module introduces the principles and commercial practices for the management of engineering projects and related wider business operations. The nature of project engineering and business management is considered in the context of time, quality, risk and sustainability aspects. It introduces the legal, commercial, social and ethical framework of engineering environments. This module provides opportunities for developing team-working in industrially based group design activities which will enhance students’ communication skills in group discussions and seminars.

Level 6 of the programme continues the Mechanical theme but it emphasises the development of self-management, independent learning, professional skills, and deep understanding of the knowledge required in Mechanical (Automotive) engineering.

In the Thermofluid & Mechanical Systems 3 (Automotive Systems II) module, students are taught Fluid Mechanics and Thermodynamics at higher levels together with the application of computational techniques such as Computational Fluid Dynamics (CFD) widely used in industry. In the Thermofluid & Mechanical Systems 3 students are taught at a more advanced level topics in Structures and Materials together with use of computational methods such as Finite Element Analysis (In FEA).

In the Business and Project Management & Group Design Project module, students are taught about various key aspects of project planning and management before engaging in a group project based and drawing on knowledge and experience gained previously. It will consist of substantial Project-Based Learning (PBL) driven by the students with supervisor/facilitators encouraging professionalism and leadership in a group activity. It provides students with an understanding of the process of project planning and an opportunity to put theory into practice in a virtual industrial project. The module encourages professionalism and leadership in a collaborative group setting in which sustainability and ethicsare embeddedwithin the project context. The above two modules develop the analytical and problem-solving skills of the students.

The Individual Project module combines the technical and academic facets of the programme and provides students with an opportunity to complete a capstone project applying the knowledge and skills learnt during the course to achieve agreed deliverables. It enables students to develop their research skills using and applying information from the technical literature.

The programme is designed to develop the students’ academic and technical knowledge and understanding, their academic and professional skills, and their personal qualities, and ultimately prepare them for employment. The assessment strategy has been designed in the same way: to develop the students rather than simply assess them to make sure they satisfy learning outcomes. The assessment is designed to be authentic, engaging and transparent that contributes to helping students to learn and develop effective attributes. The assessment tasks focus on the real world-engineering activities that enhance students’ employability. A large variety of different assessment methods are used in the programme and all modules in the programme have formal and informal assessment, and formative and summative assessment associated with them. The forms of assessment include portfolio, Clicker quizzes, online tests using the VLE system, informal in-class tests, workbooks, practical exercises, tutorial questions, end-of-module examinations and even an individual viva exam which enable assessment of understanding of a broad range of Mechanical topics. All of the coursework that students complete is formative as well as summative. The formal and informal feedback from coursework and the informal assessment given enables the students to improve knowledge and skills. The informal feedback includes group discussion in classes, one-to-one dialogue, rehearsal of oral presentations, draft reports and peer assessment.

The university is strongly committed to an Inclusive Curriculum. Students will be encouraged to see themselves as belonging to a professional community. A set of employability criteria will be identified using insight from employers and the Employability Team. We will identify skills that employers value and expect from graduates using alumni, Industrial Advisory Board, and the Institution of Mechanical Engineers. This involves support from DARE (Development, Alumni Relations and Events department) to identify alumni who graduated at least a year earlier. Each module will be examined to determine the opportunity to embed employability into the curriculum. Academic staff and members of the employability team will identify appropriate provision in the Centre for Graduate Excellence and, where necessary, tailor opportunities to bridge any gaps. Personal Tutors will enhance student engagement with these opportunities. Learning and teaching staff will highlight opportunities within their sessions that enable students to acquire employability skills. Students will develop a CPD record in the VLE to draw upon for job applications and interviews. Personal Tutors will include employability criteria and reflective questions in their first meeting and record this on the system online.

**Inclusive Teaching Practice**

Staff Student Consultative Committees and Boards of Study provide opportunities for students to make suggestions on how to develop a more inclusive curriculum by taking into account the specific circumstances of the student body. The variety of teaching activities also takes account of the student’s different learning preferences and experiences and there is a careful balance of individual and group based activities.

Marking criteria are provided for all assessments as part of the assessment booklet at the beginning of the year for each module and care is taken to ensure that the language used is clear**.** Assessment and marking criteria for all substantial assessments are discussed in class so all students have an opportunity to interrogate the criteria.

In the programme, the following components are used in the assessment of the various modules:

* Practical exercises: to assess students’ understanding and technical competence
* Individual and group-based case project work: to assess ability to understand requirements, to provide solutions to realistic problems and to interact and work effectively with others as a contributing member of a team. The outcomes can be:
* Written reports, where the ability to communicate the relevant concepts, methods, results and conclusions effectively will be assessed.
* Oral presentations, where the ability to summarise accurately and communicate clearly the key points from the work in a brief presentation will be assessed.
* Video, which may replicate features of oral presentations but allows advance preparation away from the audience (which may suit some students better).
* Multiple choice or short answer questions: to assess competence in basic techniques and understanding of concepts.
* Long answer structured questions in coursework assignments: to assess ability to apply learned techniques to solve simple to medium problems and which may include a limited investigative component
* Long answer structured questions in end-of-module examinations: to assess overall breadth of knowledge and technical competence to provide concise and accurate solutions within a restricted time
* Project: The individual project module represents an opportunity for students to draw together different aspects of their learning on the course and to apply the techniques learned in an extended study. As such the assessment here will place a greater emphasis on ability to plan work, manage time effectively, and research background information, culminating in a written report and interview.
* Individual and group practical laboratory reports

**Employability/Placement**

Initially students are guided towards learning about employability skills and career pathways, but as they move through the course they are expected to become more independent and take ownership of their career development by engaging with classes provided by Careers and Employability Service, including: Professional Communication, Time and Self-Management and Identifying and Articulating Skills. There are also opportunities to perfect skills required to gain employment such as: CV writing, Psychometric Test and Using LinkedIn. A student’s development and career options are discussed in personal tutor meetings and guidance given as appropriate. This is in liaison with the University’s Careers and Employability Team.

1. **Support for Students and their Learning**

Student support recognises that the student experience is unique to each student. A key part of our approach to an inclusive curriculum is that we acknowledge and where possible accommodate their individual circumstances. The personal tutor scheme is central to the efforts to provide a personalised learning experience (see PT section of programme specification). At levels 4 and 5 a core set of problems for each engineering module are issued to students. These cover the whole curriculum for a particular level. Students are required to work through these formative assessment problems as they cover the relevant curriculum. This allows students to test their learning and measure their progress. Discussion of progress on these problem sets will be a key part of the personal tutor scheme. Students are required to upload their progress on these activities onto the **Learning Log** created on the University VLE system. The Learning Log will be available to the relevant personal tutors for further discussion during one-to-one meetings. There will be milestones for students to meet at every level, and it will be one of the personal tutor’s roles to monitor the students’ progress and give appropriate advice*.*Where difficulties are encountered, PTs will be able to help or direct students to available support including peer mentoring schemes, PAL, Maths aid and on-line resources etc.

Students are supported by:

* **A Module Leader** for each module
* **A Course Leader** to help students understand their programme structure and provide academic support
* **A Personal Tutor** (PT) to provide academic advice and guidance.
* There is a **Student Support and Engagement Team** to help students with any problem that is affecting their studies.
* A dedicated Undergraduate Course Administrator
* **An induction programme** and study skills sessions at the start of each academic year
* **Academic Success Centre**  is a one-to-one drop-in Study Skills session for students every weekday. Help is available on a range of academic skills from writing reports, note-taking, to exam revision, referencing, programming and mathematical skills.
* **VLE** – a versatile on-line interactive intranet and learning environment accessible both on-site and remotely
* **Course Representative scheme**
* **A University Careers** **and Employability Service**
* Comprehensive University support systems including the provision of advice on finance, regulations, legal matters, accommodation, international student support, disability and equality support.
* The Students’ Union
* An Academic Team that seeks to maintain an open door policy in the spirit of supporting students.

**Personal Tutor Scheme (PTS) in the School of Engineering**

The following provides the aims and structure of the Personal Tutor Scheme (PTS) for the School of Engineering. It is intended that the PTS be embedded within the provision of the BEng programme.

**Overall Aims**

* To build a rapport between staff and students and contribute to personalising students’ experience within the School of Engineering
* To support students in the development of their academic skills providing appropriate advice and guidance to students throughout their time at Kingston, while monitoring their progress, helping to identify individual needs and referring students to other University services as appropriate
* To help students to develop the ability to be self-reliant and confident self-reflective learners who use feedback to their best advantage
* To encourage students to reflect on how their learning relates to a wider context and their personal career progression

**Allocation of Personal Tutors**

* Personal tutors will be allocated during induction week
* Tutors will be allocated on a course basis where appropriate with student numbers being equally divided amongst the staff within the school
* Students will keep the same tutor throughout their course of study
* If they change discipline at the end of TB1 a change of PT is likely to occur to allow comprehensive support through the programme.

There are specific aims and outcomes for each level, as the PTS is progressive and cumulative students will find that they are building on the skills developed in previous levels.

Formative assessment will be provided in the form of regular feedback during meetings.

The assessment in modules **EG4010** and **EG5014** is directly linked with the PTS scheme. Personal tutorials also provide opportunity to consider CV writing skills, discussion of skill sets, learning and revision techniques, as well as employment and extracurricular opportunities. Group tutorials allow students to discuss issues and help with solutions to problems.

Attendance at personal tutorials is signed off by tutors using the facility on OSIS. The PTS Lead oversees the scheme in the School in liaison with the Faculty PTS Lead. Regular reports on student attendance in personal tutorials are consulted and may feed into other student support measures to catch potentially struggling students.

**Level 4: Settling in and building confidence**

**Aims and Learning Outcomes**

* To assist students in making the transition to Higher Education and to generate a sense of belonging to the School Engineering with an emphasis on widening participation issues
* To help students to develop good academic habits and to gain the confidence to operate successfully in a university context
* To prepare students to make the most of feedback throughout their course

**Contact:**

* Teaching block 1: three one-to-one meetings during induction week, weeks 2 and 6-7
* Teaching block 2: two one-to-one meetings during week 1 and week 6-7
* End of academic year individual ‘wrap up’ email

In addition to a core set of problems for each module students are also given a list of engagement activities that they are encouraged to take advantage of at level 4. PT will discuss progress on problem sets and engagement with certain activities with tutees throughout the year.The Learning Log will be available to the relevant personal tutors for further discussion during one-to-one meetings. There will be milestones for students to meet at every level, and personal tutor’s will monitor the students’ progress and give appropriate advice.

The module **EG4010 Engineering Design and Professional** Practice is closely linked to the Personal tutor scheme as it introduces key academic and employability skills. In addition it focuses on reflective practice on feedback and their progress with academic and employability skills. It is expected that these are topics of conversation personal tutor meetings.

**Level 5: Stepping it up and broadening horizons**

**Aims and Learning Outcomes**

* To help students comprehend and plan for the academic demands of level 5 and to support increasing independence
* To encourage students to look forward, to take up opportunities to develop wider skills and to take responsibility for their personal development
* To foster students’ ability to build on and respond proactively to the feedback they have received
* To assist students in reflecting on the skills that they are developing and consider how they relate to employability

**Contact:**

* One-to-one meeting in week 1
* Email contact at the end of teaching block 1
* Individual ‘wrap up’ email at end of academic year

Throughout the year, students are expected to reflect on their acquisition of skills and preparation for and industrial placement and employment with their personal tutors. This activity is integrated into **EG5014** and constitutes 10% of the module assessment.

**Level 6: Maximising success and moving on**

**Aims and Learning Outcomes**

* To support students with the planning necessary to maximise success in their penultimate undergraduate year
* To encourage students to reflect on the employability skills they have developed and be proactive in moving towards a professional life and/or further study
* To help students to make best use of the feedback they have received so that they can build on their strengths and take steps to address any weaknesses

**Contact:**

* One-to-one meeting in week 1
* Email contact at the end of teaching block 1
* Individual ‘wrap up’ email at end of academic year

Students on sandwich placement will be encouraged to continue to maintain contact with their PT via email, telephone etc. in addition they will receive visits from an academic staff member which may be their PT. Normally, two visits will take place per placement.

Personal Tutors would have access to all the formative and summative assessment results of their tutees and would be responsible to discuss them with their tutees and assist them to prepare plans for further improvements and advise on any academic issues they may have. The personal tutors are also responsible for giving a bigger and more complete picture of learning, teaching, learning outcome and assessment and their linkage to the tutees.

1. **Ensuring and Enhancing the Quality of the Course**

The University has several methods for evaluating and improving the quality and standards of its provision. These include:

* External examiners
* Boards of study with student representation
* Annual review and development
* Periodic review undertaken at subject level
* Student evaluation
* Moderation policies
1. **Employability Statement**

This curriculum embeds the development of employability skills throughout the Course and is designed to equip students with the ability to relate the knowledge and skills that they have learnt to the real-world contexts in which they may work in the future. Group work in conjunction with external organisations at level 4 will provide students with relevant experience to add to their CV when they are applying for placement in level 5. Students are required to produce a CV early at level 5 and to improve this following feedback. The School strongly encourages and supports all students in applying for positions in industry for an Industrial Placement year between levels 5 and 6, the School emphasises the benefits to be obtained from an approved placement in industry.

An Industrial Placement comprises a period of at least 36 weeks with an approved employer. Students are required to maintain a log book of their activities and involvement and produce a final report on their activities as well as organisational and business aspects of the company. They are supported throughout the period by their personal tutor, who will visit them at their place of work on at least one occasion. The University tutor will discuss progress with the student and employer and will recommend any improvements to the learning opportunities.

Graduates develop careers in all branches of Mechanical and related engineering industries both here in the UK and throughout the world; as contract and consulting engineers, within local authorities, utility, manufacturing and transport companies, government organisations and the defence industry. In many cases, students taking an industrial placement are able to secure employment with the placement organisation following graduation. The academic and key skills developed throughout an engineering course also allow graduates to follow careers in other professions such as ICT, finance, accountancy and teaching.

Professional practice in Mechanical Engineering is introduced in the first year in the module **EG4010,** in which the students are introduced to the employment opportunities in the specialist engineering field, this is followed through all other modules at levels 5, 6 and 7, specifically in **EG5014 Project Engineering and Management, EG6023 Business and Project Management and Group Design Project and ME6014 Individual project.**

1. **Approved Variants from the Undergraduate or Postgraduate Regulations**
2. **Other sources of information that you may wish to consult**

Engineering subject benchmark:

[www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Subject-benchmark-statement-Engineering-.aspx](http://www.qaa.ac.uk/Publications/InformationAndGuidance/Pages/Subject-benchmark-statement-Engineering-.aspx)

Professional bodies:

[www.imeche.org/](http://www.imeche.org/)

Professional accreditation:

[www.engc.org.uk/](http://www.engc.org.uk/)

[www.imeche.org/](http://www.imeche.org/)

School Website:

<http://sec.kingston.ac.uk/about-SEC/subjects/mechanical-and-automotive-engineering/>

1. **Development of Field/Course Learning Outcomes in Modules**

This map identifies where the field/course learning outcomes are summatively assessed across the modules for this field/course. It provides an aid to academic staff in understanding how individual modules contribute to the field/course aims, a means to help students monitor their own learning, personal and professional development as the field/course progresses and a checklist for quality assurance purposes.

|  |  |  |  |
| --- | --- | --- | --- |
| **Module code** | **Level 4** | **Level 5** | **Level 6** |
| EG4010 | EG4011 | EG4012 | EG4013 | ME5011 | ME5012 | ME5013 | ME5021 | EG5014 | EG6023 | ME6016 | ME6012 | ME6014 | ME6021 |
| **Knowledge & Understanding** | A1 |  | S |  | S | S |  | S | S |  |  | S |  | S | S |
| A2 |  |  | S | S |  | S | S | S |  |  |  | S | S | S |
| A3 |  |  |  | S |  |  | S | S | S | S |  |  | S | S |
| A4 |  |  |  |  |  |  |  |  | S | S |  |  |  |  |
| A5 |  |  |  |  |  |  |  | S | S |  |  |  | S | S |
| A6 |  |  |  | S |  |  |  |  | S | S |  |  | S |  |
| A7 |  |  |  |  |  |  |  | S |  |  |  |  |  | S |
| **Intellectual Skills** | B1 |  | S | S | S | S | S | S | S |  |  | S | S |  | S |
| B2 |  | S | S |  | S | S |  | S |  |  | S | S |  | S |
| B3 |  |  |  | S |  |  | S | S |  |  |  |  | S | S |
| B4 | S |  |  | S |  |  |  |  | S |  |  |  |  | S |
| B5 | S |  |  |  |  |  |  |  | S |  |  |  | S |  |
| B6 | S |  |  |  |  |  |  |  | S | S |  |  |  |  |
| **Practical Skills** | C1 | S |  |  | S |  |  |  |  |  |  |  | S |  | S |
| C2 | S | S | S | S |  |  | S | S |  |  | S | S |  | S |
| C3 | S |  | S |  |  |  |  | S |  |  |  |  |  | S |
| C4 |  |  | S | S |  | S | S | S | S |  | S | S |  | S |
| C5 | S | S |  | S |  |  |  |  | S |  |  |  |  |  |

**Students will be provided with formative assessment opportunities throughout the course to practise and develop their proficiency in the range of assessment methods utilised.**

**Technical Annex**

|  |  |
| --- | --- |
| **Final Award(s):** | BEng (Hons) Mechanical Engineering BEng (Hons) Mechanical Engineering (Automotive Engineering) |
| **Intermediate Award(s):** | Cert HE in Mechanical EngineeringDip HE in Mechanical EngineeringBEng Mechanical Engineering BEng Mechanical Engineering (Automotive Engineering) |
| **Minimum period of registration:** | FT-3 years, SW- 4 years, PT- 6 years  |
| **Maximum period of registration:** | FT- 6 years, SW- 8 years, PT- 12 years |
| **FHEQ Level for the Final Award:** | Level 6 |
| **QAA Subject Benchmark:** | Engineering |
| **Modes of Delivery:** | Sandwich and Full-time |
| **Language of Delivery:** | English |
| **Faculty:** | Engineering, Computing and the Environment |
| **School:** | Engineering |
| **Department:** | Mechanical and Aerospace Engineering |
| **JACS code:** | H330 |
| **UCAS Code:** | H300 (full-time), H301(Sandwich); Automotive Engineering pathway: H320 (full time) and H321 (Sandwich)  |
| **Course/Route Code:** | *UFMEE1MEE03* |
|  |  |