

**Programme Specification**

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| **Title of Course:** | BEng(Hons) Civil and Infrastructure Engineering Degree Apprenticeship  |
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| **Date Specification Produced:** | May 2017  |
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This Programme Specification is designed for prospective students, current students, academic staff and 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 they take 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 Guide, on Canvas and in individual Module Descriptors.

**SECTION 1: GENERAL INFORMATION**

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| **Title:** | BEng (Hons) Civil and Infrastructure Engineering  |
| **Awarding Institution:** | Kingston University |
| **Teaching Institution:** | Kingston University |
| **Location:** | Penrhyn Road Campus, Kingston |
| **Programme Accredited by:** | The Joint Board of Moderators (JBM); comprising the Institution of Civil Engineers (ICE), the Institution of Structural Engineers (IStructE), the Chartered Institution of Highways and Transportation (CIHT), and the Institute of Highway Engineers (IHE). |

**SECTION2: THE PROGRAMME**

1. **Programme Introduction**

The BEng (Hons) Civil and Infrastructure Engineering programme is designed for apprentices who wish to study Civil Engineering to Honours Degree level through the five-year Degree Apprenticeship scheme and aspire to achieve the professional status of Chartered Engineer. Thus, offers the ideal preparation for a varied and interesting career in the world of Civil Engineering. The programme embraces recent developments in education and industry and the curriculum and teaching benefits from the research interests of the academic staff. The design of the programme is based on the guidelines provided by the Engineering Council UK Standard for Professional Engineering Competence (UK-SPEC), the Quality Assurance Agency (QAA) Subject Benchmark Statement for Engineering, and the Joint Board of Moderators (JBM) Guidelines for Accredited BEng (Hons) Degree Programmes.

This BEng is offered as a 5-day a week integrated five year degree apprenticeship programme for those in civil engineering related employment and are sponsored by the employers. Thirty credits at each level (90 credits in total) will be on work-based learning modules. The remaining 270 credits will be taught via an intense 1-day a week education programme at Kingston University for each of the five years of the programme (See Section E for the programme structure). Furthermore, there is an opportunity for advanced entry to Level 5 and Level 6 with appropriate academic qualifications.

In common with all engineering degrees at Kingston students will take a common set of modules with other disciplines at various levels. This allows all students to experience various engineering disciplines. A feature of the learning and teaching strategy is a focus on active learning sessions at the expense of traditional didactic lectures.

Throughout the course apprentices will have the support of a personal tutor who can provide one-to-one guidance and advice on the academic matters. Each apprentice will be allocated a personal tutor, who is an academic staff on their first day at the university. The apprentices are also supported by an employer mentor, a professional civil engineer, at work place who will monitor the progress of the students’ continuing learning at work, especially in achieving the learning outcomes of the work-based modules. Reports on students’ progress by the employer mentor will be conducted through an agreed reporting mechanism.

The personal tutor and the employer mentor will meet at least once every teaching block to ensure that the apprentices are progressing as planned and their learning experience at the university and at the work place is also acquiring the broader competencies such as: communication, group working, time and project management, computer literacy and problem solving skills.

The programme is designed to cover the JBM core subjects of structures, materials and geotechnics in full. Further topics include hydraulic and water engineering, engineering surveying, highways and transport infrastructure. Learning threads through the programme modules include design, sustainability, risk and health & safety. There is also a professional practice theme covering topics such as project, construction, quality and business management. The programme provides both breadth and depth with the aim to develop the ability to identify, define and solve problems from first principles. The course has an ethos of ‘learning through doing’ to ensure practical skills are developed. A key feature is the substantial amount of time students spend doing work based learning as well as practical work in a variety of well-equipped laboratories (which include concrete, hydraulics, materials, soils, and structures), site visits and three residential field courses - one in **engineering surveying** (surveying and setting out of a road using modern equipment currently held at Sussex University) at level 4 and two associated with geotechnical and water engineering challenges at level 5 (currently to the **Lake District** where geological features and built infrastructure are examined in order to deepen understanding of how the natural ground and geological processes affect construction in civil engineering) and at level 6 (currently to the **Isle of Wight** where coastal engineering and coastal processes, focussing on coastal landslips and erosion, as well as sustainable methods for managing these processes are studied). Sustainability and ‘Risk and Health & Safety’ are also appropriately threaded throughout the course modules

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

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

The general aims of the programme are:

* To equip graduates with engineering science, design, management, business and interpersonal skills required to become a professional Civil Engineer, as well as to enable graduates to follow careers in other professional disciplines where clear, logical, numerate skills in combination with the ability to solve problems, communicate solutions and work in teams are valued.
* To meet the academic requirements fully for Incorporated Engineer, IEng and, (*when combined with approved further learning in accordance with JBM*) for Registration as a Chartered Engineer, CEng, by ensuring that the course is accredited by the JBM.

More specific aims of the programme are:

* To produce graduates with the required breadth and depth of theoretical and practical knowledge of established technologies and methods in Civil Engineering;
* To enable graduates to develop analytical and problem-solving skills and to evaluate evidence and assumptions to reach sound judgements and communicate these effectively;
* To prepare graduates with a creative approach to the solution of civil engineering challenges and the requisite technical skills to realise these solutions with responsibility for project management;
* To equip graduates with the research skills required for postgraduate study and employability skills required for work in the engineering/construction fields;
* To provide those in relevant employment an opportunity to study a degree in Civil Engineering on a part-time day-release basis;
* To furnish graduates with a firm grasp of Engineering Design, Sustainability and ‘Risk & Health and Safety’ principles.
* 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 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. The 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:

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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 civil engineering subjects of materials, structures and geotechnics to apply existing and emerging technology | B1 | Apply fundamental theoretical scientific and mathematical principles that underpin engineering and specifically civil engineering | C1 | Use safely laboratory and workshop equipment for experimental investigation and evaluate data to produce practically valuable results |
| A2 | Demonstrate knowledge and understanding of hydraulics, surveying, water, highway, transportation and environmental engineering | B2 | Use mathematics as a tool for solving complex problems, communicating results, concepts and ideas | C2 | Undertake fieldwork and analyse the data obtained for use in planning and design |
| A3 | Demonstrate knowledge and appreciation of broader technical and non-technical engineering subjects | B3 | Think creatively and imaginatively to solve design problems and *manage* continuous improvement through quality management | C3 | Use a range of complex technical equipment and instruments, gaining a basic understanding of the underlying technology |
| A4 | Relate management and business applications to civil 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 communication |
| A5 | Demonstrate understanding of the importance of Risk and 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 regulation and procedure in practical engineering situations |
| A6 | Relate all their studies to a knowledge and holistic understanding of sustainability and environmental assessment | B6 | Recognise the importance of professional bodies and develop the professional conduct expected of Professional Engineers | C6 | Work independently or as part of a team to initiate, investigate, plan, manage and drive projects to a successful conclusion and produce the associated documentation (proposals, plans, reports, presentations). |

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: At least three A levels at Grades A\*-C including Mathematics and Physical Science, or their equivalent

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

Technician Level 3 Apprenticeship as a Civil Engineering Technician

Apprenticeship:

Students who have alternative or non-standard qualifications or have experience that needs to be credited on an ‘RPCL’ and ‘RPEL’ basis are considered on an individual basis.

1. **Course Structure**

This programme is offered in a part-time mode, with weekly one-day release from employment and scheduled continuing learning at work place, and leads to the award of BEng (Hons) Civil and Infrastructure Engineering. The course is completed when apprentices have successfully achieved 270 credits at the university (90 credits at each level of 4, 5 and 6) and 90 credits as work-based modules (30 credits at each level of 4, 5 and 6).

Entry is normally at Level 4 with A-level or equivalent qualifications (See section D).

Advanced entry to Level 5 requires academic qualifications deemed equivalent to BEng Level 4 (normally HNC) and the sponsorship of an approved employer in the construction industry.

Advanced entry to Level 6 requires academic qualification deemed equivalent to BEng Level 5 (normally HND) and the sponsorship of an approved employer in construction industry.

Intake is normally in September.

**E1. Professional and Statutory Regulatory Bodies**

The course is accredited by the JBM.

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

This BEng programme is designed for those employed within the civil engineering related industry. There are three work-based modules in the programme with one work-based module per level; namely CE4314, CE5314 and CE6314. These work-based modules provide apprentices with opportunities to acquire and apply knowledge in the work place while developing professionally.

Apprentices set out to achieve the learning outcomes of a work-based module by writing a Learning Plan. The Learning Plan must include an initial assessment of the learning outcomes and the level of competency learners have already achieved, and list the evidence required through planned activities at work to demonstrate that the learning outcomes of the work-based elements have been achieved. Through the Learning Plan, apprentices will match the knowledge acquisition in the work place to the learning outcomes for the work-based module.

The assessments of the work-based learning will be stated in the module descriptor.

In general, there are 3 elements to assess a work-based learning module:

* a portfolio of evidence with explanation of how the learning outcomes have been achieved;
* an assignment that demonstrates the knowledge and understanding, and the ability to apply that knowledge;
* an oral presentation in the University.

The benefits of these work-based modules are three-fold:

* apprentices having the opportunity to acquire knowledge and apply that knowledge in the work place;
* the University having engagement with industry;
* other full-time students having the benefit to learn from these apprentices who have practical experience in applying theory to practice.

**E3. Outline Programme Structure**

The programme structure diagram for Level 4, Level 5 and Level 6 entry is shown in Figures 1, 2 and 3, respectively.

2 Modules:

* EG4011
* EG4012

2 Modules:

* EG4013
* CE5012

2 Modules:

* CE5011
* CE5013

Work-based module:

CE4314

Work-based module:

CE5314

2 Modules:

* CE6011
* EG6023

1 Module:

* CE6012

BEng (Hons) Civil and Infrastructure Degree Apprenticeship

Certificate of Higher Education (120 credits at Level 4)

Diploma of Higher Education (240 credits at Level 4 or above of which 120 credits level 5)

Level 4 entry

(with Level 3 completion)

Work-based module:

CE6314

**Figure 1 - Programme Structure Diagram for Level 4 entry**

2 Modules:

* CE5011
* CE5013

2 Modules:

* CE5012
* CE6012

Work-based module:

CE5314

2 Modules:

* CE6011
* EG6023

BEng (Hons) Civil and Infrastructure Degree Apprenticeship achieved

Diploma of Higher Education (240 credits at Level 4 or above of which 120 credits level 5)

Level 5 entry

(with Level 4 completion e.g HNC)

Work-based module:

CE6314

**Figure 2 – Programme Structure Diagram for Level 5 entry**

BEng (Hons) Civil Engineering achieved

2 Modules:

* CE6011
* EG6023

Work-based module: CE6314

1 Module:

* CE6012

BEng (Hons) Civil and Infrastructure Degree Apprenticeship achieved

Level 6 entry

(with Level 5 completion e.g HND)

**Figure 3 – Programme Structure Diagram for Level 6 entry**

Each level is made up of four core modules each worth 30 credit points. Typically a student must complete 120 credits at each level. All apprentices will be provided with the University regulations and specific additions that are sometimes required for the 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 module guides.

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| **Level 4** (all core) |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |
| Sustainable Construction and Design | CE4314\* | 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 |

\*Work-based learning module

\*\*EG modules are common with Mechanical and Aerospace Engineering disciplines

Progression to level 5 requires passes in all four modules to give 120 credits at level 4. However, if apprentices fail to achieve 90 credits at Level 4 at the end of Year 1 (Figure 1), then they need to repeat the trailing module/s and may continue by taking the remaining Level 4 module/s at the discretion of the Progression Assessment Board.

Apprentices leaving the course at this point who have successfully completed 120 credits of level 4 are eligible for the award of Certificate of Higher Education in Civil and Infrastructure Engineering.

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| **Level 5** (all core) |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |
| Geotechnical Engineering 1 and Hydraulics | CE5011 | 30 | 5 | 1&2 |
| Engineering Surveying | CE5012 | 30 | 5 | 1&2 |
| Structural Engineering 1 and Construction Materials | CE5013 | 30 | 5 | 1&2 |
| Project and Business Management | CE5314\* | 30 | 5 | 1&2 |

\*Work-based learning module. Level 4 entry apprentices can opt to do this work-based learning module over 2 years (Year 2 and Year 3 in Figure 1).

Progression to level 6 requires passes in all four modules to give 120 credits at level 5. However, if Level 4 entry apprentices fail to achieve 90 credits at Level 5 at the end of Year 3 (Figure 1), they need to repeat the trailing module/s before progression to Level 6. If advanced entry to Level 5 apprentices fail to achieve 90 credits at Level 5 at the end of Year 1 (Figure 2), they need to repeat the trailing module/s and may continue by taking the remaining Level 5 module at the discretion of the Progression Assessment Board.

Apprentices exiting the programme at this point, who have successfully completed 120 credits, are eligible for the award of Diploma of Higher Education Civil and Infrastructure Engineering.

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| **Level 6** (all core) |
| **Compulsory modules** | **Module code** | **Credit** **Value** | **Level**  | **Teaching Block** |
| Structural Engineering 2 and Geotechnical Engineering 2 | CE6011 | 30 | 6 | 1&2 |
| Sustainable Infrastructure and Environment | CE6012 | 30 | 6 | 1&2 |
| Individual Project and Research Methods | CE6314\* | 30 | 6 | 1&2 |
| Business Management and Group Project | EG6023\*\* | 30 | 6 | 1&2 |

\*Work-based learning module. Level 5 entry apprentices can opt to do this work-based learning module over 2 years

\*\*EG modules are common with Mechanical and Aerospace Engineering disciplines

Completion of Level 6 requires passes in all modules to give 120 credits and qualify for BEng (Hons) Civil and Infrastructure Engineering

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

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

In total, 75% of the programme will be delivered at the university and the remaining 25% will be delivered through work-based learning. Associated tutorials, laboratory practicals, fieldwork, site visits and design classes are used to enhance the lecture material and continuing learning at work. The programme is devised to encourage and develop apprentices with confident interpersonal and communication skills, as well as emphasising group work, data analysis and ICT skills. The contact hours associated with a module at the University depends on the module type, but typically a module would comprise four hours per week lecture/tutorial and one hour per week for a design/practical session. Apprentices are expected to spend the remaining hours for a 30 credit module in guided independent study. Typically, the contact hours associated with a work-based module would comprise an hour per week for a tutorial during teaching weeks and eight hours for lecture/practical sessions during non-teaching weeks (10% of the module). Apprentices are expected to spend the remaining hours for a 30 credit module in work-based learning (circa 70%) and guided independent study (circa 20%).

**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 (Mathematics and IT in **EG4012 Engineering Mathematics and Computing)**, practical skills (**EG4011** **Engineering Mechanics, Structures and Materials** and, **EG4013** **Fluid Mechanics and Engineering Science i.e. Geotechnics**). This provides a solid foundation for students to undertake a deeper study at level 5 where 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 group and individual project modules **EG6023 Business Management and Group and, the work-based CE6314** **Individual Project and Research Methods**

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 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. **For example** students are offered CALcrete that is a free comprehensive suite of 16 computer-aided e-learning modules on concrete materials, design and construction, containing essential material and information for all construction professionals including engineers. CALcrete is used effectively as a learning tool and employed in the classroom to illustrate key concepts through the rich library of examples and images, as a revision tool and a source of further reading and as a self-learning tool owing to the many questions and exercises with typical answers. CALcrete helps support an inclusive approach as students can 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 modules at level 4. Due to a specialist strand in teaching block two for one of the modules i.e. the Engineering Science part of **EG4013 Fluid Mechanics and Engineering Science**, students pick the discipline-related engineering pathway i.e. Soil Mechanics at the end of teaching block one. Although apprentices study civil and infrastructure engineering exposure to other disciplines in the first teaching block will allow students to experience interdisciplinary work Project-based learning (PjBL) 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. At level 6, apprentices will consolidate their group working skills in **EG6023 Business Management and Group Project** when undertaking a group design project in their own engineering discipline, using the team working skills learned in the first year.

**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. Examples of interactive sessions can be found in all Civil Engineering modules at all levels where students are offered a highly interactive enquiry-based environment to solve realistic civil engineering problems. 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 (PBjL) is introduced at level 4 modules and developed further at level 6 in **EG6023** **Business Management and Group Project**. 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 at level 4 modules. Where 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 (4 hours). At level 5* ***CE5012*** ***Engineering Surveying*** *has a more substantial Flipped classroom approach where 12 hours of traditional lectures are replaced with extensive notes, video recorded lectures and other appropriate means and using formal class time for students to undertake collaborative and interactive activities relevant to that material. This is repeated at level 6 module* ***CE6012*** ***Sustainable Infrastructure and Environment****.*

Active and collaborative learning is also incorporated in traditional lectures which may have question-and-answer sessions, brief discussions, 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 is supports to 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 personal tutoring scheme, field work, industrial visits, extra-curricular seminars, research internships, course representative system, student ambassador work, peer mentoring and outreach opportunities.

An example of active learning is the **4D Construction Learning Environment** that is currently been developed for the New Town House Building at Kingston. This will provide online open-source access to an interactive digital environment that will host high-resolution 3-dimensional digital photographic surveys undertaken at weekly intervals (4-dimensions) during the construction of the Town House. The 4D environment facilitates self-directed movement chronologically between surveys, horizontally around hot spots on each floor plate and vertically between floors. The environment also incorporates additional resources associated with construction including technical drawings, contract administration documents, time-lapse videos and interviews with project personnel. A variety of innovative learning activities and assessment strategies have been developed to support engagement with the online construction process.

*An example of social / academic interaction between students and staff is the* ***KU Civil Engineering Society****. KUCES would be dedicated to enhancing both the learning, and social, experiences of KU Civil Engineers outside of the classroom, but would be equally open to all students including apprentices from other disciplines that may hold an interest in our area of study. Members should leave KU with great memories and continue membership as alumni, and also feel as though they have gained some experience in the profession. Site visits, possible trips abroad, attending special lectures and seminars, participating in departmental meetings such as the Industrial Advisory Board, or even society social and sports events, would enrich student experience. Networking via social media (communicating with existing groups) and a dedicated website would play a pivotal role in KUCES successful development and, enthusiastic academics and students are required to champion this exciting initiative.*

**Developments of employability skills**

The progressive development of a range key employability skills is another feature of the course as exemplified in teamwork/group work 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 teaching sessions in **EG4011**. At level 5 students will be required to produce individual laboratory reports on challenging topics in **CE5011, CE5012 and CE5013**. To help development of these skills students will be required to submit a draft report for **EG4011** to the Support for Academic Success Centre for feedback and to discuss this with their personal tutor. Employability skills continue to be enhanced at level 6 with modules **CE6011 and CE6012** that also include lab reports, presentations and group discussions. In the work-based Individual Project and Research Methods module **CE6314** apprentices will be taught how to synthesise and critical review information from a variety of sources and report this and their research results in a formal research report and an oral presentation.

Civil and Infrastructure Engineering students at Kingston are taught by qualified engineers with substantial personal experience of industry gained either prior to joining the University or through continuing consultancy practice. Industrial consultancy has a similar beneficial effect to research and scholarship, which together inform the teaching at all levels. The beneficial effects diffuse throughout the courses, ranging from the laboratories into such areas as the choice of locations and sites for visits and field courses, selection of case records for study and areas for project work as well as informing syllabus content, course design, as well as update of the content of individual lectures. The School accepted an invitation by the Institution of Civil Engineers last year and joined the newly developed portal for recording and assessing the students’ **Initial Professional Development**. This helps all students including apprentices to satisfy the ICE attributes through their studies and achieve their professional qualification soon after graduation.

A formal arrangement exists with a selection of engineers in full-time practice who generously give their time to support the department through the work of the **Industrial Advisory Board**. This Board meets with senior staff three times per year to discuss policy and course structure in the department. Some deliverables of the IAB include guest lectures (structures, H&S, sustainability, professional practice), course design (e.g. embedding JBM threads, relevance of skills to employability), research (co-supervision, subjects, KTPs), student placements and JBM visits. Industrial Members have been chosen to reflect both the various courses offered by the Department and the types of organisations for which many of our graduates end up working. We have, therefore, industrial members who are representative of both consultancy organisations – representing both international, and locally based companies, and contracting organisations – representing both major and smaller contractors. In addition, these industrial members have a range of professional qualifications including membership of Professional Engineering Institutions. Our students and apprentices take full advantage by being in continuous contact with the IAB members via mentoring by them, presenting their work to them, placements, applying for vacancies, IAB award, etc. including the yearly award for the best student by the Institution of Civil Engineers.

**Information Technology skills** are developed through a variety of mechanisms, including library and internet searches, use of the KU virtual learning environment (Canvas) and specific training in Windows based packages, but also some other proprietary packages. This includes some packages developed in-house at Kingston, for example, in Surveying and Geotechnics. Specific skills, such as graph drawing in excel, are taught as part of their laboratory report write up. The applications of MAPLE and MATLAB are taught and assessed at level 4, as is use of AutoCAD and Building Information Modelling (BIM). Within the Sustainable Infrastructure module AutoTrack is utilised as part of the coursework. Structural design and analysis software SuperSTRESS, commercial software used widely in practice, is taught in a number of modules from level 5 onwards and is also used within the final year Group Design, as well as some of the final year individual projects. Some project and risk management tools are used by students at Level 6 (Primavera Risk and MS Project, EG6023). Also at level 6, students use proprietary (Concrete Centre / Steel Construction Institute) Structural Design Spreadsheets and Software. Kingston also offers a wide range of IT training and support facilities, to suit to the varying needs of individual students. Thus students will be taught how to use IT to synthesise and critical 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; KU Talent events and opportunities. Activity in these areas is recognised by the University’s Kingston Award Scheme. KU Talent offers a range of events, including Careers Uncovered fairs, which include employers coming to campus to promote internship, placement and graduate opportunities, Spotlight on engineering networking activities where employers and alumni are invited on campus to talk about career pathways. Students are also encouraged to engage with local branches of Professional Engineering Institutions as they have to attend technical meetings and are assessed by reporting back as part of the Group Project.

**Hands-on Practical work**

A 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 as well as field trips 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 skills of measuring, interpreting and recording experimental data and how to apply these in a laboratory environment and present the results with **EG4011** (intro to structures and materials) and **CE4013** (intro to fluids and soils). Complying with Health & Safety requirements when in the lab is paramount. At level 5 the focus is on further testing and measurement of a variety of parameters in support of more level 5 concepts delivered in lectures with **CE5011** (Hydraulics and Geotechnics) and **CE5013** (Structures and Materials). 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 **CE6314** the work-based individual project module.

Academics are committed to practical fieldwork, encouraging students to acquire fieldwork skills, including health and safety, group coordination and management. This programme includes three residential field excursions, one in engineering surveying (currently held at Sussex University) at level 4 and two associated with geotechnical and hydraulic engineering at level 5 (currently to the Lake District) and level 6 (currently to the Isle of Wight). Site visits are arranged for groups of students whenever possible and are important in understanding the practical application of their academic work, as well as an appreciation of the students’ employability prospects.

**Research Informed Teaching**

The majority of the course team are either engineering research active or are involved in industry related professional activities, through KTPs or other 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. At Kingston, research in the field of Civil and Infrastructure Engineering has in recent years been concentrated in the areas of (i) structures and materials (concrete and sustainable materials) and (ii) geotechnical and hydraulic engineering science. Most of the teaching staff are also actively involved in the various Research Centres and/or Research Groups of the Faculty, or may be following interest areas of their own. These activities take them into, amongst other areas, advanced structural design, sustainable construction, composite materials, fire and blast resistance, earthquake engineering, geology and geotechnics, etc. Modules are mainly taught and managed by academic staff that are engaged in research in various areas and include their research findings in addition to well established principles, for example in module **CE6011** subject areas such as structures under complex loadings, Finite Elements, pre-stressed concrete, slope stabilisation, deep foundations, etc. are introduced.

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 into wider pedagogic issues which will then feed through to support learning in lectures and other forms of student engagement 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 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 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 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. All CE module assessments are related to real world problems. For example, in **CE5012** (surveying and setting out of a road), **CE5013** (design of elements in steel and concrete of framed buildings) and **CE6012** (hydrology report of infrastructure) 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. For example in **CE5011**, formative assessment is provided in the form of quick, regular and detailed feedback on laboratory reports facilitating improvement of these reports throughout the academic year. Examinations are still used as they are an effective way of assessing basic knowledge and understanding, and professional bodies expect to see examination 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 assessment by examination from level 4&5 to level 6.** The use of a well-balanced range of assessment methods is key part to of our inclusive assessment strategy. Group and teamwork assessment is instrumental in developing and recognising this important employability skill. For example, students study fundamental principles of structural mechanics and then demonstrate their applications in different practical examples of analysing structures in group work presentations at Level 4, e.g. understanding the principle of statics and equilibrium leads to its application i.e. ability to use statics and equilibrium in analysing a roof truss. Similar examples follow at levels L5 & L6. This demonstrates progressive skills and competences development – thus preparing employment ready graduates

**Engineering Curriculum**

Level 5 of the core programme builds on the fundamental knowledge and skills in science and mathematics gained at Level 4. Post-level-4 mathematics is deliberately incorporated with the teaching of each engineering topic that it relates to, rather than as a stand-alone subject. In all years, the industrial application of knowledge and professional practice in a multidisciplinary context are included. Level 5 focuses on knowledge and understanding of the engineering principles underpinning civil engineering. Learning-by-doing is implemented through all modules via tutorials, lab sessions, field courses, real world course works, etc.

**CE5011** enables students to apply the principles of fluid mechanics and soils learned at level 4 (EG4013) in developing skills to carry out the analysis and design of engineering problems in hydraulics and geotechnics. Hydraulics includes natural river courses and the conveyance of water through pipelines, culverts and canals. Geotechnics concentrates on geology emphasizing the influence of subsurface conditions on civil engineering and construction; effective stress and shear strength of soil and their effect in designing geotechnical problems. Groundwater seepage and dewatering of groundworks are examined effectively linking hydraulics and geotechnics.

**CE5013** is a core module covering the subjects of structures and materials. It builds and expands essential concepts of Engineering Mechanics, Structures and Materials learned at level 4 (EG4011) into the structural analysis and design of elements in construction materials such as steel, concrete, masonry and timber. Modern codes of practice such as the Eurocodes are introduced and used throughout and students become familiar with the design process from conception to detailed design and drawings. Material behaviour under loading is carefully examined at lectures and hands-on sessions and further verified by testing specimens in the lab and producing reports.

**CE5012** is a core module offering a fundamental skill expected of any civil engineer. This module exposes students to the instrumentation and observation principle of modern engineering surveying and develops their theoretical understanding and relevant mathematical expertise as well as their practical skills. The operating principles of surveying equipment including GNSS / GPS are all covered in the lecture programme and supported by practical exercises and a residential field course.

**EG5314** is a work-based learning module. It 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 in engineering environments.

Level 6 of the programme continues the themes of structures, materials and geotechnics and emphasises the development of self-management, independent learning, professional skills, and deep understanding of knowledge required in civil engineering. **Independent learning** is expected to increase at this level as students have acquired the skills required to achieve it via guidance and support (e.g. CASC) with resources as well as peer mentoring (e.g. level 4 students mentored by level 6 students) at earlier years.

**CE6011** is a core module in structures and geotechnics building on knowledge and skills attained at level 5 (CE5013). Students will learn how to analyse and design structural frames made of elements in steel and concrete which they learned at level 5. The design of advanced elements such as in pre-stressed concrete are introduced together with state-of-the-art computer-based analysis and design techniques such as Finite Elements for both structural and geotechnical problems. The geotechnics part of the module includes slope stability, deep foundations and elements of coastal engineering. Opportunities to link structures with geotechnics i.e. the soil and foundations supporting them are provided throughout.

**CE6012** is a core module in sustainable infrastructure and environment that follows elements learned at level 5 (the hydraulics part in CE5013 and the materials part in CE5011). Sustainable solutions to problems in water engineering and infrastructure such as water management and treatment or highway design are covered.

In **EG6023** Business Management and Group Project module students are taught about various key aspects of project planning and management before engaging in a group project based in the aerospace field and drawing on knowledge and experience gained previously. It will consist of substantial Project-Based Learning (PjBL) driven by the students with supervisor/facilitators encourage professionalism and leadership in a group activity support. 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.

**CE6314** is a work-based learning module. The Individual Project and Research Methods module combines the technical and academic facets of the programme and provides apprentices with an opportunity to complete a capstone project applying the knowledge and skills learnt during the programme 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 meet the requirements of the **three threads** as required by the Annexes of the JBM Guidelines; Annex B – Design, Annex C – Sustainability, Annex D – Health and Safety Risk Management as follows:

**Design (Annex B)** is a common thread throughout the whole of the programme integrating theory, analysis and design. The students start with conceptual design by using sketch books (issued during induction) and make/break model structures. As well as their developing their flair and imagination at level 4, they obtain technical skills at levels 5 and 6 (structural design of elements / frames using various materials) and integrate their knowledge with conceptual / detailed design both individually and in teams in the final year. The importance of interdisciplinary factors on the design process is emphasised throughout. Staff put worked examples or tutorial work ‘in context’, by describing typical case histories or scenarios into which the problem could fit. Any interdisciplinary factors, environmental and safety issues can thus be highlighted. Field visits are usually made to sites where staff leading the visits has been involved through practice, consultancy or research, so that briefings to students contain much practical experience.

The design process is introduced level 4 to give students the basic principles and tools to enable them to embark upon a design, giving them the confidence to 'have a go' for themselves. There is also a hands-on 'Design and Make' project at this level; such as the bridge building competition and a platform. This is further enhanced at level 5 where lectures on conceptual and detailed design are followed by tutorials and group work using various materials e.g. steel, concrete, timber and masonry. The culmination of the design work is materialised at level 6 where students work in small groups and individually and are required to take into account all aspects of the project, including financial, technical, planning, environmental, construction and safety. The Industrial Advisory Board and other industrial contacts assist in the preparation of the design brief, giving specialist expert lectures and seminars about design and in the provision of advice and constructive criticism to the student groups. In recent years themes are designed to encourage ingenuity, imagination and inventiveness, and also to develop students’ skills in critical evaluation of their own and others’ work.

Various aspects of communication skills are also assessed. These include report writing, engineering drawings (hand drawn sketches and CAD), records of group meetings and especially oral presentation of the final scheme design to peers and academic staff. The students are required to submit an individual assignment on a set topic chosen by the teaching team. The topic is chosen with a view to challenging the students' powers of argument, evaluation and critical thinking.

Students are required to attend at least two professional body meetings - full details of various national/regional Institution meetings/lectures/seminars are provided to the students. Kingston is well placed for this activity and the Surrey Branch of the IStructE regularly uses Kingston University as a meeting venue. Students are required to write a report on one of the meetings attended. This activity reinforces and encourages student membership of Professional Engineering Institutions. Special attention is drawn to meetings which have direct relevance to the design topic.

**Sustainability (Annex C)** is a thread that runs through all modules of the undergraduate programmes from induction to the final project, group design and final examinations; sustainability may be considered thoroughly embedded in the student’s degree studies. There are a number of sustainability-driven modules (e.g. EG4013, CE5011 and CE6012) where sustainable development and environmental concerns are explicit, but sustainability is also included in all core modules on structures, materials, geotechnics, hydraulics and construction. Students are made aware of the implications of climate change, the low-carbon agenda, environmental, economic and social issues and their increasing influence on construction; students are encouraged to think in broader terms than merely finding a technical design solution. The programmes were designed so that sustainability is pervasive in the curriculum.

**Health and Safety Risk Management (Annex D)** forms a key theme running from day 1 of the induction week to the end of the courses. It is emphasised in relation to laboratory work, site visits and residential field courses, as well as forming a specific part of management teaching. Considerations of health and safety form part of the key planning of any design and all students become familiar with the Construction Design and Management (CDM) Regulations and Risk Assessments for Safety. It is recognised that health and safety risk is part of construction risk management, and learning outcomes relating to risk and safety are included in several modules throughout the programme. To emphasise the importance of risk management, students gain experience of carrying out a Risk Assessment, which is assessed, at level 4 during the first teaching block in the labs. The theme of construction risk continues at level 5 with CE5314 and level 6 with EG6023. The content is reviewed and updated regularly and the department continues to actively seek new ways to present this subject.

**Inclusive Teaching Practice**

The University is strongly committed to the 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. Skills will be identified that employers think are needed from graduates using alumni or the Professional Engineering Institutions. This involves the support from DARE (Development, Alumni Relations and Events department) to identify alumni who have graduated at least a year ago. 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, tailored 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 the employability skills. Students will develop a CPD record in VLE to draw upon in applications and interviews. Personal Tutors include employability criteria and reflective questions in first meeting and record on system.

Staff Student Consultative Committees and Boards of Study provide opportunities for student to make suggestion 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, various **methods of teaching and learning** are used throughout, but not exclusively, as follows:

*Lectures*

Lectures are formal staff-led sessions designed to introduce new topics and material or provide an overview of a topic for further student study. Lectures make use of various media, supplemented by material uploaded to the University’s virtual learning environment. The School’s academics are convinced that students learn better through active participation and hence lectures would generally overlap with tutorials in expecting students to be actively involved in sketching, designing and calculating.

*Tutorials*

Academic tutorials are provided where lecturers assist students in solving design problems and in discussing lecture material. In many modules the tutorials and lectures will be integrated as described above.

*Design workshops*

Workshops may be staff-led or student-led where students participate in group design work emphasising the need for effective oral communication and planning. Design classes, case studies and workshops often integrate material from different academic areas and would include a practical real-world emphasis. Three dimensional model building also forms part of these sessions where students are expected to produce a physical model of their planned designs e.g. a bridge, a platform or building.

*Practical sessions*

Practical sessions in the laboratories are designed to enable students to acquire practical and analytical skills through the application of theory. Sessions are run throughout the course utilising the full range of laboratories: hydraulic, geotechnical, structural and materials. Each session includes some form of data collection, analysis, presentation and reporting. Practical work will generally be carried out in small groups where students are encouraged to cooperate and assist their fellow students. The outcome of the practical work is formative assessment or summative assessment based on individual or group reports depending on the nature of the activity. The overarching aim is that a student’s ability in carrying out practical work and producing technical reports will improve throughout the three years of study.

*Technology enhance learning (TEL)*

Computer aided practical sessions are also a fundamental part of the programme, enabling students to apply the design process through practical application and offering another form for communicating ideas. Throughout the three levels of study students are given computer based training in design and analysis of specific real world problems. TEL is also offered during the course through the use of video as a tool for presentation; clickers for immediate formative feedback; wiki/group discussion as an online platform for groups to provide and receive feedback from peers; smart pen and tablet to show step-by-step tutorial questions; computer software for structures and highway engineering.

*Field work and site visits*

Academics are committed to practical fieldwork, encouraging students to acquire fieldwork skills, including health and safety, group coordination and management. This programme includes three residential field excursions, one in engineering surveying (currently held at Sussex University) at level 4 and two associated with geotechnical and hydraulic engineering at level 5 (currently to the Lake District) and level 6 (currently to the Isle of Wight). Site visits are arranged for groups of students whenever possible and are important in understanding the practical application of their academic work, as well as an appreciation of the students’ employability prospects.

*Group work*

Good team-working skills are an essential skill for graduates aspiring to work in the construction industry; hence, teamwork plays an important role in the academic development of a Civil Engineering undergraduate. Group work projects throughout all three levels illustrate the value of team work, developing interpersonal skills and fostering cooperation and supportive peer relationships. In general group membership is selected by the students and group activities are student-led with staff monitoring progress. Where group work is assessed summatively a peer assessment form is submitted indicating the contribution of each member. This exercise of peer assessment is well recognised as an essential employability skill.

*Individual project*

A fundamental element of level 6 is the individual capstone project allowing students to integrate material from their course in an independent study of a research topic. A student’s research skills will be developed with the assistance of targeted lectures, as well as an assigned supervisor, encouraging students to work effectively independently, communicating their findings clearly and succinctly through oral and written presentation. The expertise of the academic team members and their research activities are commonly utilised by students during this final year project.

**Assessment**

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.

Assessment and feedback are regarded as integral parts of learning and teaching strategy and incorporated in all modules. Assessment methods are adopted in each module to enable students to demonstrate their acquisition of knowledge and skills as outlined in the module learning outcomes. The assessment regime for each module has been designed to provide ample formative opportunities that allow students to improve their performance, following feedback, in preparation for summative assessment. For example, a number of modules utilise a portfolio of work where typically short pieces of work are required, but final grades selected from the best. The development of skills is threaded through the programme and assessed both formatively and summatively. A wide range of assessment methods is used to ensure that students with diverse backgrounds are not disadvantaged for example individual coursework and project themes are selected to fit individual backgrounds. The methods of assessment have been selected so as to be most appropriate for the nature of the subject area, teaching style and learning outcomes in each module and priority is given to authentic assessments based on real world engineering challenges

In the programme as a whole, 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 restricted time
* Project: The individual project module represents an opportunity for students to draw together different aspects of their learning on the programme 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
* Posters: The group project is presented in posters to and assessed by academic staff as well as members of the industrial advisory board.
* Model building: in the first year, where students make a structure with little wooden sticks and tape e.g. a small bridge and load it to breaking point.
* Short in-class tests and on-line assessments: throughout a number of modules.

At the beginning of each academic year deadlines for submission and feedback are planned carefully and a full **assessment timeline calendar** is constructed to ensure that there is no summative assessment bunching and thus student workloads are managed. In addition, this calendar offers a synchronised and coherent delivery of the programme that is clearly understood by staff and students who can appreciate the integrated nature of their learning emanating from various module assessments.

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 PTS section of programme specification below) At level 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, 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 support
* **Faculty Student Achievement Officers** provide additional pastoral and practical advice and support, especially to students encountering difficulties
* A dedicated **Course Administrator**
* An **induction programme** and study skills sessions at the start of each academic year
* **SEC Academic Success Centre (SASC)** 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.
* **Virtual Learning Environment** – a versatile on-line interactive intranet and learning environment accessible both at the university and remotely. Canvas, the University’s virtual learning environment, is used extensively in all modules as a communication tool and means of dissemination of learning and reference materials, formative worksheets, assignments, links, videos and lecturer-annotated slides. In this way it acts as a dynamic study guide in each module and going further it provides a structured learning space to support students for independent study, facilitate discussion, and in addition, for formative and summative tests and surveys.
* A **Staff Student Consultative Committee with student Course Representatives** for each level
* **Talent 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.
* **Union of Kingston Students**
* **An Academic Team** that seeks to maintain an open door policy in the spirit of supporting students.

**Personal Tutor Scheme (PTS) and Work Place Mentoring Scheme (WPMS) 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 is embedded within the modular provision of the BEng Programme.

**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 teaching block one a change of PT is likely to occur to allow comprehensive support through the programme.

**Assessment**

The PTS is embedded in work based learning modules at each level of undergraduate study:

Level 4 – CE4314 Sustainable Construction and Design

Level 5 – CE5314 Project and Business Management

Level 6 – CE6314 Individual Project and Research Methods

There are specific aims and outcomes for each level that will be assessed, as part of each module. The PTS is a progressive scheme building on the skills developed in previous levels. Formative assessment will be provided in the form of regular feedback during meetings with the Personal Tutor and Employer Mentor when the student will be able to put forward draft assignments for evaluation. The summative assessment will be part of the assignments given in each module.

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 Monitoring and Enhancement
* Periodic review undertaken at subject level
* Student evaluation including MEQs, level surveys and the NSS
* Moderation policies
* Feedback from employers

Quality is also assured by the requirement for professional body (JBM) reaccreditation, generally at a five year interval.

1. **Employability Statement**

This curriculum embeds the development of employability skills throughout the course and is designed to equip apprentices with the ability to relate the knowledge and skills that they have learnt to real world contexts. Apprentices are required to produce a CV early at Level 5 and to improve this following feedback.

Apprentices are supported throughout the course by their personal tutor, who will visit them quarterly. The personal tutor will discuss progress with the apprentice and the mentor and will recommend any improvements to the learning opportunities, if appropriate.

This course has been designed to fulfil the core curriculum requirements (with further learning) for Chartered Engineer (CEng) status. Most graduates will aspire to becoming Chartered Engineers. Graduates develop careers in all branches of the Civil Engineering industry, in the UK and throughout the world; as contractors and consulting engineers, and within local authorities, water authorities, government organisations and the defence industry. The academic and key skills developed throughout this engineering 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 Civil Engineering and related specialist areas or other fields before continuing their career in industry or research.

1. **Approved Variants from the Undergraduate Regulations**

Minimum period of registration

Level 4 entry – 5 years Level 5 entry – 3 years Level 6 entry – 2 years

Maximum period of registration

Level 4 entry – 8 years Level 5 entry – 5 years Level 6 entry – 4 years

Progression from Level 5 to Level 6

Progression from Level 5 to Level 6 is permitted with 90 credits achieved at Level 5.

Compensation is not permitted, to meet JBM requirements, for the following module:

CE6314 Individual Project and Research Methods

Reassessment of CE6314 will normally be by

* retake to improve the dissertation for marginal failure (Grade F5 or marks of 35-39) and the mark will be capped
* repeat only with a new project brief and the mark will be capped
1. **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.ice.org.uk/](http://www.ice.org.uk/)

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

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

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

Professional accreditation:

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

School Website:

[www.sec.kingston.ac.uk/about-SEC/schools/civil-engineering/](http://www.sec.kingston.ac.uk/about-SEC/schools/civil-engineering/)

**See Appendix A for the following:**

* **Learning Outcomes for Accreditation**: EC UK-SPEC: Engineering Council UK Standard for Professional Engineering Competence - Specific Learning Outcomes in Engineering

**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** |
| EG4011 | EG4012 | EG4013 | CE4314 | CE5011 | CE5012 | CE5013 | CE5314 | CE6011 | CE6012 | CE6314 | EG6023 |
| **Knowledge & Understanding** | A1 | S |  | S | S | S | S | S |  | S |  | S | S |
| A2 |  | S |  | F |  |  |  |  | S | S | S | S |
| A3 |  |  |  |  |  |  |  | S | S |  | S | S |
| A4 |  |  |  | S | S |  |  | S | S |  | S | S |
| A5 | S |  |  | S | S |  | S | S | S |  | S | S |
| A6 | S |  |  | S | S | S |  | S | S | S | S | S |
| **Intellectual Skills** | B1 | S | S | S |  | S | S | S |  | S |  |  | S |
| B2 | S | S | S |  | S |  | S |  | S |  |  |  |
| B3 |  |  |  |  |  |  | S |  | S | S | S | S |
| B4 |  |  |  |  |  |  |  | S |  | S |  |  |
| B5 |  |  |  |  |  |  |  |  |  | S | S | S |
| B6 |  |  | S |  |  |  | S |  | S |  |  | S |
| **Practical Skills** | C1 | S |  | S | S | S | S | S |  | S |  |  | S |
| C2 |  |  |  |  | S | S |  |  | S |  |  | S |
| C3 |  |  |  |  |  | S | S |  |  |  |  | S |
| C4 |  | S |  |  | S | S | S | S | S |  | S | S |
| C5 |  |  |  |  |  |  | S | 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.**

**APPENDIX A**

**Mapping of Learning Outcomes for Accreditation by the Joint Board of Moderators (PSRB)**

**To comply with the Engineering Council’s Accreditation of Higher Education Programmes (AHEP 2014): UK Standard for Professional Engineering Competence (UKSPEC) - Specific Learning Outcomes in Engineering as incorporated in the Quality Assurance Agency Subject Benchmark Statement – Engineering (QAA 2015).**

**Output Standards for a Bachelors (Honours) Degree accredited as partly meeting the educational requirement for CEng**

**(Further Learning to Masters Level will be required)**

Graduates from accredited programmes must achieve the following six learning outcomes, defined by broad areas of learning. The weighting given to these different broad areas of learning will vary according to the nature and aims of each programme.

**Science and Mathematics**

Engineering is underpinned by science and mathematics, and other associated disciplines, as defined by the relevant professional engineering institution(s). Graduates will need the following knowledge, understanding and abilities:

1. Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies Knowledge and understanding of mathematical principles necessary to underpin their education in their engineering discipline and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of engineering problems;
2. Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems
3. Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline.

**Engineering Analysis**

Engineering analysis involves the application of engineering concepts and tools to the solution of engineering problems. Graduates will need:

* 1. Understanding of engineering principles and the ability to apply them to analyse key engineering processes
	2. Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques
	3. Ability to apply quantitative and computational methods in order to solve engineering problems and to implement appropriate action
	4. Understanding of, and the ability to apply, an integrated or systems approach to solving engineering problems.

**Design**

Design at this level is the creation and development of an economically viable product, process or system to meet a defined need. It involves significant technical and intellectual challenges and can be used to integrate all engineering understanding, knowledge and skills to the solution of real and complex problems. Graduates will therefore need the knowledge, understanding and skills to:

Graduates will therefore need the knowledge, understanding and skills to:

* 1. Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics;
	2. Investigate and define the problem, identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards
	3. Work with information that may be incomplete or uncertain and quantify the effect of this on the design
	4. Apply advanced problem-solving skills, technical knowledge and understanding, to establish rigorous and creative solutions that are fit for purpose for all aspects of the problem including production, operation, maintenance and disposal
	5. Plan and manage the design process, including cost drivers, and evaluate outcomes
	6. Communicate their work to technical and non-technical audiences.

**Economic, legal, social, ethical and environmental context**

Engineering activity can have impacts on the environment, on commerce, on society and on individuals. Graduates therefore need the skills to manage their activities and to be aware of the various legal and ethical constraints under which they are expected to operate, including:

* 1. Understanding of the need for a high level of professional and ethical conduct in engineering and a knowledge of professional codes of conduct;
	2. Knowledge and understanding of the commercial, economic and social context of engineering processes;
	3. Knowledge and understanding of management techniques, including project management, that may be used to achieve engineering objectives;
	4. Understanding of the requirement for engineering activities to promote sustainable development and ability to apply quantitative techniques where appropriate;
	5. Awareness of relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues
	6. Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and of risk assessment and risk management techniques.

**Engineering Practice**

This is the practical application of engineering skills, combining theory and experience, and use of other relevant knowledge and skills. This can include:

* 1. Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc.);
	2. Knowledge of characteristics of particular materials, equipment, processes, or products;
	3. Ability to apply relevant practical and laboratory skills;
	4. Understanding of the use of technical literature and other information sources;
	5. Knowledge of relevant legal and contractual issues;
	6. Understanding of appropriate codes of practice and industry standards;
	7. Awareness of quality issues and their application to continuous improvement;
	8. Ability to work with technical uncertainty
	9. Understanding of, and the ability to work in, different roles within an engineering team.

**Additional General Skills**

Graduates must have developed transferable skills, additional to those set out in the other learning outcomes that will be of value in a wide range of situations, including the ability to:

1. Apply their skills in problem solving, communication, working with others, information retrieval, and the effective use of general IT facilities
2. Plan self-learning and improve performance, as the foundation for lifelong learning/CPD
3. Plan and carry out a personal programme of work, adjusting where appropriate
4. Exercise initiative and personal responsibility, which may be as a team member or leader

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Module Code** | **Module Title** | **Science and Mathematics** | **Engineering Analysis** | **Design** | **Economic, Social and Environmental Context** | **Engineering Practice** | **Additional General Skills** |
| EG4011 | Engineering Mechanics, Structures and Materials | 1, 2, 3 | 1, 2, 3, 4 | 1, 2, 3, 4, 5, 6 | 1, 2, 4, 6 | 1, 2, 3, 4, 6, 7, 8 | 1, 2, 3, 4 |
| EG4012 | Engineering Mathematics and Computing Applications | 1, 2, 3 | 1, 2, 3, 4 | 3, 6 | 6 | 4, 8 | 1, 2, 3, 4 |
| EG4013 | Fluid Mechanics and Engineering Science | 1, 2, 3 | 1, 2, 3, 4 | 1, 2, 3, 4, 5, 6 | 1, 2, 4, 6 | 1, 2, 3, 4, 6, 7, 8 | 1, 2, 3, 4 |
| CE4314 | Sustainable Construction and Design | 4, 5 | 3, 4, 5 | 1, 3, 4, 6 | 1, 2, 3, 4, 6 | 3, 4, 6 | 1, 2, 3, 4 |
| CE5011 | Geotechnical Engineering 1 and Hydraulics | 1, 2, 3 | 1, 2, 3, 4 | 1, 2, 3, 4, 5, 6 | 1, 2, 4, 6 | 1, 2, 3, 4, 6, 7, 8 | 1, 2, 3, 4 |
| CE5012 | Engineering Surveying | 1, 2, 3 | 1, 2, 3, 4 | 2, 3, 4, 5, 6 | 1, 2, 4, 6 | 1, 2, 3, 4, 6, 7, 8 | 1, 2, 3, 4 |
| CE5013 | Structural Engineering 1 and Construction Materials | 1, 2, 3 | 1, 2, 3, 4 | 1, 2, 3, 4, 5, 6 | 1, 2, 4, 6 | 1, 2, 3, 4, 6, 7, 8 | 1, 2, 3, 4 |
| CE5314 | Project and Business Management | 2 | 2 |  | 1, 3, 4 | 1, 3, 4 | 1, 2, 3, 4 |
| CE6011 | Structural Engineering 2 and Geotechnical Engineering 2 | 1, 2, 3 | 1, 2, 3, 4 | 1, 2, 3, 4, 5, 6 | 1, 2, 4, 6 | 1, 2, 3, 4, 6, 7, 8 | 1, 2, 3, 4 |
| CE6012 | Sustainable Infrastructure and Environment | 1, 2, 3 | 1, 2, 3, 4 | 1, 2, 3, 4, 5, 6 | 1, 2, 3, 4, 5, 6 | 1, 2, 3, 4, 6, 7, 8 | 1, 2, 3, 4 |
| CE6314 | Individual Project and Research Methods | 1, 3, 4, 5 | 1, 3, 4, 5 | 1, 2 | 1, 6 | 1, 6 | 1, 2, 3, 4 |
| EG6023 | Business Management and Group Project | 1, 2, 3 | 1, 2, 3, 4 | 1, 2, 3, 4, 5, 6 | 1, 2, 3, 4, 5, 6 | 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1, 2, 3, 4 |

**Technical Annex**

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| **Final Award(s):** | BEng (Hons) Civil and Infrastructure Engineering |
| **Intermediate Award(s):** | Certificate of Higher Education in Civil and Infrastructure EngineeringDiploma of Higher Education in Civil and Infrastructure Engineering |
| **Minimum period of registration:** | L4 entry-5 years L5 entry-3 years L6 entry-2 years  |
| **Maximum period of registration:** | L4 entry-8 years L5 entry-5 years L6 entry-4 years |
| **FHEQ Level for the Final Award:** | Level 6 |
| **QAA Subject Benchmark:** | Engineering |
| **Modes of Delivery:** | 5-day a week integrated learning, include 1-day a week education programme at Kingston |
| **Language of Delivery:** | English |
| **Faculty:** | Science, Engineering and Computing |
| **School:** | School of Engineering |
| **Department:** | Civil Engineering, Surveying and Construction Management |
| **JACS code:** | *This is the* [*Joint Academic Coding System*](https://www.hesa.ac.uk/index.php?option=com_content&view=article&id=1805&ItemId=296&limit=&start=#q10) *(JACS) agreed jointly by UCAS and HESA* |
|  |  |
| **UCAS Code:** |  |
| **Course Code:** |  |
| **Route Code:** |  |