

# Programme Specification

# Title of Course: BEng (Hons) Civil Engineering-Degree Apprenticeship

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| Version number | 3 |
| Faculty | Engineering, Computing and the Environment |
| School | Built Environment & Geography |
| Department | Civil Engineering, Surveying and Construction Management |
| Delivery Institution | Kingston University |

This Programme Specification is designed for prospective Apprentices, current Apprentices, academic staff and employers. It provides a concise summary of the main features of the programme and the intended learning outcomes that a typical Apprentice might reasonably be expected to achieve and demonstrate if they take full advantage of the training/learning opportunities that are provided. More detailed information on the learning outcomes and content of each module can be found in the course VLE site and in individual Module Descriptors.

## SECTION 1: GENERAL INFORMATION

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| Award(s) and Title(s): | BEng (Hons) Civil Engineering-Degree Apprenticeship |
| Intermediate Awards(s) and Title(s): | Cert HE in Civil Engineering  Dip HE in Civil Engineering  BEng Civil Engineering |
| FHEQ Level for the Final Award: | Honours degree level 6 |
| Awarding Institution: | Kingston University |
| Teaching Institution: | Kingston University |
| Location: | Kingston University- Penrhyn Road Campus |
| Language of Delivery: | English |
| Modes of Delivery: | Part time |
| Available as: | Full field |
| Minimum period of registration: | PT = 5 Years |
| Maximum period of registration: | N/A |
| Entry Requirements: | The minimum entry qualifications for the programme are:  - UCAS tariff points: 112-128:   * From A levels: A-level (or equivalent) in Mathematics at grade C or above. General studies and Native language at both A-Level and AS Level not accepted in the tariff. * From BTEC: BTEC Level 3 Extended Diploma in Engineering including Construction and Built Environment, including minimum Merit in Maths and Further Maths * From BTEC Level 3 National Diploma: with D\*D\* and in addition must hold an A-level in Maths with a minimum grade of C. * T Level- Merit in Design, Surveying and Planning for Construction   - Candidates are normally required to hold five GCSE subjects at grade C/4 or above, including Mathematics and English Language.  - Access Diploma: Access HE diploma is not accepted.  - Applications from those that have undertaken an Engineering foundation year will also be considered.  - Entry is normally at Level 4 with A-level or equivalent qualifications.  - 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.  - Intake is normally in September.  - Entry into level 4, an applicant meeting entry requirements stated above and direct entry to level 5, requiring appropriate employment, employer approval and academic qualifications deemed equivalent to BEng level 4 (normally HNC/D) in a Civil Engineering or equivalent discipline.  - Learners who have alternative or non-standard qualifications that needs to be credited on an ‘RPCL’ and ‘RPEL’ basis are considered on an individual basis and is at the discretion of the course team. |
| Programme Accredited by: | This degree is accredited by the Joint Board of Moderators ([JBM](https://jbm.org.uk/)) comprising the Institution of Civil Engineers, Institution of Structural Engineers, Institute of Highway Engineers, the Chartered Institution of Highways and Transportation and the Permanent Way Institution on behalf of the Engineering Council (Accreditation of Higher Education Programmes) for the purposes of fully meeting the academic requirement for registration as an Incorporated Engineer (IEng) and partially meeting the academic requirement for registration as a Chartered Engineer (CEng). Candidates must hold a masters or doctorate accredited as further learning for CEng to hold accredited qualifications for CEng registration.  See www.jbm.org.uk for further information and details of Further Learning programmes for CEng. |
| QAA Subject Benchmark Statements: | [QAA subject benchmarks for Engineering (March 2023)](https://www.qaa.ac.uk/the-quality-code/subject-benchmark-statements/subject-benchmark-statement-engineering)  *Compensation & condonement-policy* |
| Approved Variants: | Yes, we have approved variants required to meet the new Engineering Council |
| UCAS Code: | TBC |

For Higher or Degree Apprenticeship proposals only (delete if not applicable)

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| Degree Apprenticeship standard: | *Civil Engineer (Degree)- ST0417* |
| Recruitment, Selection and Admission process: | *Information regarding available apprenticeships with a number of Employers can be found on the* [*Institute for Technical Apprenticeships and Education*](https://www.instituteforapprenticeships.org/apprentices/) *. Apprentices apply for positions with Employers, and then, following application, interview and selection process, successful apprentices apply for the degree apprenticeship through our application process led by the Central Apprenticeships Team (CAT), Admission Tutor and Programme Course Leader. Assuming qualification stipulations are met by the apprentice, they will be invited to complete the on-boarding process through our end-to-end software Aptem. This includes completion of an Initial Needs Assessment - with the apprentice declaring Recognised Prior Learning - both academic and experiential - against the learning outcomes for the academic programme and its modules.*  *Please see our apprenticeship webpages -* [*https://www.kingston.ac.uk/degree-apprenticeships/*](https://www.kingston.ac.uk/degree-apprenticeships/)  [Higher and Degree Apprenticeships - Kingston University London](https://www.kingston.ac.uk/degree-apprenticeships/) *- for more information."* |
| End Point Assessment Organisation(s): | *Institution of Civil Engineers (ICE)* |

## SECTION 2: THE COURSE

### Aims of the Course

### *The general aim of the programme is:*

### *To equip graduates with engineering science, design, management, business and interpersonal skills required to become a professional Civil Engineer, as well as to enable them 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.*

### *More specific aims of the programme are:*

### *To produce graduates with a good design capability together 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 inculcate a deep understanding of engineering principles that 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 civil engineering and the built- environmental fields;*

### *To furnish graduates with a firm grasp of design, sustainability, health and safety risk management, professionalism, ethics and inclusion practice principles.*

### *To develop skills in problem solving, communication, information retrieval, working with others and the effective use of technologies.*

### *To plan and carry out a personal programme of work, adjusting where appropriate, and develop the capacity for independent study and lifelong learning.*

### Intended Learning Outcomes

The course outcomes are referenced to the QAA subject benchmarks for Engineering (2023), the [IfATE Level 6 Degree Apprenticeship standard for “Civil Engineer”, ST0417](https://www.instituteforapprenticeships.org/apprenticeship-standards/civil-engineer-degree-v1-0) and the [Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies (2014)](https://www.qaa.ac.uk/the-quality-code/qualifications-frameworks) relating to the typical Apprentice. The course provides opportunities for learners to develop and demonstrate knowledge and understanding specific to the subject, key skills and graduate attributes in the following areas:

In addition, the defined learning outcomes are those published by the [Engineering Council](http://www.engc.org.uk/) in the UK Standard for Professional Engineering Competence (UK-SPEC): [The accreditation of Higher Education Programmes - Fourth edition](https://www.engc.org.uk/ahep).

### Programme Learning Outcomes

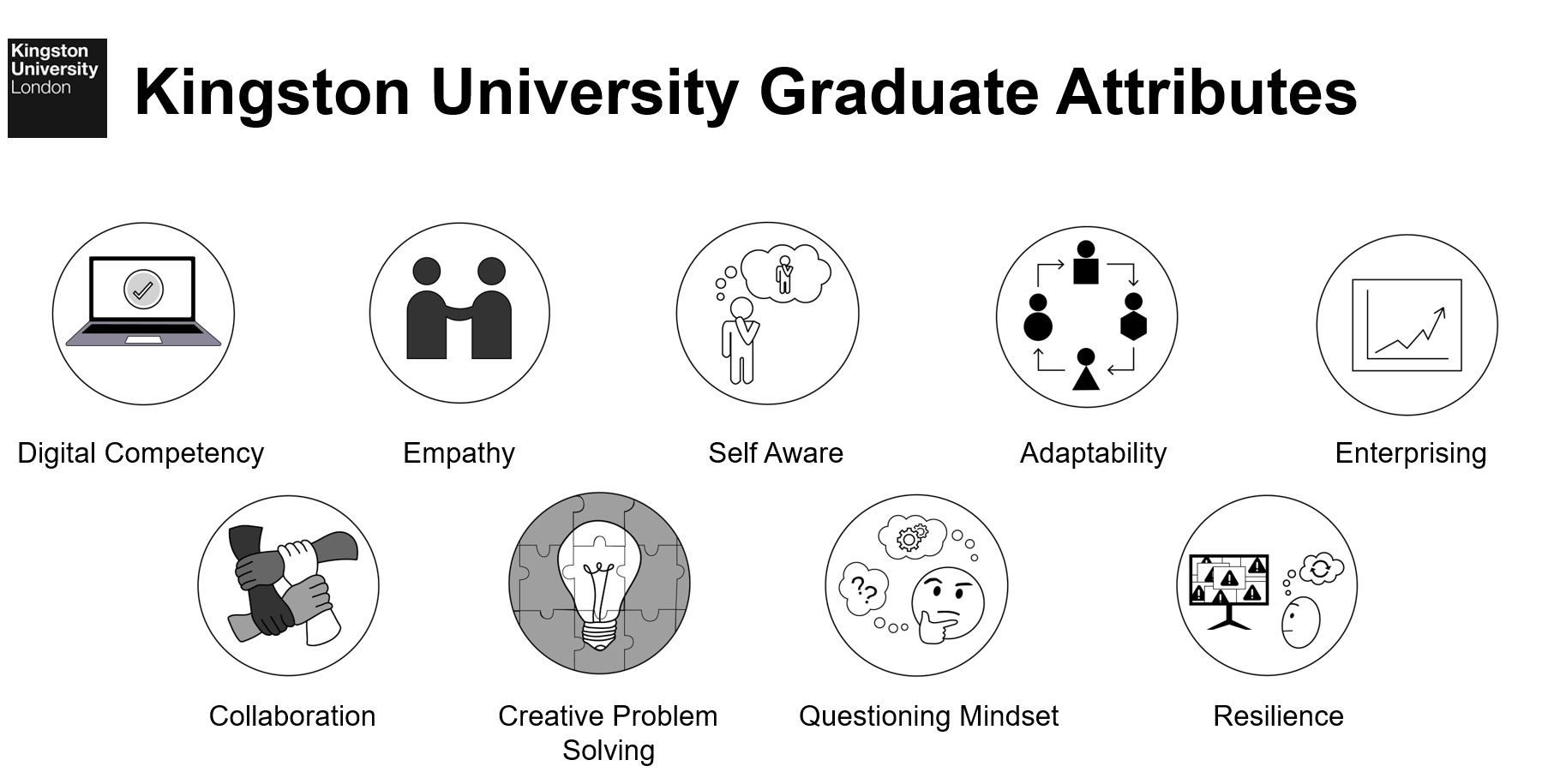
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|  | **Knowledge and Understanding**  On completion of the course Apprentices will be able to: |  | **Intellectual Skills**  On completion of the course Apprentices will be able to |  | **Subject Practical Skills**  On completion of the course Apprentices will be able to |
| A1 | Demonstrate knowledge and understanding of scientific principles and methodology necessary to underpin their education in civil engineering, to enable appreciation of its scientific and engineering context, and to devise sustainable, safe, economical and creative practical solutions. | B1 | Apply fundamental theoretical studies of scientific and mathematical principles that underpin engineering and specifically civil engineering | C1 | Use laboratory and workshop equipment, safely, for experimental investigation and evaluate data to produce practically valuable results |
| A2 | Demonstrate knowledge and understanding of materials, structures, geotechnics, 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, and work with information that may be incomplete or uncertain and quantify the effect of this on the design and construction. |
| 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, recognising the appropriate software that supports analysis, design and digital construction. |
| 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 including social, economic and environmental aspects as well as the effect of global challenge, wrapped up in the Climate Emergency, and environmental assessments | 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).  Communicate their work to technical and non-technical audiences |

**Additional General Skills (Required for Accreditation)**

On successful completion, graduates have developed transferrable skills, and competencies, that will be of value in a range of employment situations. This includes ability to know wasteful or not a design is when rated against carbon footprint and societal benefit, and self-learning and improve performance, as the foundation for lifelong learning, as well as exercise initiative and personal responsibility, which may be as a team member or leader.

In addition to the programme learning outcomes identified overleaf, the programme of study defined in this programme specification will allow apprentices to develop a range of Key Graduate Attribute and Personal Development Skills in line with the Kinston University’s Championing Future Skills.

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| **Graduate Attribute and Personal Development Skills and the Associated Skills and Competencies** | | | | | | | | |
| **Questioning Mind-set** | **Creative Problem Solving** | **Collaboration** | **Empathetic** | **Digital Competency** | **Adaptability** | **Resilience** | **Enterprising** | **Self-Aware** |
| **Curiosity** – good at showing an interest in learning about the people or things around me | **Creativity** – good at using my imagination to produce original ideas | **Communication** – good at expressing ideas effectively and confidently in speech, writing and other media, to multiple audiences | **Cross-cultural communication** – good at communicating effectively with people from different cultural backgrounds | **Digital Literacy** – good at using information and communication technologies to find, evaluate, create, and communicate information safely online | **Agility** – good at understanding new ideas, concepts, and situations quickly | **Growth Mindset** – good at recognising that personal abilities can be developed through dedication, hard work and continuous learning | **Entrepreneurial thinking** – good at identifying unexploited opportunities and making the most of them | **Reflective Thinking** – good at carefully thinking about an experience and learning from it for the future |
| **Active Listening** – good at paying attention to and effectively interpreting what others are saying | **Decision Making** – good at evaluating options and determining the best course of action based on facts and logic | **Conflict Management** – good at dealing with conflict in a positive and constructive way to find a mutually agreeable solution | **Cultural Intelligence** – good at working effectively with diverse individuals, demonstrating an interest in cultures other than my own | **Digital Citizenship** – good at engaging positively, critically and competently in the digital environment | **Opportunity Recognition** – good at identifying and seeking out new opportunities for development and growth | **Perseverance** - good at continuing doing something or moving forward in spite of obstacles | **Innovation** – good at demonstrating original ideas and thinking | **Values Informed** – good at identifying the things that I believe are important in my life and work, and living true to them in my actions |
| **Analytical Thinking** – good at analysing information and making reasoned judgements | **Critical Thinking** – good at questioning and challenging information to make reasoned judgements | **Negotiation** – good at discussing an issue and determining ways to reach an agreement to mutual satisfaction | **Perspective Taking** – good at perceiving a situation from the perspective of another person | **Digital Productivity** – good at utilising a range of digital technologies to work smarter, supporting efficiency and effectiveness | **Open-minded** – good at considering ideas and opinions new or different to my own | **Stress Management** – good at applying a range of strategies and tools to support stress reduction | **Networking** – good at making contacts and building good relationships | **Mindful** – good at being aware of my behaviours and considering the consequences on others |



**Programme Introduction**

BEng (Honours) Civil Engineering - Degree Apprenticeship is aimed at apprentices who wish to study Civil Engineering to Honours Degree level through the five-year Degree Apprenticeship Scheme. The programme embraces recent developments in higher education and industry and the curriculum and teaching benefits from the research interests of the academic staff. The programme is accredited by the Joint Board of Moderation (JBM) and has been designed in accordance with the IfATE Standard ST0417 and associated KSBs.

The course is offered as a five-year non-integrated Degree Apprenticeship programme (60 months plus 6 months for completion of the End Point Assessment for those in Civil Engineering-related employment, sponsored by the employers. The programme comprises 18 modules (12 modules of 15 credits + 6 modules of 30 credits) spanning from level 4 to level 6 utilising a minimum of 20% of the apprenticeship time over the main 5-year period of study (60 months) followed by Gateway and End Point Assessment (EPA) preparation (an additional 6 months). The taught commitment is typically one-day per week educational programme at Kingston University for each of the five years of the programme, and addition to some pre-advertised block release for activities such as Site visits, fieldtrips and other project-based work. Hours associated with module assessments are also included within the minimum 20% off-the-job training, and these can be spread out throughout the main academic calendar (i.e., late September to end May) around workplace commitments. There is an opportunity for direct entry to Level 5 with appropriate academic qualifications and professional experience.

The BEng (Honours) Civil Engineering - Degree Apprenticeship draws on staff expertise in the Department of Civil, Surveying and construction management; from staff in the Faculty of Engineering, Computing and the Environment, university support services (e.g., the Guild of Students), and working closely with Kingston University Sustainability Hub (KUSH) to ensure the course is compliant to the principles and values of sustainable development.

The majority of modules will be co-taught with students on the 3-year full-time and 5-year part-time BEng (Honours) Civil Engineering programme with dedicated support from Personal Tutors, the Academic Lead, and the Degree Apprenticeship Skills Coach. Support is tailored to the needs of the Degree Apprentices, including employer liaison prior to the commencement of training (e.g., on-boarding and induction); bespoken tutorials and Tripartite Review Meetings during the 60 months of core-training; and guidance and support in the completion of the Gateway Process and preparation to sit final End Point Assessment. Additionally, the apprentices are supported by an Employer Mentor at the workplace who will monitor apprentices’ progress. As a minimum the apprentices will meet with the Degree Apprenticeship Skills Coach/Academic Lead (i.e., training provider representative) and the Workplace Mentor/Line Manager (i.e., employer representative) at least four times per year at strategically defined points in the curriculum – these being the Tripartite Meetings, to ensure that the apprentices are progressing as planned in both their studies and learning experience at the university and in the workplace, and to discuss academic and practitioner-based development in relation to the Apprenticeship Standard Knowledge, Skills and Behaviours (KSBs), learning gains and future learning needs. Progress will be monitored through the completion of Learning Logs, the monitoring of module assessment results and feedback, discussion and review during Tripartite meetings, and – following the main training period – the Gateway meeting. All forms of monitoring will be uploaded to and reviewed using the University’s end-to-end software package, Aptem.

Kingston University Civil Engineering apprentices are ideally placed to develop their career aspirations with their employment environment and apply their knowledge and skills training in a range of learning environments. Civil Engineering learning and teaching is informed directly by staff who are actively engaged in research and consultancy-based activities to embed pedagogically informed best practices into our teaching. We will foster a developmental partnership between the employer, Kingston University and the apprentices to develop professional competence. We place emphasis on practical skills development and the integration of theoretical and academic practical elements with their work-based learning experiences.

**On-boarding Process**

The minimum entry qualifications for the programme are:

- UCAS tariff points: 112-128:

* From A levels: A-level (or equivalent) in Mathematics at grade C or above. General studies and Native language at both A-Level and AS Level not accepted in the tariff.
* From BTEC: BTEC Level 3 Extended Diploma in Engineering including Construction and Built Environment, including minimum Merit in Maths and Further Maths
* From BTEC Level 3 National Diploma: with D\*D\* and in addition must hold an A-level in Maths with a minimum grade of C.
* T Level- Merit in Design, Surveying and Planning for Construction

- Candidates are normally required to hold five GCSE subjects at grade C/4 or above, including Mathematics and English Language.

- Access Diploma: Access HE diploma is not accepted.

- Applications from those that have undertaken an Engineering foundation year will also be considered.

- Apprentices with equivalent international qualifications are welcomed.

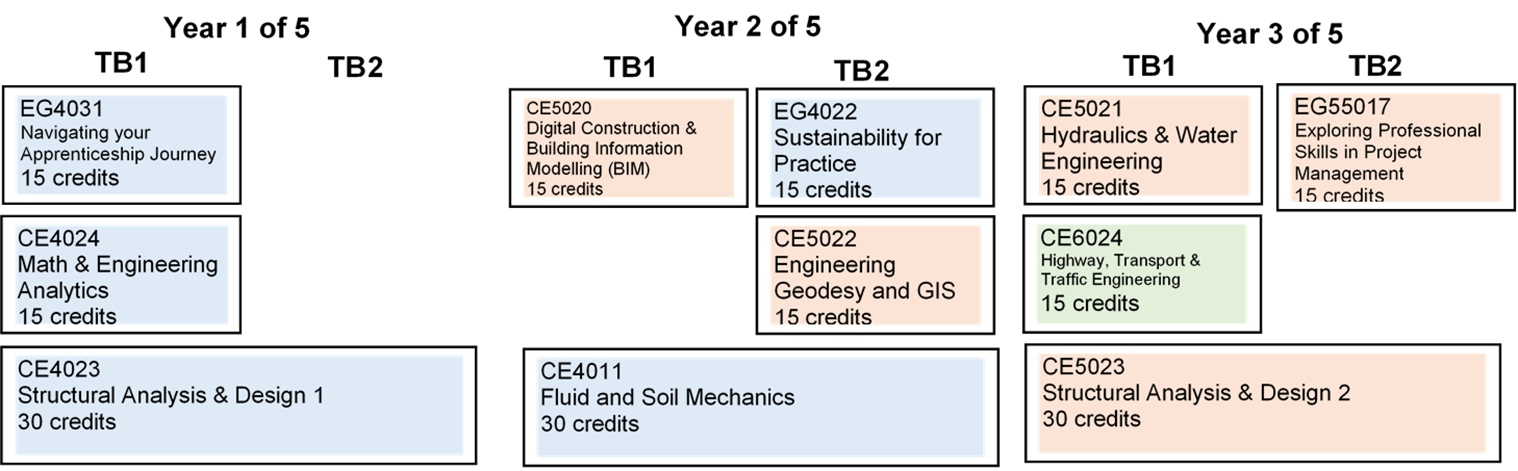
All apprentices are subject to an Initial Needs Assessment (INA) against the KSBs as defined by IfATE and the L6 Civil Engineer Standard ST0417 in consultation between the employer, university and apprentice. The INA addresses Recognised Prior Learning (RPL) and identifies the apprentice’s starting level of competency against the learning outcomes for each core module, in-so-doing allowing the Academic Lead to determine the correct Entry Level and module diet. The INA is completed as part of Kingston Universities On-boarding Process for apprentices, all documentation being completed, reviewed, and stored using the end-to-end software Aptem.

Following completion and review of the INA, a Learner Journey is created to fit the needs of the apprentice. This is agreed by all parties and signed as part of the contract process. Note, RPL will be conducted in accordance with Section H of the AQSH.

Entry to this programme is normally at Level 4 with A-Level or equivalent (level 3) qualifications as stated above. Advanced entry to Level 5 requires academic qualifications in a relevant field that deemed equivalent to BEng at Level 4 (normally HNC) or academic qualification deemed equivalent to BEng Level 5 (normally HND).

### Outline Programme Structure

**BEng (Hons) Civil Engineering** **– Degree Apprenticeship Route Diagram**



**Year 4 of 5**

EG6025

Application of your Professional Skills for End Point Assessment

15 credits

**TB1**

**TB2**

CE6027

Integrated Design project

15 credits

EG6021

Geotechnical & Environmental Engineering

15 credits

CE5024

Geotechnics and Materials

30 credits

CE6020

Advanced Structural Modelling & Design

30 credits

CE6025

Individual Research Project

30 credits

**TB1**

**TB2**

**Year 5 of 5**

Full details of each module will be provided in module descriptors and learner module guides.

### Level 4 (all core)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Core modules | Module code | Credit  Value | Level | Teaching Block |
| Navigating your Apprenticeship Journey | EG4031 | 15 | 4 | 1 |
| Mathematics & Engineering Analytics | CE4024 | 15 | 4 | 1 |
| Sustainability for Professional Practice | EG4022 | 15 | 4 | 2 |
| Introduction To Mechanics & Materials | CE4025 | 15 | 4 | 2 |
| Structural Analysis & Design 1 | CE4023 | 30 | 4 | 1 & 2 |
| Fluid and Soil Mechanics | CE4011 | 30 | 4 | 1 & 2 |

Progression to Level 5 requires 120 credits including passes in all Level 4 modules.

This course permits progression from level 4 to level 5 with 90 credits at level 4 or above. The outstanding 30 credits from level 4 can be trailed into level 5 and must be passed before progression to level 6.

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

### Level 5 (all core)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Core modules | Module code | Credit  Value | Level | Teaching Block |
| Exploring Professional Skills in Project Management | EG5017 | 15 | 5 | 2 |
| Digital Construction & Building Information Modelling (BIM) | CE5020 | 15 | 5 | 1 |
| Engineering Geodesy and GIS | CE5022 | 15 | 5 | 2 |
| Hydraulics & Water Engineering | CE5021 | 15 | 5 | 1 |
| Structural Analysis & Design 2 | CE5023 | 30 | 5 | 1 & 2 |
| Geotechnics & Materials | CE5024 | 30 | 5 | 1 & 2 |

Progression to level 6 requires 120 credits including passes in all Level 5 modules.

This course permits progression from level 5 to level 6 with 90 credits at level 5 or above. The outstanding 30 credits from level 5 can be trailed into level 6.

Apprentices exiting the programme at this point who have successfully completed 120 credits at level 5 or above are eligible for the award of Diploma of Higher Education in Civil Engineering.

### Level 6 (5 core modules + 1 optional module\*)

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| --- | --- | --- | --- | --- |
| Core modules | Module code | Credit  Value | Level | Teaching Block |
| Application of your Professional Skills for End Point Assessment | EG6025 | 15 | 6 | 1 |
| Highway, Transport & Traffic Engineering | CE6024 | 15 | 6 | 1 |
| Integrated Group Design project | CE6027 | 15 | 6 | 2 |
| Advanced Structural Modelling & Design | CE6020 | 30 | 6 | 1 & 2 |
| Individual Research Project | CE6025 | 30 | 6 | 1 & 2 |

Apprentices will also choose one of three optional modules

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Optional modules | Module code | Credit  Value | Level | Teaching Block |
| Geotechnical & Environmental Engineering\* | CE6021 | 15 | 6 | 2 |
| Geotechnical Engineering & Geophysical Hazards | CE6023 | 15 | 6 | 2 |
| Geotechnical Engineering & Geomorphological Hazards | CE6022 | 15 | 6 | 2 |

Level 6 requires the completion of all modules to give 120 credits and qualify for BEng (Hons) Civil Engineering-Degree Apprenticeship. Apprentices exiting the programme at this point who have successfully completed 90 credits at level 6 are eligible for the award of BEng Civil Engineering.

## Principles of Teaching, Learning and Assessment

The BEng (Hons) Civil Engineering - Degree Apprenticeship course has been designed, considering 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.

**Overarching principles**

All learners on the course are working to develop in a professional career in which they must be able to exercise judgement, communicate with clients and the public and throughout take an ethical approach to all that they do; we also encourage them through the design and execution of the curriculum to be both knowledgeable in terms of how sustainability principles apply to their own field but also develop a responsible attitude towards the role that built environment professionals can play in helping to manage resources in ways which promote environmental sustainability, good governance, respect for people, well-being and the pursuit of economic goals. Sustainability may not be mentioned specifically in many of the titles of modules, however, the principles of regenerative design, intervention which has societal benefit, and sustainable development are reflected in the learning outcomes and it underpins all that we teach and the way we encourage learners to approach their own learning in a reflective way seeking to find themselves as individuals.

The role of teaching and assessment is to underpin Apprentice learning and throughout the programme the strategy is to engage apprentices with a wide range of activities that enable them to develop the knowledge and skills that they will need as practitioners alongside their knowledge base. The apprentice should, as far as practicable, be empowered to take control of their learning but be supported strongly through the process. It follows that as the apprentice progresses through the levels the emphasis will be from lecturer-led to apprentice-led work though lectures will feature at all levels of the programme. In delivering on this principle, much of the teaching related to knowledge and understanding will be focused on simulated real-life study and projects in which apprentices will be led through the materials and required to develop their skills through the tasks set. Field trips, Laboratory work and site visits are therefore key components of the strategy and support sessions aimed at skills development are an important part of the delivery strategy.

**Work-based learning**

This course is aimed at apprentices in Civil Engineering-related employment who wish to compliment and develop their employability knowledge and skills portfolio. The Civil engineering non-integrated Degree Apprenticeship programme is a bridge between the academic and the practitioner environment. Apprentices can expect to spend a minimum of 20% of their employment time related to the academic component of their apprenticeship, net one-day per week over five years but with a negotiated level of flexibility to allow for specific learning tasks, including assessment preparation, examination revision, residential fieldwork. The remaining maximum 80% involves on-the-job training and experiential learning.

**Teaching & Learning**

A solid and comprehensive technical and professional knowledge base is non-negotiable and is delivered through lectures and seminars provided in a collaborative working environment which aims to facilitate lecturer/learner and learner-to-learner interaction across disciplines. Lectures are used to impart key information and will normally be followed up by tutorials and workshops which provide opportunities for problem-based learning (PBL), project-based learning (PjBL), flipped classrooms and game learning via a range of in-class activities including for instance scenario analysis, role-play and simulations.

Module guides set out clear expectations for guided independent learning. Apprentices 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, discussion boards and interactive teaching packages. It will also deliver teaching material such as lecture notes/presentations, problems set and worked examples to reinforce the Apprentices learning and helps them to understand how construction elements are put together. This helps support an inclusive approach as apprentices 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. Teaching may be augmented by on-line discussion boards to aid understanding. We recognise that an ability to be comfortable with a range of digital media is important to employability skills and effective learning. Apprentices also need to be computer literate and able to operate industry standard computer packages.

**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 apprentices’ learning with an emphasis on the acquisition of fundamental engineering knowledge and skills (Mathematics and IT in CE4024 Mathematics & Engineering Analytics), practical skills (CE4025 Introduction to Mechanics & Materials) and, (CE4011 Fluid and Soil Mechanics) and, the initial development of key employability skills (EG4031 Navigate). This provides a solid foundation for apprentices to undertake a 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 apprentices will be expected to take greater ownership of their independent study with academics taking on more of a supervisory role of apprentice independent study, this is exemplified in the group and individual project modules CE6027 Integrated Group Design Project and, CE6025 Individual Research Project

**Integrated and interdisciplinary collaboration**

All apprentices within the School of Built Environment & Geography at Kingston University take two (15 credit) common modules at Level 4 namely (EG4031 Navigate) and (EG4022 Sustainability for Practice). This provides opportunity to study and work with apprentices/students from different disciplines is a distinct feature of the course at Kingston University. In EG4031 Navigate apprentices will be able to demonstrate the ability to plan their personal development and to use graduate attributes to explore problem within the specific discipline context. In EG4022 Sustainability for Professional Practice, apprentices able to focus on the 21st century environmental and climate change challenges at the same time to unleash the interconnectedness among topics such as United Nation Sustainable Development Goals (UNSDGs), Net Zero Carbon and Circular Economy whilst identify approaches to problem-solving in a real-world scenarios.

The (EG4031 Navigate) module is extended into the Level 5 in (EG5017 Explore) where apprentices will be able to demonstrate the ability to critically evaluate their own personal development through reflection on their progress and goals, and at the same time demonstrate the use of graduate attributes to explore problems beyond the discipline.

In addition, at Level 5, apprentices will have the opportunity to collaborate with apprentices from Construction engineering management, Building Surveying and Quantity Surveying in (CE5020 Digital Construction & Building Information Modelling (BIM)) where apprentices have the opportunity for interdisciplinary Project-based Learning (PjBL) applying BIM and data management techniques and present solutions to small scale engineering/project challenges. This will give the apprentices an opportunity to talk about how they have worked with an external company on a construction engineering problem as part of a team, when they apply for an industrial placement.

The (EG5017 Explore) module is then further scaffolds into the Level 6 in (EG6025 Apply) where apprentices will be able to demonstrate the ability to set goals and take action relating to their development and future plans, and at the same time demonstrate the use of their graduate attributes to explore complex challenges beyond the University.

In addition, at Level 6, apprentices will continue to have collaboration with apprentices from Other Engineering discipline in (EG6025) where apprentices develop further their interdisciplinary group working through Project-based Learning (PjBL) demonstrating the range of skills underpin successful project delivery client care, market analysis, business context and risk management. Apprentices will have opportunities to develop interpersonal skills to facilitate collaborative working practices including conflict management and avoidance techniques.

**Focus on active learning and enhancing apprentice 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 apprentices to prepare for, and participate in, the classroom activities, rather than passively listening to the lecturer. Apprentices are expected to engage with the guided learning to prepare for these teaching sessions and consolidate their learning after the session through preparation of assessments. These interactive sessions also provide apprentices with opportunities for peer learning, group work and presentation practice.

Examples of interactive sessions can be found in all CE modules at all levels where apprentices are offered a highly interactive enquiry-based environment to solve realistic civil engineering problems. In these sessions the lecturer facilitates learning by supporting apprentices in creating their own knowledge and understanding. Lecturers may also introduce and summarise key concepts with short mini-lectures. Project based Learning (PBjL) is introduced in EG4017 Sustainability for Professional Practice and developed further in CE5020 Digital Construction & Building Information Modelling (BIM). These collaborative activities encourage apprentices to draw on their own set of experiences and cultural backgrounds when tackling real world challenges.

The use of Future Skills and Graduate Attributes through EG4031 Navigate, EG5017 Explore and EG6025 Apply within the discipline context where at Level 4 these are linked to the Learning to Learn where apprentices identify their learning targets from Induction to graduation; beyond the discipline at Level 5 which includes an inter-departmental team sustainability design project; beyond the university at Level 6 which is to foster a bridge to the wider professional communities of practice for the apprentice’s subject discipline.

Active and collaborative learning is also incorporated in traditional lectures which may have question-and-answer sessions, brief Apprentice discussions, Mentimeter 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 apprentice engagement, creativity, confidence and self-reliance. The course endeavours to further secure apprentice engagement by making apprentices 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, apprentice course representative work, peer mentoring, civic engagement and outreach opportunities.

**Hands-on Practical work**

A hand on practical experience in workshops and laboratories is fundamental in developing practical skills as well as enhancing data collection and analysis skills. Apprentices 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 apprentices 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 (CE4025Introduction to Mechanics & Materials) and (CE4011 Fluid and Soil Mechanics). 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 CE5021 (Hydraulics and water Engineering), CE5023 (Structural Analysis & Design 2) and CE5024 (Geotechnics & Materials). This is delivered through supervised practical sessions with experiment protocols. At level 6 apprentices and expected to select and apply requisite practical skills in their own independent research work in (CE6025 the Individual Research Project) module.

Academics are committed to practical fieldwork, encouraging Apprentices to acquire fieldwork skills, including health and safety, group coordination and management. This programme includes a number of field excursions, modules that include field work include: CE5022 (Engineering Geodesy and GIS), CE6021 (Geotechnical & Environmental Engineering). Site visits are arranged for groups of apprentices and students whenever possible (levels 5 & 6) and are important in understanding the practical application of their academic work, as well as an appreciation of the apprentices’ career development prospects.

**Practice and research-informed teaching**

Embedded in our teaching and learning practice are two major shifts in pedagogy, specifically, our teaching is both practice and research informed.

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 School staff two 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 and career development), research (co-supervision, subjects, KTPs), 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 Institution. Our 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 learner by the Institution of Civil Engineers.

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 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 (CE6027 integrated Group Design Project) subject areas such as structures under complex loadings, Finite Elements, pre-stressed concrete, slope stabilisation, deep foundations, etc. are introduced (e.g. CE6020 (Advanced Structural Modelling & Design).

Apprentices 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 Apprentices 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 Apprentice 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 classroom 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 Apprentices in their future professional practice.

**Development of Graduate Attributes and Future Skills**

The progressive development of a range key Graduate Attributes is another feature of the course as exemplified in teamwork and development of Future Skills are effectively scaffold from Level 4 to 6 in (EG4031 Navigate, EG5017 Explore and EG6025026 Apply),where Apprentices able to plan their personal development through learning journey, critically evaluate their own personal development through reflection and to set goals and take action relating to their development.

To complement the development of Graduate Attributes and Future Skills within the curriculum, Personal tutors will encourage Apprentices to engage in a range of extra-curricular activities such as apprentice representation, part-time work, sports and recreation, society membership, leadership and mentoring; cultural and creative activities;  academic and professional collaboration; placement activity; enterprise activity; Careers 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 spotlight on engineering networking activities where employers and alumni are invited on campus to talk about career pathways.

**Assessment for Learning**

The assessment strategy has been designed to help Apprentices to learn and prepare them for continuous career development, 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 Apprentices’ employability. All CE module assessments are related to real world problems. For example, in CE5022 (surveying and setting out of a road), CE5023 (design of elements in steel and concrete of framed buildings) and CE6024 (Modelling of Road Junctions for traffic growth) All modules have explicit formative assessments to provide opportunities for practice and the chance to use ‘feed forward’ to help apprentices improve their work in subsequent summative assessments. For example, in CE5024, 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 at levels 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, Apprentices 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 5 & 6. This demonstrates progressive skills and competences development – thus preparing employment ready graduates

**Inclusive Teaching and Assessment Practices**

Apprentices participate in Student Voice Committees and School Education Committee provide opportunities for apprentices to make suggestion on how to develop a more inclusive curriculum by considering the specific circumstances of the apprenticeship body. The variety of teaching activities also takes account of the apprentice’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 learners have an opportunity to interrogate the criteria.

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

* Practical exercises: to assess Apprentices’ 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 Apprentices 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 Apprentices 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
* 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 Apprentices 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 Apprentice workloads are managed. In addition, this calendar is then presented to the cohorts for consultation before it is formally fixed. The calendar then offers a synchronised and coherent delivery of the programme that is clearly understood by staff and Apprentices who can appreciate the integrated nature of their learning emanating from various module assessments.

**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.

**CE5021** & **CE5024** enables Apprentices to apply the principles of fluid mechanics and soils learned at level 4 (CE4011) 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.

**CE5023** is a core module covering the subjects of structures and design. It builds and expands essential concepts of Engineering Mechanics, Structures and Materials learned at level 4 (CE4025 & CE4023) 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 Apprentices 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.

**CE5022** is a core module offering a fundamental skill expected of any civil engineer. This module exposes Apprentices 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.

**EG5017** 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. This module provides opportunities for developing the team-working and communication skills in group discussions and seminars.

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 Apprentices have acquired the skills required to achieve it via guidance and support (e.g., SASC) with resources as well as peer mentoring (e.g., level 4 Apprentices mentored by level 5 & 6 Apprentices) at earlier years.

**CE6020** is a core module in structures and design building on knowledge and skills attained at level 5 (CE5023). Apprentices 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 structural problems.

**In CE6021**, 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.

**CE6024** is a core module in sustainable infrastructure that follows elements learned at level 5. Sustainable solutions to problems in infrastructure such transportation modelling and highway design are covered.

In **CE6027** module, Apprentices are taught about various key aspects of project planning and management before engaging in a group project based in the Civil Engineering field and drawing on knowledge and experience gained previously. It will consist of substantial Project-Based Learning (PjBL) driven by the Apprentices with supervisor/facilitators encourage professionalism and leadership in a group activity support. It provides Apprentices 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.

**CE6025** the Individual Research Project 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 Apprentices to develop their research skills using and applying information from the technical literature.

**Additional Details (Required for Accreditation)**

**The JBM Core Subjects**

### To satisfy the professional accreditation requirements of the JBM (Joint Board of Moderators), this section outlines how programme modules covers the Lists (A) & (B) of Core Subjects, as well as Maths, Fluid mechanics (Hydraulics), Surveying and Highway/Transportation engineering.

### Level 4

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Module | Module code | Credit  Value | Level | JBM Core Subjects | | |
| List A | List B | Other |
| Navigating your Apprenticeship Journey | EG4031 | 15 | 4 | - | - | - |
| Mathematics & Engineering Analytics | CE4024 | 15 | 4 | - | - | Maths |
| Sustainability for Professional Practice | EG4022 | 15 | 4 | - | - | - |
| Introduction To Mechanics & Materials | CE4025 | 15 | 4 | Structures  &  Materials | - | - |
| Structural Analysis & Design 1 | CE4023 | 30 | 4 | Structures | - | - |
| Fluid and Soil Mechanics | CE4011 | 30 | 4 | Geotechnics | - | Fluid Mechanics |

### Level 5

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Module | Module code | Credit  Value | Level | JBM Core Subjects | | |
| List A | List B | Other |
| Exploring Professional Skills in Project Management | EG5017 | 15 | 5 | - | Construction Management | - |
| Digital Construction & Building Information Modelling (BIM) | CE5032 | 15 | 5 | - | Construction Management | - |
| Engineering Geodesy and GIS | CE5022 | 15 | 5 | - | - | Surveying |
| Hydraulics & Water Engineering | CE5021 | 15 | 5 | - | - | Hydraulics |
| Structural Analysis & Design 2 | CE5023 | 30 | 5 | Structures | - | - |
| Geotechnics & Materials | CE5024 | 30 | 5 | Geotechnics &  Materials | - | Fluid Mechanics |

### Level 6 (One Optional module \*)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Module | Module code | Credit  Value | Level | JBM Core Subjects | | |
| List A | List B | Other |
| Application of your Professional Skills for End Point Assessment | EG6025 | 15 | 6 | - | - | - |
| Highway, Transport & Traffic Engineering | CE6024 | 15 | 6 | - | - | Highways & Transportation engineering |
| Geotechnical & Environmental Engineering\* | CE6021\* | 15 | 6 | Geotechnics | Environmental Engineering | - |
| Integrated Group Design project | CE6027 | 15 | 6 | Structures | - | - |
| Advanced Structural Modelling & Design | CE6020 | 30 | 6 | Structures | - | - |
| Individual Research Project | CE6025 | 30 | 6 | - | - | - |

\*Will be optional to choose between the following:

1. CE6021 Geotechnical & Environmental Engineering
2. CE6023 Geotechnical Engineering & Geophysical Hazards
3. CE6022 Geotechnical Engineering & Geomorphological Hazards

**The JBM Threads**

To satisfy the professional accreditation requirements of the JBM (Joint Board of Moderators), this section outlines how programme modules cover each of four JBM Threads- design, sustainability, health and safety risk management, professionalism, and ethics- by highlighting major and minor contributions. (Note:- Major contributions (which are assessed and evidenced in outputs; and Minor contributions (which are not always assessed))

### Level 4

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Module | Module code | Credit  Value | Level | JBM Threads | |
| Primary  Major  (Assessed) | Contributory  Minor  (not assessed) |
| Navigating your Apprenticeship Journey | EG4031 | 15 | 4 | Professionalism and ethics | Design |
| Mathematics & Engineering Analytics | CE4024 | 15 | 4 | Design | - |
| Sustainability for Professional Practice | EG4022 | 15 | 4 | Sustainability,  Professionalism and ethics | Design |
| Introduction To Mechanics & Materials | CE4025 | 15 | 4 | Design, Health and safety risk management | Sustainability,  Professionalism and ethics |
| Structural Analysis & Design 1 | CE4023 | 30 | 4 | Design, Sustainability, Health and safety risk management | Professionalism and ethics |
| Fluid and Soil Mechanics | CE4011 | 30 | 4 | Design, Health and safety risk management | Sustainability,  Professionalism and ethics |

### Level 5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Module | Module code | Credit  Value | Level | JBM Threads | |
| Primary  Major  (Assessed) | Contributory  Minor  (not assessed) |
| Exploring Professional Skills in Project Management | EG5017 | 15 | 5 | Design, Sustainability,  Professionalism and ethics | Health and safety risk management |
| Digital Construction & Building Information Modelling (BIM) | CE5020 | 15 | 5 | Design | Sustainability, Professionalism and ethics |
| Engineering Geodesy and GIS | CE5022 | 15 | 5 | Design, Sustainability Health and safety risk management. | Professionalism and ethics |
| Hydraulics & Water Engineering | EG5021 | 15 | 5 | Design, Sustainability, Health and safety risk management. | Professionalism and ethics. |
| Structural Analysis & Design 2 | CE5023 | 30 | 5 | Design, Sustainability, Health and safety risk management. | Professionalism and ethics. |
| Geotechnics & Materials | CE5024 | 30 | 5 | Design, Sustainability, Health and safety risk management. | Professionalism and ethics. |

### Level 6 (One optional module \*)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Module | Module code | Credit  Value | Level | JBM Threads | |
| Primary  Major  (Assessed) | Contributory  Minor  (not assessed) |
| Application of your Professional Skills for End Point Assessment | EG6025 | 15 | 6 | Design, Sustainability,  Professionalism and ethics. | - |
| Highway, Transport & Traffic Engineering | CE6024 | 15 | 6 | Design, Sustainability. | Health & safety risk management. |
| Geotechnical & Environmental Engineering\* | CE6021\* | 15 | 6 | Design, Sustainability, Health and safety risk management. | - |
| Integrated Group Design project | CE6027 | 15 | 6 | Design, Sustainability, Health and safety risk management, Professionalism and ethics. | - |
| Advanced Structural Modelling & Design | CE6020 | 30 | 6 | Design, Sustainability, Health and safety risk management. | Professionalism and ethics. |
| Individual Research Project | CE6025 | 30 | 6 | Sustainability, Health and safety risk management, Professionalism and ethics. | Design. |

\*Will be optional to choose between the following:

1. CE6021 Geotechnical & Environmental Engineering
2. CE6023 Geotechnical Engineering & Geophysical Hazards
3. CE6022 Geotechnical Engineering & Geomorphological Hazards

The Geotechnical Engineering part covered in all with second half dedicated to sustainability.

The following section briefly explains how each of the four JBM threads are embedded within and developed throughout.

**Design** is a common thread throughout the whole of the programme integrating theory, analysis, and design. As well as being a subject for study, it plays an essential role of establishing and developing contextual understanding. The Apprentices start with a holistic conceptual design through use of sketch books (issued during induction) and make/break model structures (CE4025 Introduction to Mechanics & Materials). As well as their developing their flair and imagination at level 4, they obtain technical skills at level 5 (CE5022 Engineering Geodesy and GIS & CE5023 Structural Analysis and Design 2) and Level 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 (CE6024 Highways & CE6027 integrated Group Design Project). The importance of interdisciplinary factors on the design process is emphasised throughout (EG5017 Explore & EG6025 Apply). 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 Apprentices contain much practical experience.

The design process is introduced level 4 to give Apprentices the basic principles and tools to enable them to embark upon a design, giving them the confidence to ‘experiment and be creative' or ‘have a go’ for themselves. There is also a hands-on 'Design and Make' project at this level; such as the bridge/platform building competition (CE4025 Introduction to Mechanics & Materials). 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 (CE5023 Structural Analysis and Design 2). The culmination of the design work is materialised at level 6 where Apprentices work in small groups and individually and are required to consider all aspects of the project, including financial, technical, planning, environmental, construction and safety (CE6027 Integrated Design Group Project, EG6025 Apply Business Management). 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 Apprentice groups. In recent years themes are designed to embed key climate emergency drivers and to encourage ingenuity, imagination and inventiveness, and also to develop Apprentices’ skills in critical evaluation of their own and others’ work through the different design phases.

In (CE5023 Structural Analysis and Design 2 & CE6024 Highway) Apprentices undertake digital modelling, output validation and parametric design. While they are introduced to the global challenges of the Climate Emergency, the 17 UNSDGs and cultural change in (EG4022 sustainability for professional practice) and these become central to their material selection, design and construction thinking in a multidisciplinary sustainability project in (EG5017 Explore) and a group design project in (CE6027 Integrated Group Design Project).

Various aspects of communication skills are also assessed. These include report writing, engineering drawings (hand drawn sketches and CAD) (CE4025 Introduction to Mechanics & Materials) digital Modelling (CE5020 BIM), records of group meetings and especially oral presentation of the final scheme design to peers and academic staff (CE6027 Integrated Design project). The Apprentices 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 Apprentices' powers of argument, evaluation and critical thinking.

**Sustainability** is a thread that runs through all modules of the programme, from induction to the final project, group design and final examinations; sustainability may be considered thoroughly embedded in the Apprentice’s degree studies. There are a number of sustainability-driven modules (e.g., EG4022 Sustainability for Professional Practice, EG5017 Explore, CE5023 Structural Analysis and Materials, CE6024 Highways & CE6027 Design Project) where sustainable development and environmental concerns are explicit and also formally assessed, but sustainability is also included in all core modules on structures, materials, geotechnics, hydraulics and construction. Apprentices are made aware of the implications of climate change, the low-carbon agenda, environmental, economic and social issues and their increasing influence on construction; Apprentices 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 where Apprentices are made to understand that their interventions should minimise the temporary borrowing of finite-resource material, while maximising societal benefit. Apprentices also carry out embodied-carbon check on their design (CE6027 Design Project), and then try to minimise this carbon footprint without compromising key elements of their design.

As mentioned above, while Apprentices are introduced to the global challenges of the Climate Emergency, the 17 UNSDGs and cultural change in (EG4022 sustainability for professional practice), these become central to their material selection, design and construction thinking in a multidisciplinary sustainability project in (EG5017 Explore) and a group design project in (CE6027 Integrated Group Design Project).

**Health and Safety Risk Management** 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 Apprentices become familiar with the Construction Design and Management (CDM) Regulations and Risk Assessments for Safety (EG4031 Navigate). 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, Apprentices 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 EG5017 Explore and level 6 with CE6027 Integrated Group Design Project and EG6025 Apply. The content is reviewed and updated regularly, and the department continues to actively seek new ways to present this subject.

**Professionalism and Ethics** is integrated & nurtured within teaching/ learning throughout Apprentices’ learning journey. From Induction, professional institutions are present to address the new Apprentices on the importance of professional bodies and networks as well as introduce the support/benefits of joining networks of professionals. We aim for the Apprentices to see themselves as belonging to a professional community. For example, the School has been an academic partner with the Institution of Civil Engineers for many years where Apprentices are introduced to the institute from induction and many times throughout their learning journey and are encouraged to join the ICE portal for recording and assessing the Apprentices’ Initial Professional Development. This will help Apprentices’ employability as they will be able to satisfy the ICE attributes through their studies and achieve their professional qualification soon after graduation.

This course has been designed to fully meet the exemplifying academic benchmark requirements, for an Incorporated Engineer (IEng) and (with further learning) for Chartered Engineer (CEng) status. Most graduates will aspire to careers in the construction industry and to becoming chartered.

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

## Support for Apprentices and their Learning

Apprentices are supported by:

* **A Course Leader** to help Apprentices understand their programme structure and progression and to ensure Learners’ support(s)
* **A Degree Apprenticeship Skills Coach** to support the apprentice throughout their Apprenticeship Journey and to assist in keeping the apprentice on track through quarterly Tripartite Review Meetings and monitoring of Learning Logs and KSB Trackers.
* A **Module Leader** for each module to provide academic support.
* A **module team** for each module to provide academic support.
* A **Personal Tutor** programme which ensures that apprentices have a designated personal tutor for the duration of their studies to foster a close and engaged academic relationship
* An **Apprentice Mentoring scheme**.
* A **Future Skills and Employability Team** to provide apprentices with advice on career development and progression, future job applications, updating CVs and mock-interview opportunities
* **Technical support** to advise apprentices on IT and the use of software packages.
* A designated **programme administrator**.
* An **induction** week at the beginning of each new academic session.
* **Course Representatives** and a **Student Voice Committee**.
* **CANVAS**– a versatile on-line interactive learning environment
* A range of Study Skills and Academic Skills support services
* **Student support facilities** that provide advice on issues such as finance, regulations, legal matters, and accommodation.
* A **faculty-based Student Support Team** that provides advice and guidance on mitigation and student issues.
* A Disability, Dyslexia and **Wellbeing student support centre**.
* A **Students' Union** who run a range of clubs and societies and student advice services
* A **student society** who organises discipline related social events
* **Academic Success Centre** is a one-to-one drop-in Study Skills session for learners every weekday. Help is available on a range of academic skills from writing reports, note-taking, to exam revision, referencing, programming and mathematical skills.

**Personal Tutor Scheme (PTS)**

The following provides the aims and structure of the Personal Tutor Scheme (PTS). It is intended that the PTS is embedded within the modular provision of the BEng. Course.

**Aims**

* To build a rapport between staff and learners and contribute to personalising their experience acting as a central pillar of the pastoral care system
* To support apprentices in the development of their academic skills providing appropriate advice and guidance to learners throughout their time at Kingston, while monitoring their progress, helping to identify individual needs and referring Apprentices to other University services as appropriate
* To help apprentices to develop the ability to be self-reliant and confident self-reflective learners who use feedback to their best advantage
* To encourage Apprentices 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 Apprentice numbers being equally divided amongst the staff within the school
* Apprentices will keep the same tutor throughout their course of study

**Assessment**

The PTS is embedded in core curriculum modules at each level of undergraduate study:

Level 4 – EG4031 Navigate

Level 5 – EG5017 Explore

Level 6 – EG6025 Apply

There are specific aims and outcomes for each level that will be assessed, as the PTS is a progressive and cumulative scheme building on the skills developed in previous levels.

**At level 4 (EG4031 Navigate),** Apprentices will complete a digital skills portfolio that will include problem solving and design thinking, team-working, personal development planning and evidence of engagement within their learning and professional community (Initiation of learning log). The digital portfolio will be linked to PTS-supported exercises including:

(1) Learning resources exercise.

(2) Teamwork exercise.

(3) Reflection on learning/training and production of the first attempt at learning logs.

**At level 5 (EG5017 Explore),** Apprentices will complete a digital skills portfolio. A major element of the digital skills portfolio will be to systematically track the progress of the interdisciplinary project and reflect on the professional lessons learned. The digital portfolio will be linked to PTS-supported exercises including:

(1) Demonstrate the ability to critically evaluate your own personal development through reflection on your progress and goals.

(2) Demonstrate use of the graduate attributes to explore problems beyond the discipline.

(3) Explore and apply project management principles and techniques in the context of wider business operations, including risk management, health and safety, sustainability and ethics, and to develop professional competency in the communication of ideas.

Summative assessment will comprise:

1. A team-based project presentation of 20-minutes per group accompanied with the submission of the project team log.
2. An individual Reflective Action Plan that identifies and considers personal feed-forward lessons from the task and the personal association to IfATE Standard KSBs.

**At Level 6 (EG6025 Apply),** Apprentices will complete a digital skills portfolio. A major element of the digital skills portfolio will be to formulate and systematically track the experiences acquired through participation in at least three networking activities in the final year. Dialogic formative feedback will be provided on entries within the digital portfolio by the personal tutor. The digital portfolio will be linked to PTS-supported exercises including:

(1) Evaluate the environmental and commercial impact of professional decisions, demonstrating competencies in relevant IfATE Standard KSBs, contributing towards the successful completion of Gateway and the End Point Assessment.

(2) Demonstrate the ability to set goals and take action relating to your development and future plans.

(3) Demonstrate use of the graduate attributes to explore complex challenges beyond the University.

Summative assessment consists of:

1. Entrepreneurship Presentation (50%). Teams will present their business proposal in a competitive environment, pitching their business proposal against other teams. A peer assessment process will be followed allowing differentiation of individual performance to allow for individual grades to be awarded.
2. Draft Portfolio of Evidence of Competencies (50%). Individual report, in the style of a portfolio that will provide case study evidence of competency in a select group of IfATE Standard KSBs.

The use of Future Skills and Graduate Attributes through **EG4031 Navigate**, **EG5017 Explore** and **EG6025 Apply** within the discipline context where at Level 4 these are linked to the Learning to Learn where apprentices identify their learning targets from Induction to graduation; beyond the discipline at Level 5 which includes an inter-departmental team design project; beyond the university at Level 6 which is to foster a bridge to the wider professional communities of practice for the Apprentice’s subject discipline.

## 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 Apprentice representation
* Annual Monitoring and Enhancement
* Continuous Monitoring of courses through the Kingston Course Enhancement Programme (KCEP+)
* Apprentice evaluation including Module Evaluation Questionnaires (MEQs), level surveys and the National Apprentice Survey (NSS)
* Moderation policies
* Feedback from employers (varying forms including IAB)
* Quality is also assured by the requirement for professional body (JBM) reaccreditation, generally at a five-year interval. Annual monitoring and periodic reviews by professional bodies (i.e., JBM) provide other opportunities for reflection and external contribution to course design, quality assurance and enhancement

**Approved Variants from the Undergraduate Regulations**

**Compensation**

Compensation is not permitted, to meet PSRB requirements, for the following modules:

CE6025 Individual Project

CE6027 Integrated Group Design Project

## Employability/Career Development and Work-Based Learning

This curriculum is designed so that it embeds the development of employability skills throughout the course and equips Apprentices with the ability to relate the knowledge and skills that they have learnt to real world contexts in which they may work in the future.

Initially Apprentices 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 progress in employment such as; CV writing, Psychometric tests and using LinkedIn-Learning modules (an active list is prepared and updated by a library and learning resources specialist). Apprentice’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 Service team.

The apprentice’s development of Future skills and Graduate Attribute is supported through active engagement in the KU Navigate Programme enabling apprentices to understand and develop a design thinking approach to Future Skills development.

**Development of employability skills throughout the course**

The development of a range of employment skills that complement the work-based component of the Degree Apprenticeship is central to our learning design. Employability skills are constructively aligned from the course level to the module level and closely managed by the Course Leader.

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 (CE4011 Fluid and Soil Mechanics) using a standard format and style and encouraging Apprentices to orally communicate the outcomes of small group exercises in the active learning teaching sessions in (CE4023 Engineering Design) and (CE4025 Mechanics and Materials). To help development of these skills Apprentice will be required to submit a draft of a report for (CE4025 Introduction To Mechanics & Materials) to the School Academic Success Centre (SASC) for feedback and to discuss this with their personal tutor. The module (EG4031 Navigate) which is closely linked to the Personal tutor scheme and it introduces key academic and employability skills. In addition, it focuses on reflective practice on feedback on their progress with academic and employability skills.

At level 5 Apprentices will be required to participate in a substantial multi-disciplinary group project on sustainability and present their individual findings in (EG5017 Explore). This module aims to assist Apprentices in reflecting on the skills that they are developing and consider how they relate to employability. In many other modules i.e. CE5021, CE5023 and CE5024, Apprentices are required to produce individual/group laboratory reports on more challenging topics.

Employability skills continue to be enhanced at level 6 with the module (EG6025 Apply) where entrepreneurship is addressed using KU Bright Ideas competition as well as encouraging Apprentices to reflect on the employability skills they have developed and be proactive in moving towards a professional life and/or further study. With modules (CE6027 Design Project) where group design activities are at the centre of learning and CE6020 that also include lab reports, presentations and group discussions. In the Individual Project module CE6025 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 Engineering apprentices 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 has been an academic partner with the Institution of Civil Engineers for many years where Apprentices are introduced to the institute from induction and many times throughout their learning journey and are encouraged to join the ICE portal for recording and assessing the Apprentices’ Initial Professional Development. This will help Apprentices’ employability as they will be able to satisfy the ICE attributes through their studies and achieve their professional qualification soon after graduation.

This course has been designed to fully meet the exemplifying academic benchmark requirements, for an Incorporated Engineer (IEng) and (with further learning) for Chartered Engineer (CEng) status. Most graduates will aspire to careers in the construction industry and to becoming chartered. Graduates develop careers in all branches of the Civil Engineering/Construction industry, in the UK and throughout the world; as contractors and consulting engineers, and within local authorities, water authorities, government organisations, businesses and the defence industry. Where Apprentices take an industrial placement, they are, in many instances, able to secure employment with the placement organisation following graduation. The academic and key skills developed throughout a course allow graduates to follow careers in other professions such as ICT, finance, teaching and as construction professionals. In addition, a number of graduates will progress to MSc courses in Civil/Structural/Construction-related specialist areas before continuing their career in industry or research.

**Approved Variants from the Undergraduate Regulations**

**Compensation**

* A maximum of 30 credits in this Bachelors degree programme can be compensated to meet PSRB requirements.
* Compensation is not permitted in any major individual and group-based project modules to meet PSRB requirements. For the following modules, compensation is not permitted:

CE6025 Individual Research Project

CE6027 Integrated Group Design project

**Reassessment of Level 6 modules**

Reassessment of the above CE6025 Individual Research Project will normally be by repeat only with a new project brief unless the student has achieved a grade of FM in which case a retake in the form re-writing the dissertation will be allowed.

## 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)

UK Standard for Professional Engineering Competence (UK-SPEC): [The accreditation of Higher Education Programmes - Fourth edition.](https://www.engc.org.uk/ahep)

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/)

www.thepwi.org/

Professional accreditation:

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

School Website:

www.sec.kingston.ac.uk/about-SEC/schools/civil-engineering/

See Appendix A for:

**Learning Outcomes for Accreditation**: EC UK-SPEC: Engineering Council UK Standard for Professional Engineering Competence - Specific Learning Outcomes in Engineering in accordance with UK Standard for Professional Engineering Competence (UK-SPEC): [The accreditation of Higher Education Programmes - Fourth edition (AHEP4).](https://www.engc.org.uk/ahep)

See Appendix B for:

Mapping the Course Contents to the Knowledge, Skill & Behaviours of the [IfATE Level 6 Degree Apprenticeship standard for “Civil Engineer”, ST0417](https://www.instituteforapprenticeships.org/apprenticeship-standards/civil-engineer-degree-v1-0)

## Development of Course Learning Outcomes in Modules

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  | **Level 4** | | | | | | **Level 5** | | | | | | **Level 6** | | | | | |
|  | **Module Code** |  | EG4031  Navigate | EG4022 Sust.ain. | CE4024 Maths | CE4023 Str.&Des1 | CE4025  Mech. & M | CE4011  Fluid&Soil | EG5017  Explore | CE5020 BIM | CE5022  Geodesy | CE5024  Geo & Mat | CE5023 Str.&Desi2 | CE5021 Hydraulics | EG6025  Apply | CE6020 AStr.&Desig | CE6024  Highway | CE6021  Geotechn | CE6027  Des Proj | CE6025  Individual |
| **Programme Learning Outcomes** | **Knowledge & Understanding** | A1 |  |  |  | S | S | S |  |  |  | S | S | S |  | S | S | S | S | S |
| A2 |  |  |  |  |  | S |  | S | S | S |  |  |  |  | S | S | S |  |
| A3 | S |  |  |  |  |  | S |  |  |  |  |  | S |  |  |  | S | S |
| A4 |  | S |  |  |  |  | S |  |  |  |  |  | S |  |  |  | S | S |
| A5 |  |  |  | S | S | S |  |  | S | S | S |  |  | S | S | S |  |  |
| A6 |  | S |  |  |  | S | S |  |  | S |  |  | S |  | S | S | S |  |
| **Intellectual Skills** | B1 |  |  | S | S | S | S |  |  | S | S | S | S |  | S | S | S | S |  |
| B2 |  |  | S | S | S | S |  |  | S | S | S | S |  | S |  | S | S | S |
| B3 |  |  |  |  |  |  | S | S |  |  |  |  | S |  |  |  |  | S |
| B4 |  | S |  |  |  |  | S |  | S |  |  |  | S |  |  |  | S |  |
| B5 | S |  |  |  |  |  | S |  |  |  |  |  | S |  |  |  |  |  |
| B6 | S |  |  |  |  |  | S |  |  |  |  |  | S |  |  |  | S |  |
| **Practical Skills** | C1 |  |  |  | S | S | S |  |  | S | S | S | S |  | S | S | S |  | S |
| C2 |  |  |  |  |  |  |  |  | S |  |  | S |  |  | S |  |  | S |
| C3 |  |  |  |  |  | S |  | S | S | S |  | S |  |  | S | S | S | S |
| C4 |  |  |  | S |  |  |  | S | S |  | S |  | S | S | S |  | S | S |
| C5 |  |  |  | S | S | S |  |  | S | S | S | S |  | S | S | S |  | S |
| C6 |  |  |  | S | S | S | S | S |  | S | S | S | S | S | S | S | S | S |

*(S) Denotes Summative assessments while Apprentices 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**

AHEP4 Learning Outcomes for Bachelors (Honours) degrees and equivalent qualifications and apprenticeships approved or accredited as fully meeting the academic requirement for IEng registration and partially meeting the academic requirement for CEng registration:

|  |  |
| --- | --- |
| **Area of learning** | **On successful completion of an approved or accredited programme, an individual will be able to:** |
| **Science and mathematics**  The study of engineering requires a substantial grounding in engineering principles, science and mathematics commensurate with the level of study. | |
| **Science, mathematics and engineering principles** | **C1.** Apply knowledge of mathematics, statistics, natural science and engineering principles to the solution of complex problems. Some of the knowledge will be at the forefront of the particular subject of study. |
| **Engineering analysis**  Engineering analysis involves the application of engineering concepts and tools to analyse, model and solve problems. At higher levels of study engineers will work with information that may be uncertain or incomplete. | |
| **Problem analysis** | **C2.** Analyse complex problems to reach substantiated conclusions using first principles of mathematics, statistics, natural science and engineering principles. |
| **Analytical tools and techniques** | **C3.** Select and apply appropriate computational and analytical techniques to model complex problems, recognising the limitations of the techniques employed. |
| **Technical literature** | **C4.** Select and evaluate technical literature and other sources of information to address complex problems. |
| **Design and innovation**  Design 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 commensurate with the level of study. | |
| **Design** | **C5.** Design solutions for complex problems that meet a combination of societal, user, business and customer needs as appropriate. This will involve consideration of applicable health and safety, diversity, inclusion, cultural, societal, environmental and commercial matters, codes of practice and industry standards. |
| **Integrated/systems approach** | **C6.** Apply an integrated or systems approach to the solution of complex problems. |
| **The engineer and society**  Engineering activity can have a significant societal impact and engineers must operate in a responsible and ethical manner, recognise the importance of diversity, and help ensure that the benefits of innovation and progress are shared equitably and do not compromise the natural environment or deplete natural resources to the detriment of future generations. | |
| **Sustainability** | **C7.** Evaluate the environmental and societal impact of solutions to complex problems and minimise adverse impacts. |
| **Ethics** | **C8.** Identify and analyse ethical concerns and make reasoned ethical choices informed by professional codes of conduct. |
| **Risk** | **C9.** Use a risk management process to identify, evaluate and mitigate risks (the effects of uncertainty) associated with a particular project or activity. |
| **Security** | **C10.** Adopt a holistic and proportionate approach to the mitigation of security risks. |
| **Equality, diversity and inclusion** | **C11.** Adopt an inclusive approach to engineering practice and recognise the responsibilities, benefits and importance of supporting equality, diversity and inclusion. |
| **Engineering practice**  The practical application of engineering concepts and tools, engineering and project management, teamwork and communication skills. Engineers also require a sound grasp of the commercial context of their work, specifically the ways an organisation creates, delivers and captures value in economic, social, cultural or other contexts. | |
| **Practical and workshop skills** | **C12.** Use practical laboratory and workshop skills to investigate complex problems. |
| **Materials, equipment, technologies and processes** | **C13.** Select and apply appropriate materials, equipment, engineering technologies and processes, recognising their limitations. |
| **Quality management** | **C14.** Discuss the role of quality management systems and continuous improvement in the context of complex problems. |
| **Engineering and project management** | **C15.** Apply knowledge of engineering management principles, commercial context, project and change management, and relevant legal matters including intellectual property rights. |
| **Teamwork** | **C16.** Function effectively as an individual, and as a member or leader of a team. |
| **Communication** | **C17.** Communicate effectively on complex engineering matters with technical and non-technical audiences. |
| **Lifelong learning** | **C18.** Plan and record self-learning and development as the foundation for lifelong learning/CPD. |

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|  |  |  | **Level 4** | | | | | | **Level 5** | | | | | | **Level 6** | | | | | |
|  | **Module Code** |  | EG4031  Navigate | EG4022 Sust.ain. | CE4024 Maths | CE4023 Str.&Des1 | CE4025  Mech. & M | CE4011  Fluid&Soil | EG5017  Explore | CE5020 BIM | CE5022  Geodesy | CE5024  Geo & Mat | CE5023 Str.&Desi2 | CE5021 Hydraulics | EG6025  Apply | CE6020 AStr.&Desig | CE6024  Highway | CE6021  Geotechn | CE6027  Des Proj | CE6025  Individual |
| **AHEP4 Learning Outcomes** | **Science and Mathematics** | C1 |  |  | √ | √ | √ | √ |  |  | √ | √ | √ | √ |  | √ | √ | √ | √ | √ |
| **Engineering Analysis** | C2 |  |  |  | √ | √ | √ |  |  | √ |  | √ | √ |  | √ | √ |  | √ | √ |
| C3 |  |  | √ |  |  |  |  | √ | √ |  | √ | √ |  | √ | √ |  | √ | √ |
| C4 |  |  |  |  |  | √ |  |  | √ |  | √ | √ |  | √ |  |  | √ | √ |
| **Design and Innovation** | C5 |  | √ |  | √ |  |  |  | √ |  |  | √ | √ | √ | √ | √ |  | √ | √ |
| C6 |  |  |  |  |  |  |  | √ | √ |  |  |  | √ |  |  |  | √ | √ |
| **The Engineer and Society** | C7 |  | √ |  | √ |  |  | √ |  |  |  | √ | √ | √ | √ | √ |  | √ | √ |
| C8 | √ | √ |  |  |  |  | √ |  |  |  |  |  | √ |  | √ |  |  | √ |
| C9 | √ |  |  |  |  |  | √ |  | √ |  | √ | √ |  | √ |  |  | √ | √ |
| C10 |  |  |  |  |  |  | √ | √ |  |  |  |  |  |  |  |  |  |  |
| C11 | √ |  |  |  |  |  | √ |  |  |  |  |  | √ |  |  |  | √ | √ |
| **Engineering Practice** | C12 |  |  |  |  | √ | √ |  | √ | √ | √ | √ | √ |  | √ | √ | √ |  |  |
| C13 |  |  |  | √ | √ | √ |  | √ | √ | √ | √ | √ |  | √ | √ | √ | √ | √ |
| C14 |  |  |  |  |  |  | √ |  |  |  |  |  | √ |  |  |  |  |  |
| C15 |  |  |  |  |  |  | √ |  |  |  |  |  | √ |  |  |  | √ |  |
| C16 | √ |  |  | √ |  | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |  |
| C17 |  |  |  | √ | √ | √ |  | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| C18 | √ |  |  |  |  |  | √ |  |  |  |  |  | √ |  |  |  |  | √ |

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|  |  |  | **Level 4** | | | | | | **Level 5** | | | | | | **Level 6** | | | | | |
|  | **Module Code** |  | EG4031  Navigate | EG4022 Sust.ain. | CE4024 Maths | CE4023 Str.&Des1 | CE4025  Mech. & M | CE4011  Fluid&Soil | EG5017  Explore | CE5020 BIM | CE5022  Geodesy | CE5024  Geo & Mat | CE5023 Str.&Desi2 | CE5021 Hydraulics | EG6025  Apply | CE6020 AStr.&Desig | CE6024  Highway | CE6021  Geotechn | CE6027  Des Proj | CE6025  Individual |
| **AHEP4 Learning Outcomes** | **Science and Mathematics** | C1 |  |  | E/C | E/C | C | E/C |  |  | C | C | E/C | E/C |  | E/C | C | C | C | C |
| **Engineering Analysis** | C2 |  |  |  | E/C | C | E/C |  |  | C |  | E/C | E/C |  | E/C | C | C | C | C |
| C3 |  |  | E/C | C |  |  |  | C | C |  | E/C | E/C |  | C | C | C | C | C |
| C4 |  |  |  | C |  | E/C |  |  | C |  | E/C | E/C |  | E/C |  | C | C | C |
| **Design and Innovation** | C5 |  | C |  | E/C |  |  |  | C |  |  | E/C | E/C |  | E/C | C | C | C | C |
| C6 |  |  |  |  |  |  |  | C | C |  |  |  |  |  |  | C | C | C |
| **The Engineer and Society** | C7 |  | C |  | C |  |  | C |  |  |  | C | E/C |  | C | C | C | C | C |
| C8 | C | C |  |  |  |  | C |  |  |  |  |  | C |  | C |  |  | C |
| C9 | C |  |  | C |  |  | C |  | C |  | C | E/C |  | C |  |  | C | C |
| C10 |  |  |  |  |  |  | C | C |  |  |  |  |  |  |  |  |  |  |
| C11 | C |  |  |  |  |  | C |  |  |  |  |  | C |  |  |  | C | C |
| **Engineering Practice** | C12 |  |  |  | C | C | E/C |  | C | C | C | C | E/C |  | C | C | C |  |  |
| C13 |  |  |  | E/C | C | E/C |  |  | C | C | E/C | E/C |  | C | C | C | C | C |
| C14 |  |  |  |  |  |  | C |  |  |  |  |  | C |  |  |  |  |  |
| C15 |  |  |  |  |  |  | C |  |  |  |  |  | C |  |  |  | C |  |
| C16 | C |  |  | C |  | E/C | C |  | C | C | C | C |  | C | C | C | C |  |
| C17 |  |  |  | C | C | E/C |  | C | C | C | C | C | C | C | C | C | C | C |
| C18 | C |  |  |  |  |  | C |  |  |  |  |  | C |  |  |  |  | C |

E = Exam & C = Coursework

# Appendix B:

# BEng (Hons) Civil and Infrastructure Engineering (Degree Apprenticeship)

**Commitment Matrix: Mapping against the Civil Engineer Level 6 Apprenticeship Standard (Ref: ST0417)**

A successful apprentice will have met the core requirements in terms of knowledge and skills and all the behaviour requirements Note: This will be achieved throughout the apprenticeship duration utilising On-the-job training components as well as Off-the-Job training (a minimum of 20% of the apprenticeship contractual hours)

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|  | |  | **Level 4** | | | | | | **Level 5** | | | | | | **Level 6** | | | | | |
|  | **Module Code** |  | **EG4031**  **Navigate** | **CE4024**  **Math & Engineering Analytics** | **EG44022**  **Sustainability for Practice** | **CE4025**  **Intro to Mechanics & Materials** | **CE4023**  **Structural Analysis & Design 1** | **CE4011**  **Fluid and Soil Mechanics** | **EG5017**  **Exploring Project Management** | **CE5020**  **Digital Construction & (BIM)** | **CE5022**  **Engineering Geodesy and GIS** | **CE5021**  **Hydraulics & Water Engineering** | **CE5023**  **Structural Analysis & Design 2** | **CE5024**  **Geotechnics and Materials** | **EG6025**  **Apply** | **CE6024**  **HighwaysTransport, Traffic** | **CE6021 \***  **Geotechnical & Environmental** | **CE6027**  **Integrated Design project** | **CE6020**  **Advanced Structural Modelling & Design** | **CE6025**  **Individual Research Project** |
| Civil Engineer Standard | KNOWLEDGE |  |  | | | | | | | | | | | | | | | | | |
| The principles and techniques used to evaluate the impact of civil engineering infrastructure on society and the environment taking account of business, client and end user needs in its construction, management and use. This includes the importance of the tools used to measure welfare, health, safety and sustainability. Examples include: knowledge and understanding of environmental impact assessment, building information modelling taking into account the context of sustainability, CEEQUAL (a sustainability assessment tool used for the assessment of all types of civil engineering, infrastructure, coastal protection works, coastal landslides, sewerage and drainage systems, and public realm projects and contracts) the environmental impact of materials, integrated transport systems, water quality and supply as well as urban drainage systems for a sustainable built environment. | K1 |  |  | **√** |  |  |  | **√** |  |  | **√** |  | **√** | **√** |  | **√** | **√** |  | **√** |
| The mathematical, scientific and engineering principles, methods and modelling that underpin the design and construction of civil engineering infrastructure. This will include understanding structural and ground responses, properties of materials and their predicted behaviour as part of integrated systems. Examples include, knowledge of the design and construction of buildings, transportation systems, water and wastewater networks, foundations and temporary works, coastal protection, understanding slope stability, retaining walls, ground water movement, elastic/plastic and failure behaviour of materials such as concrete, steel, asphalt and timber, behaviour of structural elements such as beams, land surveying and formulating applicable mathematical solutions through suitable software. | K2 |  | **√** |  | **√** | **√** | **√** |  |  | **√** | **√** | **√** | **√** |  |  | **√** | **√** | **√** |  |
| The use and validation of digital solutions and data gathering tools to model, evaluate, design, test, build and manage civil engineering infrastructure, refining as required and applied to integrated solutions. . Examples include: knowledge of software packages including building information modelling, structural engineering design and analysis, computational fluid dynamics and finite element modelling software. | K3 |  | **√** |  | **√** | **√** | **√** |  | **√** | **√** | **√** | **√** | **√** |  | **√** | **√** | **√** | **√** |  |
| A range of research techniques used to develop innovative solutions to civil engineering problems and the use of current and emerging technologies and products. Examples include: knowledge of site investigation techniques, flood risk management, materials testing, physical and numerical modelling, transport analysis, road traffic flow, growth, traffic management and safety. | K4 |  |  |  |  |  |  |  |  |  | **√** | **√** | **√** |  | **√** | **√** | **√** | **√** | **√** |
| The design and quality standards, codes of practice, legal and regulatory frameworks, such as those of asset owners and regulatory bodies, that govern the life cycle of civil engineering infrastructure. Examples include: British Standards, Construction (Design and Management) policies, building regulations, Eurocodes, Network Rail and nuclear industry standards, | K5 | **√** |  |  | **√** | **√** |  |  |  |  |  | **√** |  | **√** |  | **√** |  |  |  |
| The principles and techniques of effective project management including resources, cost management and risk assessment. Examples include: knowledge of project and contract management in terms of cost, quality, performance and continuous improvement; procedures and processes involved in procuring projects, producing tenders and estimates and factors that affect profitability; management structures and relationships involved in project delivery; commercial and financial risks; project management systems and procedures for forecasting, planning, allocating and controlling human, material and financial resources; continuous quality improvement strategy. | K6 |  |  |  |  |  |  | **√** |  |  |  |  |  | **√** |  |  | **√** |  |  |
| How to manage teams and develop staff to meet changing technical and managerial needs. Examples include: knowing how to build teams, effective team working, time management, reviewing and appraising performance in relation to delivery of civil and infrastructure engineering projects and related wider operations. Using change- management techniques to address client changes and impacts on civil engineering design and delivery. | K7 |  |  | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** |  |
| How to communicate effectively and provide guidance to others through design models, calculations, reports, drawings, specifications, presentations, digital media and discussions with those both inside and outside the industry. | K8 |  |  | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** |  |
| The professional and ethical codes of conduct and associated responsibilities as set out by the relevant professional engineering institution. | K9 | **√** |  |  |  |  |  | **√** |  |  |  |  |  | **√** |  |  |  |  |  |

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| Civil Engineer Standard | SKILL |  |  | | | | | | | | | | | | | | | | | |
| Evaluate the impact of civil engineering infrastructure on society and the environment taking account of business, client and end user needs in its construction, management and use. Examples include: the ability to use the CEEQUAL toolkit, carry out environmental impact assessments, designing and constructing the built infrastructure to ensure that it is safe, usable, appropriate and cost effective. | S1 |  |  | **√** |  |  |  | **√** |  |  | **√** |  | **√** | **√** |  | **√** | **√** |  | **√** |
| Proactively consider welfare, health, safety and sustainability in the life cycle of civil engineering infrastructure using tools such as CEEQUAL and environmental impact assessments. | S2 |  |  | **√** | **√** |  |  |  |  |  | **√** |  | **√** |  |  | **√** |  |  |  |
| Apply mathematical, scientific and engineering principles, methods and modelling to the design and construction of civil engineering infrastructure. Examples include: the design, construction and maintenance of buildings, transportation systems, water and wastewater networks, foundations and temporary works, understanding slope stability, retaining walls, ground water movement, coastal works, elastic/plastic and failure behaviour of materials such as concrete, steel, asphalt and timber, behaviour of structural elements such as beams, land surveying | S3 |  |  |  | **√** | **√** |  |  |  | **√** | **√** | **√** | **√** |  | **√** | **√** | **√** | **√** |  |
| Use and validate digital solutions and data gathering tools to model, evaluate, design, test, build, and manage civil engineering infrastructure defining engineering and other constraints, identifying risks and how these may be resolved through design. Examples include: ability to use building information modelling, structural engineering design and analysis, computational fluid dynamics and geospatial information systems software. | S4 |  |  |  |  | **√** |  |  | **√** | **√** |  |  |  |  | **√** | **√** | **√** | **√** | **√** |
| Develop innovative, safe, technical solutions to civil engineering problems through the use of research techniques, market intelligence and best practice. Examples include: ability to use of range of research methods to collect and analyses data to draw well-founded practical conclusions for implementation, applicable research strategy and methodology, literature searches. | S5 |  |  |  |  |  |  | **√** |  |  |  |  |  | **√** | **√** |  | **√** |  | **√** |
| Interpret and apply design and quality standards including codes of practice, legal and regulatory frameworks, in the development of civil engineering solutions, the determination of construction methods and the technical aspects of site activities. Examples include: planning, designing, construction and maintenance of buildings and infrastructure in compliance with current codes, standards and legislation, industry regulations, the use of Risk Assessment Method Statements, | S6 |  |  |  |  | **√** |  |  | **√** |  |  | **√** |  |  | **√** |  | **√** | **√** |  |
| Manage and apply safe systems of work including taking responsibility for own obligations for health, safety and welfare issues, assessing and controlling risk, working with health, safety and welfare legislation and best practice. Examples include: recognise the health and safety aspects of civil and infrastructural projects as well as assess associated risks and identify appropriate safety measures in site work and for undertaking construction works. Apply the principles of civil engineering and construction business risk management | S7 |  |  |  |  |  |  | **√** |  |  |  |  |  | **√** |  |  |  |  |  |
| Manage the planning, budgeting and organisation of tasks, people and resources through the use of appropriate management systems, working to agreed quality standards, project programme and budget, within legal, contractual and statutory requirements. | S8 | **√** |  |  |  |  |  | **√** |  |  |  |  |  | **√** |  |  |  |  |  |
| Manage teams and develop staff to meet changing technical and managerial needs. | S9 |  |  | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** |  |
|  | Communicate effectively and provide guidance to others through design models, calculations, reports, drawings, specifications, presentations, digital media and discussions with those both inside and outside the industry. | S10 |  |  | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** | **√** |  |
|  | Carry out and record the continuing professional development necessary to maintain and enhance knowledge and competence as a civil engineer. | S11 | **√** |  |  |  |  |  | **√** |  |  |  |  |  | **√** |  |  |  | **√** | **√** |

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| Civil Engineer Standard | BEHAVIOURS |  |  | | | | | | | | | | | | | | | | | |
| Be aware of the needs and concerns of others, especially in relation to diversity and equality. | B1 | **√** |  |  |  |  |  | **√** |  |  |  |  |  | **√** |  |  |  |  |  |
| Demonstrate reliability, integrity and respect for confidentiality. | B2 | **√** |  |  |  |  |  | **√** | **√** |  |  |  |  | **√** |  |  |  |  | **√** |
| Demonstrate confidence and flexibility in dealing with new and changing interpersonal situations. | B3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Be conscious of the need to create maintain, and enhance productive working relationships. | B4 |  |  |  |  |  |  | **√** | **√** | **√** |  |  |  |  |  |  | **√** |  |  |
| Demonstrate a strong commitment to health, safety and welfare. | B5 | **√** |  |  | **√** |  | **√** | **√** |  | **√** | **√** | **√** | **√** |  | **√** | **√** |  |  |  |
| Demonstrate a personal commitment to professional and ethical standards, recognising one’s obligations to society, the profession and the environment. | B6 | **√** |  | **√** |  |  |  | **√** |  |  |  |  |  | **√** |  | **√** |  |  |  |
| Demonstrate self-awareness of knowledge and skills and only undertake work that they are competent to do. | B7 | **√** |  |  |  |  |  | **√** |  |  |  |  |  | **√** |  | **√** |  |  |  |
| Reflect on their personal development needs and place a strong emphasis on addressing them. | B8 | **√** |  |  |  |  |  | **√** |  |  |  |  |  | **√** |  |  |  |  |  |

Key to colour coding:

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Principle delivery/development by Kingston University

Primary delivery/development by Kingston University Supported by Employer

Principle delivery/development by Employer Supported by Kingston University