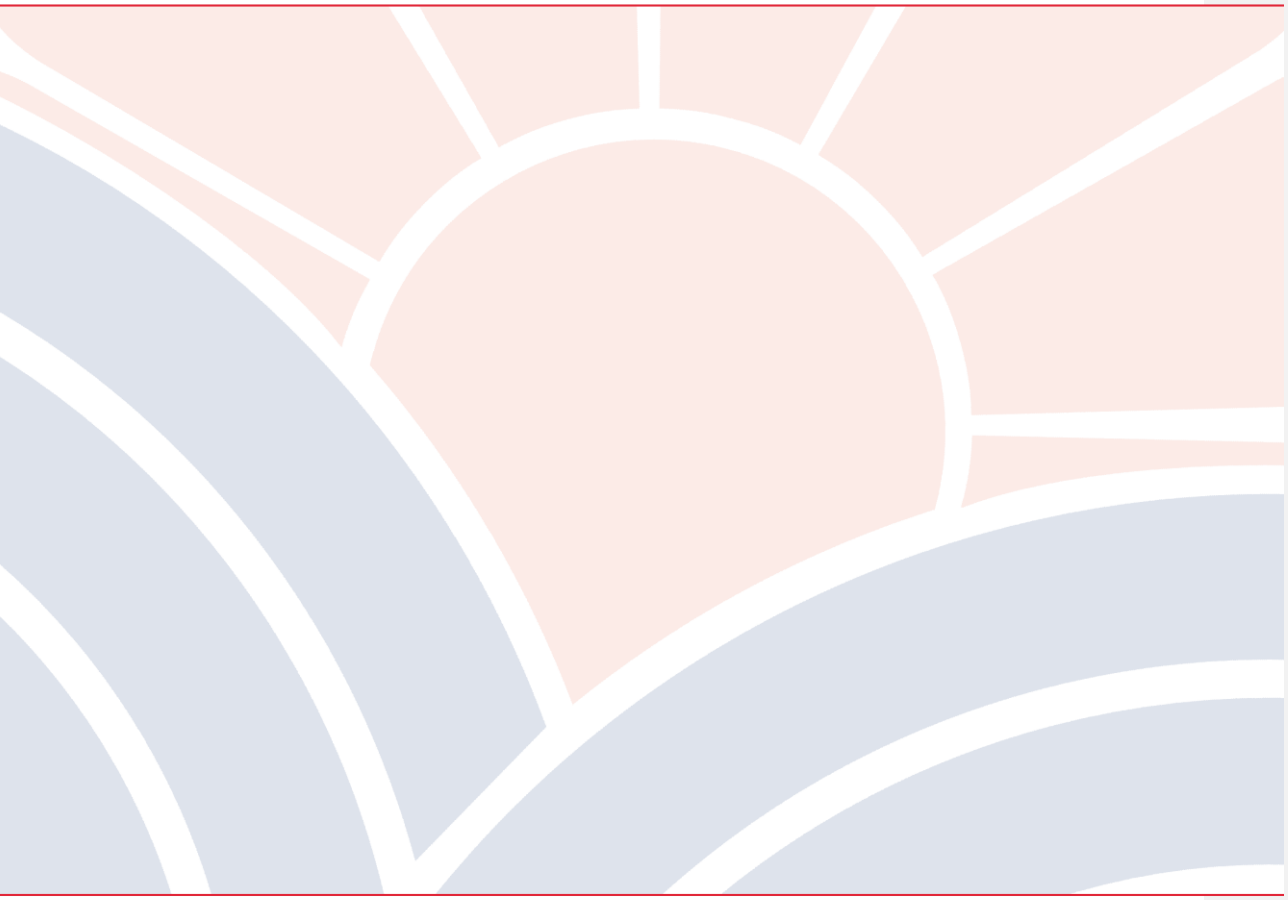
Solihull College & University Centre

Programme Specification

HNC Diploma in Construction and the Built Environment (Civil Engineering)



Awarded by

Pearson

Programme Specification

Title of Programme: HNC Diploma in Construction and the Built Environment (Civil Engineering)

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

1.	**Awarding Body**	Pearson BTEC
2.	**Teaching location**	Woodlands
3.	**Accreditation details**	N/A
4.	**Final award**	Higher National Certificate
5.	**Name of award**	Pearson BTEC Level 4 HNC in Construction and the Built Environment (Civil Engineering)
6.	**Codes**	
	a. UCAS code	N/A
	b. Solihull Qualification Code	BUENC052
	c. Edexcel Programme Code (& approval dates)	500/8276/0
7.	**QAA Subject Benchmark or other external reference such as published by Edexcel if the course is a Higher National**	Construction, Property and Surveying 2008 Subject Benchmark Statement
8.	**Date this specification applies from**	01.09.16
	Approved	Mick Nicholl, Head of School Engineering and Construction

9. Educational Aims of the Programme

This programme aims to:

- provide an educational foundation for a range of technical careers in Civil Engineering;
- provide specialised studies directly relevant to individual vocations and professions
- provide flexibility, knowledge, skills and motivation as a basis for career development and as a basis for progression to graduate studies
- develop students' ability in Civil Engineering through effective use and combination of the knowledge and skills gained in different parts of the programme;
- develop a range of skills, techniques and personal attributes essential for successful performance in the working place.

10. Intended Learning Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

Subject knowledge and critical understanding includes:

A sound basic knowledge and understanding that includes:

- Mathematical methods relevant to Civil Engineering
- Good practice within Civil Engineering
- Scientific principles underpinning Civil Engineering
- Use of Information and Communication Technology (ICT) relevant to Civil Engineering
- General principles of and design techniques
- An overview of Management and Business practices

Higher level academic/intellectual skills includes

The ability to:

- Understand and apply principles and concepts;
- Present reasoned arguments and apply judgement;
- Analyse and evaluate practical problems and provide logical solutions.
- Capacity to formulate solutions to engineering problems with a level of independence

Higher practical and professional skills includes:

The ability to:

- Select and apply routine mathematical methods to the modelling and analysing of engineering problems
- Select and apply scientific principles and set up appropriate equipment for the analysis and solution of engineering problems
- Select and apply appropriate computer-based methods to solve engineering problems
- Produce a design for a system, component or process to meet a specified requirement
- Research and undertake tests for a design solution and report the results effectively
- Apply engineering techniques to take account of a range of commercial and industrial constraints
- Apply management principles and techniques to the solution of engineering problems

Higher Level transferable skills development includes:

The ability to:

- Manage and develop self;
- Work with and relate to others;
- Communicate ideas effectively both orally and in writing;
- Apply numeracy;
- Apply technology;
- Manage tasks and solve problems;
- Apply design techniques and show creativity/originality in work produced

Teaching and Learning Methods

- Acquisition of core knowledge is through a mixture of lecture/presentations/demonstration/laboratory experiment and directed study
- Analytic thinking skills are developed through discussion and self-assessment test questions.
- Practical skills are developed through laboratory experiments and the use of simulation software
- Common skills are developed through assignments and presentations, particularly in the project unit

Assessment methods

Assessment activities provide major opportunities for learning. Assessment criteria are linked to and stated in individual module outcomes.

Assessment methods vary for different modules but over the two years of the course will include

- Unseen mathematical tests
- Case studies or relevant workplace scenarios
- Practical Assessment
- Assignment Reports
- Oral presentations within the project unit
- Individual and paired practical work and group project work

Each module will include a variety of methods from the list above. Assessments in the form of assignments and in-class assessments are posted on the Moodle site and students' work collected via electronic submission and checked by plagiarism detection software prior to marking.
The number of assessments varies from unit to unit and can take the form of case studies, research projects, formal reports and presentations.

11. Programme Structure

All units in this programme of study are compulsory and chosen by the Awarding Body.

Civil Engineering Year 1
Unit 1: Design Principles and Applications for Construction and the Built Environment
Unit 2: Science and Materials for Construction and the Built Environment
Unit 3: Applied Mathematics for Construction and the Built Environment
Unit 27: Site Surveying Procedures for Construction and the Built Environment

Civil Engineering Year 2
Unit 5: Group Project in the Construction Industry
Unit 32: Engineering Geology and Soil Mechanics
Unit 33: Civil Engineering Technology
Unit 34: Structural Analysis and Design

Progression to Year 2

Progression onto the second year of the programme normally requires the completion of all 1st year units

Completion of the Award

All units studied must be completed with a minimum grade of a Pass in order to complete the award.

Module Descriptors

Unit 1: Design Principles and Application for Construction and the Built Environment:
Planning, design and production phases of the construction process, the coordination and management of each phase; factors affecting the selection of materials, systems and equipment; environmental impact of energy and other constraints on the planning, design and construction processes; roles, responsibilities and obligations (including liability for health, safety and welfare) of all parties involved in construction projects; cost implications and how technology affects the design of construction projects and the design processes and procedures used for the production phase.

Unit 2: Science and Materials for Construction and the Built Environment:
Scientific principles and an understanding of the properties and use of materials needed to successfully complete the other core and specialist content; analyse, apply, investigate and evaluate properties and behaviour of materials and components used for structural designs and construction operations; determine comfort levels in the design and use of buildings; experimentation and modelling of scientific principles.

Unit 3: Applied Mathematics for Construction and the Built Environment:
Application of analytical techniques needed to successfully complete the core and specialist content, to include algebra, graphical techniques, laws of motion, matrices, trigonometry, calculus, statistics and probability, surveying and setting out procedures and construction/engineering problems.

Unit 5: Group Project in the Construction Industry:
Evaluate and resolve realistic practical problems by working as part of a team for a major piece of work or project that reflects the type of performance expected of technologists in a construction discipline; this work should involve interpreting an agreed brief that contains an agreed timescale for the staged development of an overall 'plan of work' and be within given, defined constraints, with the team working towards an acceptable and viable solution; enabling learners to demonstrate the application of individual high-level skills in managing self, working as a member of a team and presenting technical solutions.

Unit 27: Site Surveying Procedures for Construction and the Built Environment:
Range of instruments used for surveying and setting-out processes; principles of surveying and setting-out; calculate the information required from raw data for cartographic detailing and setting-out of construction and civil engineering work; surveying controls; use of electronic and laser instruments; GPS

systems; total station instruments and the application of computer software to calculate and produce surveying solutions.

Unit 32. Engineering Geology and Soil Mechanics:
Engineering characteristics of geological materials and the formation of rock and soils; description and classification of geological materials; common rock types, their mode of formation, geographical/geological distribution and uses within construction and the built environment; engineering performance of rock materials; determination of basic soil properties by common soil tests and the associated analysis of laboratory data; classify soils to establish their design parameters; primary design parameters for soils, including methods of ground investigation techniques.

Unit 33. Civil Engineering Technology:
Construction methods and techniques used in earthworks, substructures and superstructures. Hazards arising from civil engineering activities and solving problems arising from civil engineering activities.

Unit 34. Structural Analysis and Design:
Analysis and calculation for the design of common structural elements to the appropriate British Standards, codes of practice or European Codes of Practice; bending moments and shear forces for statically determinate structures; bending deflections for statically determinate structures; the behaviour of elastic columns subjected to axial loading; design methods for simply supported beams in steel, reinforced concrete and timber; design methods for columns in steel, reinforced concrete, timber and masonry; bending moments and shear forces in three pin frames.

12. Support for Students and Their Learning

Student progression on course is supported both by subject tutors and central College services and includes:

Comment [HB1]: This section should be customised to the programme

- An induction programme introducing new students to the subject of study, higher level skills that need to be developed, and the college facilities (including the library, IT facilities, staff and other students).
- One one-week induction programme for second year students to refresh study skills
- College and course/ module handbooks available in print and electronic format on Moodle.
- Personal and academic support is integrated in teaching provided by supportive and accessible tutors and identified 1:1 support sessions are also available.
- Planned Site Visits and Visiting Speakers
- Extensive library and other learning resources and facilities
- Laboratories with up-to-date Materials Testing and IT facilities.
- Access to Teaching and Learning Support Services, which provides assistance and guidance eg dyslexia.
- All students are allocated personal tutors whose role is to assist them with personal problems and to advise on pastoral issues.
- Study skills sessions integrated in programme.
- Personal development planning sessions integrated into programme
- Up-to-date Computer laboratories with specialist facilities for computer networking and multimedia computing.
- Access to counsellors and support for students with special needs.
- Written assignment / assessment feedback (normally provided with 3 weeks of assessment submission).
- Regular 1:1 and group tutorial support
- Access to regularly updated course section and college wide sections on the college's intranet Moodle
- Dedicated HE Common Room to provide a social study area.
- Student e-mail and access to personal tutor and Course Leader.

13. Criteria for Admission

Normally the course enrols students, who are in, or plan to enter, employment and who have reached the minimum age of 18. Students enter with at least one of the following qualifications:

Entry Requirements:

4 GCSEs grade C or level4 and above, plus

1 A Level, or 2AS Levels (40 points),

or BTEC National in a relevant construction/engineering qualification,

or an equivalent qualification

Students with existing level 4/5 qualifications may be eligible for some accreditation for prior learning which can be discussed on an individual basis.

Mature students, over the age of 21, with a suitable background or experience may be accepted without formal qualifications.

All students will be invited to interview before an offer is made.

Comment [HB2]: Need too add the new GCSE tariff and UCAS tariff

14. Progression

It may be possible to progress onto a HND Construction and the Built Environment (Civil Engineering) at Solihull College and University Centre on successful completion of the HNC.

The units have been designed to fit the Trailblazer Standard for Civil Engineering 2015 (Draft)

It may be possible for you to join courses at level 5 at local universities such as Birmingham City University or Coventry University.

15. Evaluating the Quality of Teaching and Learning

Evaluation of the Standards of Teaching and Learning is undertaken using the results of the following documents;

- Student feedback questionnaires, both initial impressions and the spring survey
- Module review forms completed by students at the end of every module and summarised by the course leader.
- Student input to the Programme Quality Board held twice a year.
- Student representations made through the HE Student Council.
- Action areas fed by the above to the course based Annual Monitoring report.
- Findings of the peer teaching observation scheme and recommendations for improvement that are made
- Periodic Review of the programme led by the Dean of Higher Education and Curriculum Innovation including views of critical friend, students, ex-students and employers.
- External Examiners report and audit of assessed work

Students have the opportunity to comment on the quality of the programme in the following ways

- Submitting module evaluation questionnaires which are shared in team meetings and relevant actions raised are included in the Annual Monitoring Review.
- Student Representatives volunteer from each group to bring forward the views of their colleagues informally and within bi-annual programme quality boards (PQB). The minutes of student meetings are placed on Moodle and actions are reviewed at each PQB.

The ways in which the quality of this programme is checked, both inside and outside the college, are:

- External Examiners, who produce an annual report which is available to view on Moodle and also results in an action plan for the following academic year.
- Annual module review in the form of student evaluations which are discussed in a team meeting
- Periodic programme review to identify best practice and invite employers to contribute to the design of the programmes
- Invitation to attend Programme Quality Boards to all students and create a transparent discussion to share ideas, best practice and areas for improvement.

16. Regulation of Assessment

- The programme is the subject of an Annual Monitoring Report (AMR) the last section of which is a Quality Improvement Plan (QIP), written by the course leader with help and input from the teaching and tutoring team this is passed to the Head of School for audit and from them to the quality unit for further audit and acceptance as part of the College plan.
- Assessment rules and regulations and quality standards are those overseen by the HE Quality and Standards Board.
- Assessment and assessment vehicles are regulated by the internal verification system for each programme which is itself audited by the quality unit within the College and also by the External Examiner appointed by Pearson.
- External verification of assessment and of the provision and standards of teaching are regulated by Pearson BTEC and their quality unit, the programme has to seek approval for continuance every 5 years. Their requirements are monitored annually by the visit and report of their appointed external verifier (Standards Verifier)
- Also the programme is the subject of periodic review by QAA, ensuring that national benchmarks are met throughout the programme.

Standards Verifiers (External Examiners) are appointed by the Pearson

The role of Standards Verifier is that of moderator. In order to do this they check and review:

- action points from previous reports
- Centre assessment policy and boards
- effectiveness of assignments and internal verification
- the maintenance and audit of assessment records
- student registration and certification claims
- student support and review
- areas of good practice

17. Enhancement

- An action plan is provided in each annual programme report and progress in achieving enhancements is regularly reviewed
- Good practice in teaching and learning is developed and disseminated through regular staff development workshops and through participation in internal verification of completed student work.
- Staff development activities are discussed at annual appraisal interviews and are actively encouraged to develop their professional practice and industrial experience.

18. Programme Resources

Suitable IT resources including AutoCad

Materials Laboratory

Employer links providing suitable site visits

Access to equipment at Coventry University

Student Employability

This programme is part of Solihull College's commitment to meeting the needs of local, national and international employers by delivering a diverse range of educational models including part-time and work-based study for learners drawn from non-traditional backgrounds in addition to internal progressions from FE vocational programmes.

As part of this commitment, the HNC Construction and the Built Environment (Civil Engineering) will:

1. Support students by providing professional, impartial advice and guidance to enable students to make considered career decisions before and during their studies to enable them to be prepared for their future employment and development by:
    1. identifying the skills needed for progression into employment,
    2. enhancing their existing employment prospects.
2. Provide subject-related resources and information on local, national and international labour markets;
3. Be responsive to the needs of employers in order to maximise students' employability and career progression prospects;
4. Include study skills which will improve students' academic writing and research capabilities to enable further study and facilitate career progression;
5. Support equality and diversity, and minimise barriers to learning, as described in the college's Equality Policy which can be found on the website under Mission and Policies.
6. Ensure that employers play a key part in module content, course design and assessment criteria by formally seeking their views through regular employer meetings organised by the Technician Apprenticeship Consortium and meetings with industry groups, and the use of a specialist employer service researcher to help to ensure that the course content meets industry expectations and requirements;
7. Professional Body recognition - successful completion of the HNC enables students to apply to become a Technician Member of The Institute of Civil Engineers.

Table mapping HNC Construction and the Built Environment (Civil Engineering) Programme learning outcomes across the modules:

Modules	Design Principles and Application for the Built	Unit (2) – Science and Materials for Construction and the Built Environment	Unit (3) Applied Mathematics in the Construction	Unit (5) – Group Project in the Construction Industry	Unit (27) – Site Surveying Procedures for Construction and the Built Environment	Unit (32) – Engineering Geology and Soil Mechanics	Unit (33) – Civil Engineering Technology	Unit (34) – Structural Analysis and Design
3.1 Academic Literacy								
1.1	x	x	x	x	x	x	x	x
1.2	x	x	x	x	x	x	x	x
1.3	x	x	x	x	x	x	x	x
3.2 Research Literacy								
2.1	x	x	x	x	x	x	x	x
2.2	x			x			x	
2.3	x	x	x	x	x	x	x	x
2.4		x			x	x	x	x
2.5	x	x	x	x	x	x	x	x
2.6	x			x				
3.3 Critical self–awareness and personal literacy								
3.1	x	x	x	x	x	x	x	x
3.2	x	x	x	x	x	x	x	x
3.3	x			x	x	x	x	x
3.4	x	x	x	x	x	x	x	x
3.4 Digital and Information Literacy								
4.1	x	x	x	x	X	x	x	x
4.2	x	x	x	x	x	x	x	x
4.3	x	x	x	x	x	x	x	x
4.4	X	x	x	x	x	x	x	x
3.5 Active Citizenship								
5.1	x	x	x	x	x	x	x	x
5.2	x				x	x	x	
5.3	x			x				
5.4	x			x				
5.5	X	x	x	x	x	x	x	x
5.6	X	x	x	x	x	x	x	x
All Modules are Mandatory								

The UK-Spec Learning Outcomes are covered in the programme as follows (definition of UK-Spec Learning Outcomes can be found, for example, in the IET handbook of Learning outcomes http://www.engc.org.uk/engcdocuments/internet/Website/UK-SPEC%20third%20edition%20%281%29.pdf):

Modules	US1i	US2i	E1i	E2i	E3i	E4i	D1i	D2i	D4i	D5i	D6i	P1i	P2i	P3i	P4i	P6i	P7i	P8i
Unit (1)- Design Principles and Application for the Built Environment			X	X		X	X	X			X	X		X	X	X	X	X
Unit (2) - Science and Materials for Construction and the Built Environment	X	X		X	X							X	X	X	X	X		
Unit (3) - Applied Mathematics in the Construction Industry	X	X		X	X							X		X	X	X		
Unit (5) – Group Project in the Construction Industry			X	x	X	X	X	X	x	X	x	x		x	x	X		X
Unit (27) – Site Surveying Procedures for Construction and the Built Environment		X		X	X							X	X	X	X	X		
Unit (32) – Engineering Geology and Soil Mechanics				X	X							X	X	X	X	X		
Unit (33) – Civil Engineering Technology	X			X	X	X				X		X	X	X	X	X		
Unit (34) – Structural Analysis and Design		X		X	X							X	X	X	X	X		

1. Academic literacy

Learners are expected to have academic literacy of:

1.1. Civil Engineering, so that they are able to demonstrate the knowledge and understanding to deal with well-established, and with some depth, facts, concepts, principles & theories relevant to Civil Engineering, within a broad engineering subject base (UK-SPEC A1, A2: Output[1] US1i, S1i, P6i).
1.2. Complexity within Civil Engineering systems, informed by literature & resources which are largely prescribed (UK-SPEC A1, A2: Output P4i, P5i).
1.3. The inter-relationships of health & safety, design, engineering science & applications, analytical & mathematical techniques, environmental considerations & sustainability, systems, management and economic factors in relation to Civil Engineering (Output US2i, D1i, S1i, S2i, S3i, S4i, P6i).

2. Research literacy

Learners are expected to have research literacy so that they can:

2.1. Apply aspects of relevant facts, concepts, principles & theories relevant to Civil Engineering issues to their subject and / or professional work areas (UK-SPEC A1, A2: Output US1i, US2i, S1i, P6i).
2.2. Make and justify decisions relevant to design, use and decommissioning of civil equipment including preventative measures which are specified and predictable; and produce an action plan, where appropriate, supported by pertinent evidence (UK-SPEC A2, B2: Output E1i, E3i, D3i, D4i, D5i).
2.3. With guidance, in relation to the field of Civil Engineering and within specified parameters, explain key engineering principles and identify their relevance and significance to Civil Engineering and justify their application to specific problems which are specified and produce a coherent line of argument supported by relevant evidence (UK-SPEC B1: Output E1i, E2i, E3i, P4i).
2.4. Identify, explain and use appropriate practical and laboratory skills with the appropriate selection of experimental and investigative techniques (Output P1i, P2i).
2.5. Identify, access, use, explain and evaluate information / data which is relevant from a range of sources (Output P4i).
2.6. Set milestones within a given plan and implement plan to achieve several objectives (UK-SPEC C1: Output S2i).

3. Critical self-awareness and personal literacy

Learners are expected to have critical self-awareness and personal literacy so that they can:

3.1. Undertake prescribed independent study techniques and their application to work-based learning including the setting of goals, managing time appropriately and prioritising tasks, and review personal performance to ensure that work is completed in a timely manner.
3.2. In relation to the professional work area, operate effectively in situations that are largely straightforward and predictable within practical / employment / work contexts requiring the exercise of personal responsibility and/or decision-making as evidenced by work-based learning in the application of underlying concepts and principles of Civil Engineering in routine and novel situations (UK-SPEC C1, C2, E2: Output D3i, P3i, P4i).
3.3. In relation to the learner's professional area and with clear guidance / support, participate effectively in appropriate collaboration with people from other disciplines / professions (UK-SPEC C3, D3: Output P3i).
3.4. For a given situation and audience, communicate knowledge and understanding appropriate to the level in an appropriate written, verbal or visual format in a way that is appropriate for the purpose, topic and situation and in such a way as to demonstrate understanding to academic, specialist and non-specialist audiences (UK-SPEC D1: Generic Output).

4. Digital and information literacy

Learners are expected to have digital and information literacy so that they can:

4.1. With guidance, in relation to academic and practical work, convey information which has some complexity in written/spoken English which is accurate and clear in terms of grammar / syntax / vocabulary-choice / style and use academic conventions appropriately for the purpose, topic, situation and audience and also reference a range of different types of sources accurately in line with guidance provided (Generic Output).
4.2. Select and use specified IT applications and strategies as appropriate for guided purposes and tasks and the retrieval of information (Output E2i, P1i).

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[1] The definition of UK-Spec Outputs can be found, for example, in the IET handbook of Learning outcomes http://www.theiet.org/academics/accreditation/policy-guidance/handbook_lo.cfm

4.3. Solve straightforward contextual, qualitative and numerical problems by identifying, explaining and selecting appropriate approaches to use and also evaluate both the approaches and solutions to the problem (Output E2i, E3i).
4.4. Critically evaluate the validity and implications of information relevant to Civil Engineering and their work practice (Generic Output).

5. Active citizenship

Learners are expected to have active citizenship so that they can:

5.1. With guidance, in relation to the field of Civil Engineering and within specified parameters, identify and explain issues related to health and safety, design, engineering science & applications, analytical & mathematical techniques, environmental considerations & sustainability, systems, management and economic factors (UK-SPEC E2, E3: Output E4i, D1i, D2i, D5i, S4i).
5.2. With guidance, in relation to the field of Civil Engineering and within specified parameters, evaluate and critically analyse equipment and systems and make suggestions to improve the design life, performance and efficiency and justify decisions about the management of equipment and systems and also related technologies (UK-SPEC B3, C4: Output E1i, E2i, E3i, E4i, D4i, D5i, P7i).
5.3. Demonstrate respect for the perspective of other disciplines / professions and be able to identify the potential contribution of own and other professions / disciplines to the area of practice and describe the purpose of these disciplines / professions and their role within a multidisciplinary team (UK-SPEC C3, D3: Output P3i).
5.4. In relation to Engineering, with clear guidance & support, appropriately work effectively within the boundaries imposed by ethical and legal issues (including standards & codes) and demonstrate respect for the ethical and legal boundaries of other disciplines (UK-SPEC E1, E2: Output S4i, S5i, P3i, P5i).
5.5. Demonstrate the learning ability needed to undertake further training, develop existing skills, and acquire new competences that will enable them to assume significant responsibility within organisations (UK-SPEC A1, E4: Generic Output).
5.6. Reflect, selecting from a range of suggested approaches and techniques, and seek and use feedback to inform reflection on and analysis of own strengths, limitations & performance and identify their implications (UK-SPEC D3: Generic Output).

	IEng degree as an enhancement or limitation to BEng (Hons) for CEng		**BEng (Hons) for CEng**		**Integrated MEng degree as enhancement of BEng (Hons)**
	The weighting given to these different broad areas of learning will vary according to the nature and aims				
	Underpinning Science and Mathematics and associated engineering disciplines (US)				
US1i	• Knowledge and understanding of the scientific principles underpinning relevant technologies, and their evolution	**US1**	• Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context and to support their understanding of future developments and technologies.	**US1m**	• A comprehensive understanding of the scientific principles of own specialisation and related disciplines.
US2i	• Knowledge and understanding of mathematics necessary to support application of key engineering principles	**US2**	• Knowledge and understanding of mathematical principles necessary to underpin their education in their engineering discipline and to enable them to apply mathematical methods,	**US2m**	• A comprehensive knowledge and understanding of mathematical and computer models relevant to the engineering discipline, and an

			tools and notations proficiently in the analysis and solution of engineering problems.		appreciation of their limitations.
US3		**US3**	• Ability to apply and integrate knowledge and understanding of other engineering disciplines to support the study of their own engineering discipline	**US3m**	• An understanding of concepts from a range of areas including some outside engineering, and the ability to apply them effectively in engineering projects.
				US4m	• An awareness of developing related to own specialisation.

IEng degree		BEng(Hons) for CEng		Integrated MEng degree	
	Engineering Analysis (E)				
E1i	• Ability to monitor, interpret and apply the results of analyses and modelling in order to bring about continuous improvement	**E1**	• Understanding of engineering principles and the ability to apply them to analyse key engineering processes.	**E1m**	• Ability to use fundamental knowledge to investigate new and emerging technologies.
E2i	• Ability to use the results of analysis to solve engineering problems, apply technology and implement engineering processes.	**E2**	• Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques	**E2m**	• Ability to extract data pertinent to an unfamiliar problem, and apply its solution using computer based engineering tools when appropriate
E3i	• Ability to apply quantitative methods and computer software relevant to their engineering technology discipline(s), frequently within a multidisciplinary context.	**E3**	• Ability to apply quantitative methods and computer software relevant to their engineering discipline, to solve engineering problems	**E3m**	• Ability to apply mathematical and computer based models for solving problems in engineering, and the ability to assess the limitations of particular cases.
E4i	• Ability to apply a systems approach to engineering problems through know-how of the application of the relevant technologies	**E4**	• Understanding of and ability to apply a systems approach to engineering problems	**E4**	

	IEng degree		BEng(Hons) for CEng		Integrated MEng degree
	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 and can be used to integrate all engineering understanding, knowledge and skills to the solution of real problems. Graduates need the knowledge understanding and skills to:				
	Design (D)				
D1i	• Define a problem and identify constraints.	**D1**	• Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues	**D1m**	• Wide knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations.
D2i	• Design solutions according to customer and user needs	**D2**	• Understand customer and user needs and the importance of considerations such as aesthetics	**D2**	
D3		**D3**	• Identify and manage cost drivers	**D3**	
D4i	• Use creativity and innovation in a practical context	**D4**	• Use creativity to establish innovative solutions	**D4m**	• Ability to generate an innovative design for products, systems, components or processes to fulfil new needs.
D5i	• Ensure fitness for purpose (including operation, maintenance, reliability etc)	**D5**	• Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal	**D5m**	
D6i	• Adapt designs to meet their new purposes or applications	**D6**	• Manage the design process and evaluate outcomes	**D6**	

	IEng degree		BEng(Hons) for CEng		Integrated MEng degree
	Economic, social and environmental context (S)				
S1		**S1**	• Knowledge and understanding of commercial and economic context of engineering processes	**S1m**	• The ability to make general evaluations of commercial risks through some understanding of the basis of such risks
S2		**S2**	• Knowledge of management techniques which may be used to achieve engineering objectives within that context	**S2m**	• Extensive knowledge and understanding of management and business practices, and their limitations, and how these may be applied appropriately *to strategic and tactical issues.*
S3		**S3**	• Understanding of the requirement for engineering activities to promote sustainable development	**S3**	
S4		**S4**	• Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues.	**S4**	
S5		**S5**	• Understanding of the need for a high level of professional and ethical conduct in engineering	**S5**	

	IEng degree		BEng(Hons) for CEng		Integrated MEng degree
	Practical application of engineering skills, combining theory and experience, and use of other relevant knowledge and skills. This must include an appropriate combination of the majority of these outcomes				
	Engineering Practice (P)				
P1i	• Understanding of and ability to use relevant equipment, tools, processes, or products	**P1**	• Knowledge of characteristics of particular equipment, processes or products	**P1m**	• A thorough understanding of current practice and its limitations and some appreciation of likely new developments
P2i	• Knowledge and understanding of workshop and laboratory practice	**P2**	• Workshop and laboratory skills	**P2m**	• Extensive knowledge and understanding of a wide range of engineering materials and components
P3i	• Knowledge of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc)	**P3**	• Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology, development, etc)	**P3**	
P4i	• Ability to use and apply information from technical literature	**P4**	• Understanding use of technical literature and other information sources	**P4**	
P5		**P5**	• Awareness of nature of intellectual property and contractual issues	**P5**	
P6i	• Ability to use appropriate codes of practice and industry standards	**P6**	• Understanding of appropriate codes of practice and industry standards	**P6**	
P7i	• Awareness of quality issues and their application to continuous improvement	**P7**	• Awareness of quality issues	**P7**	
P8i	• Understanding of the principles of managing engineering processes	**P8**	• Ability to work with technical uncertainty	**P8m**	• Ability to apply engineering techniques taking account of a range of commercial and industrial constraints

Please note: This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided. More detailed information can be found in the programme handbook or online.

Document History

1. 06.08.15
2. 23.02.17
3.

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