Programme Specification

A statement of the knowledge, understanding and skills that underpin a taught programme of study leading to an award from The University of Sheffield

1	**Programme Title**	Civil Engineering with an Industrial Placement Year
2	**Programme Code**	MACU015
3	**JACS Code**	H200
4	**Level of Study**	Undergraduate
5a	**Final Qualification**	Bachelor of Engineering with Honours (BEng)
5b	**QAA FHEQ Level**	Bachelor of Engineering (BEng) = Level 6
6	**Intermediate Qualification**	BEng in Civil Engineering
6b	**QAA FHEQ Level**	BEng = Level
7	**Teaching Institution** (if not Sheffield)	Not applicable
8	**Faculty**	Engineering
9	**Department**	Civil and Structural Engineering
10	**Other Departments involved in teaching the programme**	Core teaching: ● Applied Mathematics ● Materials Science and Engineering ● Management School
11	**Mode of Attendance**	Full-time
12	**Duration of the Programme**	4 years (BEng) This includes a year in industry (= minimum 38 weeks), which usually takes place after the 2nd year.
13	**Accrediting Professional or Statutory Body**	Joint Board of Moderators (JBM) of the Institution of Civil Engineers (ICE), Institution of Structural Engineers (IStructE), Chartered Institution of Highways & Transportation (CIHT), Institute of Highway Engineers (IHE) and Permanent Way Institution (PWI) http://www.jbm.org.uk
14	**Date of production/revision**	March 2015, September 2023, October 2024, March 2026

15. Background to the programme and subject area

Civil engineers are responsible for the design, construction and maintenance of the infrastructure that supports human living, trade and industry. This includes the provision of shelter, water supply, sanitation, transportation, energy and structures of all kinds. Structural engineers design and verify the safety of the buildings, bridges and other structures essential to modern society. In order to qualify, professional engineers must obtain appropriate academic qualifications, accredited by the relevant professional institutions, and must also obtain sufficient practical experience and training.

The BEng Civil Engineering programme with an Industrial Placement Year is designed to inspire and prepare students to address the complex, global civil and structural engineering challenges of the 21st century, but without specialising in any particular aspect in their first degree. It is also designed to maintain our current status as offering one of the leading undergraduate degrees in this field. By providing a co-ordinated and balanced programme, delivered by staff working in research and staff with industrial experience, the programme integrates core engineering science with practical application, aiming to inspire students and to challenge them to excel academically, whilst preparing them to enter professional practice or to pursue further study.

The BEng in Civil Engineering fully satisfies the educational base requirements for an Incorporated Engineer and partially satisfies the educational base requirements (requiring appropriate further learning to Masters' level) for a Chartered Engineer.

Strengths of this programme stem from the development of a sound technical base in engineering principles and

skills in the first two years, which is built on and complemented by application to increasingly complex problems.

Students on the BEng in Civil Engineering with an Industrial Placement Year spend the third year of the four-year degree working in an engineering company of their choice. This provides them with wide-ranging experiences and opportunities to put their academic studies into context, and to improve their technical and professional skills. It also enhances their employment prospects, enabling them to gain direct experience of industry culture, make contacts and strengthen their CV. Students who complete their placements successfully may be offered full-time graduate employment with the same company following their final year. Students are responsible for finding their own industrial placements but are assisted by staff in the department and the Careers Service.

The final year consolidates previous learning and further develops independent learning and project management skills in individual and group project work. The group design project involves independent, and group working and requires integration of technical, professional and management knowledge in a real-life context. Part of this project also provides opportunity to undertake a major piece of individual investigative project work.

The department has a strong research focus, with students taught by active research academics throughout their programme. In addition to the year in industry, the programme includes significant industrial involvement, with a variety of industry speakers, lectures, industrial tutors for design projects, and site visits.

The department also has strong links with alumni and an Industry Partnership careers event which provides opportunities for graduate jobs, work placements and advice on career opportunities. Graduates from this programme have a very strong employability record with most going on to jobs in Civil or Structural Engineering.

Further information about both the programme and the Department may be found on the internet at http://www.shef.ac.uk/civil/ug.

16. Programme aims

The overall aims of our BEng Civil Engineering programme with an Industrial Placement Year are to prepare students to address the complex, global civil engineering challenges of the 21st century and to engender a commitment to professional development, life-long learning and social responsibility, thus creating graduates who have the capacity to make a beneficial impact in their chosen career, or who are well prepared for further study. In doing this, we aim to fully satisfy the educational base requirements for an Incorporated Civil / Structural Engineer and partially satisfy the educational base requirements (requiring appropriate further learning to Masters' level) for a Chartered Civil / Structural Engineer.

The key objectives of this programme are:

1. to provide students with a sound technical foundation in the key areas of civil and structural engineering, including structures, geotechnics, water, and the environment.
2. to introduce the multi-disciplinary, global and professional context in which civil and structural engineering projects are developed, enabling students to develop an appreciation of the professional responsibilities of civil and structural engineers to society and the environment.
3. to develop students' ability to produce effective, innovative designs solutions for the benefit of humanity, by taking a holistic approach, integrating engineering principles, subject-specialist knowledge with professional engineering skills and attitudes.
4. for students to develop independence of thought, a critical approach to new information and ability to make rational, evidence-based decisions.
5. to provide students with direct experience of working in industry, applying and developing their technical and professional skills.
6. for students to develop key engineering and professional skills and attitudes valued by employers, including ability to communicate clearly and effectively in a professional environment and to plan and manage work both independently and as part of a diverse but integrated team.
7. to inspire intellectual curiosity and develop the breadth of vision for students to become life-long learners by appreciating the need to adapt and keep up to date with changing knowledge and requirements.

17. Programme learning outcomes

Knowledge and understanding:

On successful completion of the programme, candidates for MEng and BEng will have developed:

K1	broad knowledge and understanding of fundamental concepts, principles and theories of engineering science relevant to civil engineering.	**Teaching / learning methods & strategies (see section 18)** K1, K2 and K3 are developed through a combination of lectures, tutorials / example classes, practical laboratory classes, small group project work, design classes and coursework assignments mainly in Y1 and Y2 but also extending into Y3 of the course. K4 is developed mainly through practical classes, design classes and coursework assignments, supported by lectures where relevant. K5 is developed through lectures, group project work, design classes and coursework assignments supported by seminars. This starts in Y1, but is principally developed in Y3, Y4 and the final year. K6 is developed through a combination of lectures, coursework and small group work in Y1 and 2 and the Y3 group design project. K7 is gained through experience and discussions with industrial mentor and academic tutor during the year in industry. **Assessment (see section 18)** Knowledge and understanding are assessed through a combination of written examinations / class tests (K1-K3, K6), assessed coursework (K1-K6), laboratory reports (K1, K2), group and individual design project reports (K3, K5, K6), oral presentations and interviews (K1, K3, K5, K6). K7 is assessed through an experience report and presentation at the end of the placement.
K2	broad knowledge and understanding of the mathematics necessary to represent physical concepts and apply engineering science to civil engineering.	
K3	broad knowledge and understanding of analytical and design methods used in civil engineering.	
K4	knowledge and understanding of the use of information and computation technology for analysis, design and management.	
K5	an understanding of the operation of the civil engineering industry, including business practice and project management.	
K6	an understanding of the professional and ethical responsibilities of civil engineers, the global context and impacts of civil engineering projects, and the social, environmental, ethical, economic and commercial considerations and constraints that influence engineering decisions.	
K7	working experience and appreciation of how subject-specific knowledge gained during the degree applies in the workplace.	

Skills and other attributes:

On successful completion of the programme, students will be able to:

Intellectual skills:

S1	Use engineering science, mathematics and, where appropriate, information technology to analyse and develop solutions to engineering problems.	**Teaching / learning methods & strategies (see section 18)** Intellectual skills are developed over the course of the programme through the teaching / learning methods outlined above and in section 18. Analysis and problem-solving skills (S1, S2) are developed through coursework in the form of problem sheets, supported by tutorial / example classes as well as through laboratory classes and small group / design projects. Further design and problem-solving skills (S3, S4, S5) are developed mainly through design classes, individual and group project work and coursework assignments. Experimental and research skills (S2, S6, S7, S8) are developed through coursework activities, practical laboratory analysis and the Y3 group design project, as well as through the individual research project.
S2	Analyse and interpret experimental and other numerical data.	
S3	Design a system, component, process or structure to meet a need.	
S4	Be creative and innovative in solving unfamiliar problems and developing designs.	
S5	Take an integrated / holistic approach to solving problems and developing designs, applying professional judgement to take into account risks, costs, benefits, safety, reliability, social and environmental impact.	
S6	Integrate and evaluate information and data from a variety of sources, exercising independent thought and judgement, taking a critical approach to new information.	

S7	Undertake health and safety risk assessments and devise safe systems of working.	**Assessment (see section 18)** Intellectual skills associated with analysis, problem solving, and design are assessed through a combination of written examinations (S1), coursework assignments (S1-S7), lab reports (S2, S7), group and individual project reports and presentations / interviews (S3-S6, S8).
S8	Plan and perform and report a programme of original research to investigate a technical problem.	
Practical skills:		
S9	Plan and conduct safely practical experiments to investigate engineering behaviour and material properties.	**Teaching / learning methods & strategies (see section 18)** Practical skills are developed over the course of the programme as outlined above and in section 18. Practical experimental skills, surveying, drawing and writing computer programmes (S10-S13) are introduced in Y1 through lectures and undertaking practical laboratory, surveying and computer classes, sketching and drawing / design classes. These are developed through coursework submissions and through group project work. These skills are further developed in later years, particularly in laboratory practicals and group project work. Use of computer software, scientific literature and skills in technical communication (S14-16) are introduced through lectures and project work and developed through application in group projects and coursework assignments. **Assessment (see section 18)** Practical skills are assessed through coursework assignments (S9-S16), lab reports (S9, S10), class tests (S14), group and individual project reports and presentations / interviews (S11-S16).
S10	Use laboratory equipment to generate data.	
S11	Undertake basic surveying activities.	
S12	Prepare technical sketches and drawings, using hand or computer methods as appropriate.	
S13	Write computer programs to perform analysis of engineering problems.	
S14	Use commercial computer software for analysis and design.	
S15	Use published scientific / engineering literature effectively.	
S16	Prepare technical reports and give technical presentations.	
General Transferable Skills:		
S17	Use information technology for communication and presentation.	**Teaching / learning methods & strategies (see section 18)** General transferable skills are developed over the course of the programme as outlined above and in section 18. Communication and presentation skills (S17, S18) are developed through practice in group project work and feedback on reports, coursework assignments and in individual project work. Teamworking and planning and management skills (S19, S20) are developed throughout the programme, particularly through group design projects and the Y3 integrated design project. In particular, the interdisciplinary teamworking and project management is introduced in theY1 and Y2 faculty interdisciplinary project weeks. Students are encouraged to reflect on their learning and progress (S22) in individual progress reviews with their academic tutor. Reflection on learning and personal and
S18	Communicate effectively (in writing, orally and through drawings).	
S19	Collaborate with others in interdisciplinary teams.	
S20	Plan and manage their time and resources efficiently.	
S21	Find information and learn independently in familiar and unfamiliar situations, through critical enquiry.	
S22	Review their experience and level of competence and plan further personal / professional development in a wide context throughout their career.	

S23	Work effectively in an industrial environment.	professional development forms part of the Y1 Skills module and Y3 integrated design project. **Assessment (see section 18)** S17 and S18 are assessed through group and individual coursework submissions and project work. S19 is assessed within group design projects, in particular, the Y3 group design project. S20 and S21 are assessed through the final year individual project, and other group design projects and individual coursework. S22 is mainly assessed through the Y3 integrated design project, and the final year individual project. S23 is assessed through the year in industry report and presentation, and from discussions with the industrial mentor.

18. Teaching, learning and assessment

Development of the learning outcomes is promoted through the following teaching and learning methods:

- **Lectures –** used to transmit information, explain theories and concepts, and illustrate methods of analysis or design. For most lecture programmes tutorial sheets are provided to enable students to develop their understanding during private study.
- **Practical classes -** students undertake laboratory experiments, surveying and computing to gain practical skills.
- **Coursework assignments -** generally require students to seek additional information and work on their own, or sometimes in small groups, to develop understanding of subject matter.
- **Tutorials and example classes -** run for small groups or a whole class to help students with their understanding and to resolve problems as they work through tutorial sheets.
- **Design classes -** students work to solve design problems related to real engineering situations in order to learn design methods and to practise associated analytical techniques.
- **Individual investigative project –** a major study carried out in the final semester of the final year and involving a significant research component. It is supervised by a member of the academic staff but allows the student ample scope to display initiative, originality and creativity.
- **Group projects -** teams, typically of 4 - 6 students, collaborate to tackle realistic design and field-based engineering projects by working through various design stages from concept and elaboration of design briefs to elements of detailed design. These projects, which increase in complexity over the duration of the course, develop a wide range of skills, including team-working and communication skills as well as further developing technical skills.

Formative feedback is provided in all modules, sometimes through the teaching and learning methods outlined above (e.g. advice in tutorial, example and design classes) and sometimes in the form of written comments or verbal discussion relating to coursework assignments. The feedback is usually given by academic staff and teaching assistants, but also through organised peer- and self-assessment, which are very effective learning methods.

Opportunities to demonstrate achievement of the learning outcomes are provided through the following assessment methods:

- **Written examinations –** typically of 2 or 3 hours duration.
- **Coursework submissions -** these include design studies, computational assignments, laboratory reports and essays.
- **Class tests -** tests conducted in a lecture theatre or workroom during the main teaching periods to assess progress, as an alternative to more formal assessment methods.
- **Oral presentations and interviews –** most group design projects involve an oral presentation of the proposed design in which each group member plays a part. The audience may include industrial visitors

and fellow students. An individual interview with two academic staff is held as part of the assessment of the Individual Investigative Project.

- **Individual project reports –** these include intermediate and final written reports for the Individual Investigative Project and other written reports describing individual work and experience gained in group design projects.
- **Group design project reports –** written reports assembled by teams of students with shared authorship.

The teaching, learning and assessment methods adopted for each learning outcome are shown in the following table. In most cases a combination of methods is used.

LEARNING OUTCOME (abbreviated - see Section 17 for full text)	TEACHING / LEARNING								ASSESSMENT					
	Lectures	Practical classes	Coursework assignments	Tutorials /examples classes	Design classes	Individual investigative project	Group design projects	Individual industrial placement	Written examinations	Coursework submissions	Class tests	Oral presentations / interviews	Individual project reports	Group design project reports
K1 Fundamental principles	•	•	•	•		•			•	•		•	•	
K2 Mathematics	•		•	•					•		•			
K3 Analytical / design methods	•		•	•	•		•		•	•	•	•		•
K4 Information technology	•	•	•		•		•			•	•			•
K5 Industry / business operation	•		•				•	•		•		•		•
K6 Professional & ethical responsibility	•		•				•	•	•	•	•	•		•
K7 Application of degree in the workplace								•				•	•	
S1 Analyse problems	•		•	•	•		•	•	•	•				•
S2 Analyse / interpret data	•	•	•	•	•	•	•			•			•	•
S3 Design to meet a need	•				•		•	•						•
S4 Be creative / innovative					•	•	•	•					•	•
S5 Produce integrated designs					•		•	•				•		•
S6 Exercise independent judgement			•		•	•	•	•		•		•	•	•
S7 Carry out risk assessment	•	•	•			•	•	•		•				•
S8 Plan & perform technical investigation		•				•				•		•	•	
S9 Plan and conduct experiments		•	•							•				
S10 Generate data		•								•				

LEARNING OUTCOME (abbreviated - see Section 17 for full text)		TEACHING / LEARNING							ASSESSMENT					
	Lectures	Practical classes	Coursework assignments	Tutorials /examples classes	Design classes	Individual investigative project	Group design projects	Individual industrial placement	Written examinations	Coursework submissions	Class tests	Oral presentations / interviews	Individual project reports	Group design project reports
S11 Undertake surveying	•	•						•		•				•
S12 Prepare sketches / drawings		•	•		•		•	•		•				•
S13 Write computer programs	•	•	•							•	•			
S14 Use commercial software			•				•	•		•				•
S15 Use published literature	•		•			•	•			•			•	
S16 Communicate technical info			•			•	•	•		•		•	•	•
S17Use information technology			•			•	•	•		•		•	•	•
S18 Communicate effectively			•			•	•	•	•	•		•	•	•
S19 Collaborate in teams							•	•						•
S20 Manage time efficiently			•			•	•	•					•	•
S21 Learn independently			•			•	•	•		•			•	•
S22 Manage professional development			•				•	•		•			•	•
S23 Work effectively in an industrial environment								•				•	•	

Proportions of types of assessment by level can be found on the UniStats website: http://unistats.direct.gov.uk/

Detailed information about the structure of programmes, regulations concerning assessment and progression, and descriptions of individual modules are published in the University Calendar available on-line at http://www.sheffield.ac.uk/calendar/regs.

19. Reference points

The learning outcomes have been developed to reflect the following points of reference:

Subject Benchmark Statements
https://www.qaa.ac.uk/quality-code/subject-benchmark-statements

Framework for Higher Education Qualifications (2024)
https://www.qaa.ac.uk/the-quality-code/qualifications-frameworks#

Guidelines for Accredited MEng Degree Programmes leading to Chartered Engineer, Joint Board of Moderators of the Institution of Civil Engineers (ICE), Institution of Structural Engineers (IStructE), Chartered Institution of Highways & Transportation (CIHT), Institute of Highway Engineers (IHE) and Permanent Way Institution (PWI), 2023 https://www.jbm.org.uk/accreditation-guidance/

The Accreditation of Higher Education Programmes, UK SPEC, 2020 (Fourth Edition) Engineering Council
https://www.engc.org.uk/standards-guidance/standards/uk-spec/

University Vision and Strategic Plan
https://www.sheffield.ac.uk/vision

Education Strategy (2020-27)
https://www.sheffield.ac.uk/vision/our-pillars/education

The University of Sheffield Placement Learning Guidelines
https://students.sheffield.ac.uk/careers/find/placement-or-internship

In assessing the learning outcomes, the level of performance, e.g. the extent of knowledge and depth of understanding, will comply with guidance given in the above references.

20. Programme structure and regulations

The programme structure is modular and in each year students study modules worth a total of 120 credits.

In the first and second year, all modules are compulsory. The programmes comprise mainly 20-credit modules and the curriculum has major components of mathematics and applied science including structural analysis, structural design, geotechnical engineering, materials, water engineering as well as introducing key skills such as drawing and sketching, programming and surveying. Tutor groups are also paired with an industrial mentor, and students visit their mentor's office and / or site to gain an introduction to work in industry.

In Year 1, students also participate in a compulsory week-long "Global Engineering Challenge". Based on the Engineers without Borders Challenge (a national challenge for engineering undergraduates), students from across the Faculty of Engineering work together in multi-disciplinary teams to tackle a real-world problem with a global perspective. In Year 2, students take part in the compulsory week-long project "Engineering: You're Hired". Again, working with students from other engineering disciplines, this project requires them to apply their technical skills and engineering judgement to develop proposals for a technical industrially relevant problem. The projects enable students to develop a range of professional and technical competences, including awareness of the global context of their decisions, communication skills, cultural agility and enterprising problem solving.

In Year 3, students work in an engineering company for a minimum of 38 weeks. Throughout the placement year, students maintain an online skills-based journal. At the end of the placement, they use the journal to write a short reflection and give a presentation on the skills they have developed. The placement is assessed on a pass/fail basis and does not contribute to the degree classification: a pass in this placement year is required for the degree title to reflect the industry experience.

In the final year, the curriculum is broader and involves consolidation of previous learning and application to real, complex situations. A key feature of the final year programme the final semester (60-credits) of project work, involving both group design work, based on a real site in Sheffield, (which develops through the design process from initial brief and concepts to scheme design) and an individual investigative project. This project work, which involves self-directed individual and teamwork in a multi-discipline environment, requires innovative conceptual thinking skills. The final part of the project involves considering the risks, requirements and adaptations for undertaking a similar project in a specific international context.

During Years 1 and 2, students may transfer their registration to study for a three-year BEng in Civil Engineering. Students performing at a sufficiently high level may be allowed to transfer their registration to study for an MEng in Civil Engineering or MEng in Civil Engineering with an Industrial Placement Year.

At the end of the second year, students not meeting specified progression targets for the BEng with an Industrial Placement Year will be required to transfer their registration to BEng Civil Engineering. In Year 3, a student who fails the placement may be permitted to transfer to the final year of the BEng Civil Engineering. In the final year, normally no changes of registration are allowed.
Detailed information about the structure of programmes, regulations concerning assessment and progression, and descriptions of individual modules are published in the University Calendar available on-line at http://www.sheffield.ac.uk/calendar/regs.

21. Student development over the course of study

Level 1 (1st Year)	Students are introduced to the principal civil engineering subjects and fundamental engineering principles and will be able to apply standard methods to analyse relatively simple problems in these areas. They undertake practical experiments and programming and will be able to present, interpret and evaluate data reliably. They also participate in design exercises requiring conceptual thinking, logical argument and judgement, and allowing the development of communication skills and teamwork.
Level 2 (2nd Year)	Students gain more extensive knowledge and deeper understanding of the principal civil engineering subjects and principles. They will be able to select and apply established methods of analysis to solve more difficult problems. They undertake more detailed design work in which some elements of professional practice are introduced. Students' practical and transferable skills will be further developed.
Year in Industry	Students spend a year in industry, working with an employer on graduate-level projects (or series of projects), applying and developing their knowledge and skills in the context of the employer's area of work and within relevant time and funding constraints. In addition to an industry mentor, a university tutor will be in contact during the year, and where possible, will visit the student in their place of employment. The student will keep a skills-based journal of their professional development and will produce reports and a presentation covering their industry experience.
Level 3 (4th Year)	Students are further developing their knowledge of methods of analysis for a range of civil and structural engineering problems and apply these methods in project work. They also enhance their knowledge and understanding of technical, design, and professional issues and construction and project management. Over the course of the second semester, students have the opportunity to experience the design process by working on proposals for the redevelopment of a real brownfield site in Sheffield. The exciting and challenging project involves integrating a wide range of technical engineering design and management issues into development of a scheme from initial site and stakeholder analysis through option identification and evaluation to production of design calculations and scheme design drawings. As well as developing skills in team-working, the project also involves a significant piece of individual research and design. This will enhance students' innovative conceptual thinking skills in a multi-discipline environment, require application and integration of technical, professional and management knowledge, develop skills in creativity, independent research, critical evaluation and judgement. On successful completion of the programme, students will be well prepared for a career in civil engineering and a range of other careers. They will have obtained the necessary academic qualification and educational base required to become an Incorporated Engineer and partially satisfied the educational base requirements (requiring appropriate further learning to Master's level) for a Chartered Engineer. They will also be able to assess whether or not they have the ability, motivation and interest to pursue post-graduate education in civil engineering.

22. Criteria for admission to the programme

Detailed information regarding admission to programmes is available from the Department's website at http://www.shef.ac.uk/civil/ug.

23. Additional information

Every student has an academic tutor who is a member of the academic staff. The academic tutor is available to provide help and advice on all aspects of university life, including career decisions. In addition, Year 1 students see their tutor at a series of structured meetings to discuss personal skills and professional issues.

One of the aims of the programmes is to assist students in developing a commitment to self-improvement and continuing professional development. Throughout the programmes, students are encouraged to think about and record their skills development, producing a portfolio to demonstrate achievement of some of the competences required by the Institution of Civil Engineers for graduates aiming to become Chartered Engineers. This is particularly required for the year in industry.

Students are expected to find their own placement (either in the UK or abroad), although we are able to assist through the many contacts University staff have with industry. We regularly update students with details of companies with suitable placements. The University has a Student Placement Officer and Careers Officers, who brief students in Years 2 on CV writing, strategies for securing a placement and the practicalities of placement work. It is expected that students receive a salary for their work. The Year in Industry Tutor and the administrative staff maintain regular contact with the student and the placement provider throughout the year to check that the placement is going well. For all UK-based placements, a member of academic staff also visits the company.

Further information about both the programme and the Department of Civil and Structural Engineering can be found on the internet at http://www.sheffield.ac.uk/civil

This specification represents a concise statement about the main features of the programmes and should be considered alongside other sources of information provided by the teaching department(s) and the University. In addition to programme specific information, further information about studying at The University of Sheffield can be accessed via our Student Services web site at http://www.shef.ac.uk/ssid.