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**	Structural Engineering and Architecture
2	**Programme Code**	CIVU12
3	**JACS Code**	H210
4	**Level of Study**	Undergraduate
5a	**Final Qualification**	Master of Engineering (MEng)
5b	**QAA FHEQ Level**	Master's = Level 7
6	**Intermediate Qualification**	BEng in Structural Engineering with Architectural Studies or MEng in Structural Engineering with Architectural Studies (see separate programme specification) (refer to section 20)
6b	**QAA FHEQ Level**	MEng = Level 7
7	**Teaching Institution** (if not Sheffield)	Not applicable
8	**Faculty**	Engineering
9	**Department**	School of Mechanical, Aerospace and Civil Engineering
10	**Other Departments involved in teaching the programme**	Core teaching: • Architecture • Mathematics • Materials Science and Engineering
11	**Mode of Attendance**	Full-time
12	**Duration of the Programme**	4 years (MEng)
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/ ARB (Architects Registration Board) http://www.arb.org.uk RIBA (Royal Institute of British Architects) http://www.architecture.com
14	**Date of production/revision**	March 2015, February 2018, October 2024

15. Background to the programme and subject area

Structural engineers are responsible for the design, construction and maintenance of the buildings and other structures that support human living, trade and industry. In this role, they must often work closely with architects who are engaged in bringing together conceptual, contextual, ethical and material considerations in the realisation of space or form. Successful design requires the expression and exploration of ideas using both creativity and engineering analysis.

In order to qualify, professional engineers and architects must obtain appropriate academic qualifications, accredited by the relevant professional institutions, and must also obtain sufficient practical experience and training. This programme addresses a need for graduates who have the background necessary to bridge the cultural and educational divide that has traditionally existed between structural engineers and architects. The programme is the first-degree programme in the UK to have accreditation for both Civil and Structural Engineering and Architecture i.e. to fully satisfy the academic requirements for registration with the Engineering Council as a Chartered Engineer and is recognised by the Royal Institute of British Architects as giving exemption from RIBA Part 1. The qualification is also prescribed by the Architects Registration Board (ARB), subject to periodic review by ARB, for the purposes of entry onto the United Kingdom Register of Architects.

The programme includes significant industrial involvement, with a variety of industry speakers, practice lectures, industrial tutors for design projects, and site visits. The departments also have 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 Structural Engineering or Architecture.

Further information about the programme may be found on the internet at https://www.sheffield.ac.uk/mac/undergraduate/civil/courses and https://www.sheffield.ac.uk/architecture-landscape/undergraduate/courses.

16. Programme aims

The aims of the programme are to:

1. Enable students to develop a sound knowledge and understanding of engineering principles and the ability to apply these in developing structural engineering designs.
2. To provide a thorough introduction to architectural design.
3. Provide the historical and cultural background within which architecture is considered.
4. Provide a thorough introduction to building design, including issues of engineering and architectural technology, sustainability, and environmental and social factors.
5. Provide the educational base for a Chartered Structural Engineer and RIBA Part 1 exemption.
6. Introduce the global and professional context in which structural engineering and architecture projects are developed, enabling students to develop an appreciation of the professional responsibilities of structural engineers and architects to society and the environment.
7. Develop in students an independence of thought and a critical approach to new information, theories and concepts, and ability to make rational, evidence-based decisions.
8. Develop in students a range of key engineering, generic and professional skills and attitudes valued by employers, including ability to communicate clearly and effectively in a professional environment and to plan and conduct work both independently and as part of a team.
9. Inspire intellectual curiosity and develop the breadth of vision for students to become life-long learners, 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 and mathematics relevant to structural 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 studios and coursework assignments mainly in Y1 and Y2, but also extending into Y3 and Y4 of the course. K5 is developed mainly through practical classes, design classes and coursework assignments, supported by lectures where relevant. K6 is developed through lectures and project work assignments supported by seminars. This starts in Y1 but is principally developed in Y3 and Y4. K7 is developed through a combination of lectures, coursework and design work in throughout the programme.
K2	broad knowledge and understanding of the design process and roles and responsibilities of the engineering and architect within the process.	
K3	broad knowledge and understanding of analytical and design methods used in structural engineering and architecture, and the way that they are informed by analysis, key architectural theories, research, context, budget and brief.	
K4	Knowledge and understanding of factors which influence architectural design, including the historical, theoretical, cultural, and technological context, and the effect of environmental and sustainability issues.	
K5	knowledge and understanding of the use of information and computation technology for analysis, design and management.	
K6	an understanding of the operation of the building industry, including business practice and project management.	
K7	an understanding of the professional and ethical	

	responsibilities of structural engineers and architects, the global context and impacts of construction / engineering projects, and the social, environmental, ethical, economic and commercial considerations and constraints and regulatory frameworks that influence engineering decisions.	**Assessment (see section 18)** Knowledge and understanding are assessed through a combination of written examinations / class tests (K1-K3, K6, K7), assessed coursework (K1-K7), laboratory reports (K1), group and individual design studio assessments and design reports (K2-K7), oral presentations and interviews (K1, K3, K7).

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 4-year 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-S6) are developed through design classes / studio, individual and group project work and field trips / site visits. Experimental and research skills (S2, S7, S8) are developed through coursework activities, practical laboratory analysis and design studio work, as well as through the individual research project. **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), group and individual design studio assessments and project reports and presentations / interviews (S3-S8)
S2	Analyse and interpret experimental and other numerical data.	
S3	Produce coherent architectural designs that integrate historical, theoretical, practical, technical, environmental and professional factors.	
S4	Produce structural engineering designs which fully incorporate analytical aspects of structural engineering.	
S5	Engage as a designer with issues of site, scale, context, programme and users' needs of a design within the scope and scale of the wider environment.	
S6	Display creativity and innovation in producing a brief for solving unfamiliar problems and the ability to develop solutions for the identified brief.	
S7	Exercise independent thought and judgement.	
S8	Plan and perform and report a programme of original research to investigate a technical problem.	

Practical skills:

S9	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 4-year programme as outlined above and in section 18. Practical experimental skills, surveying, drawing and writing computer programmes (S9-S12) 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 / design studios. Use of computer software, scientific literature and skills in technical communication (S13-15) are introduced through lectures and project work, and developed through application in group and individual projects and coursework assignments
S10	Undertake basic surveying activities.	
S11	Ability to use and critically appraise the use of a range of visual, written and verbal techniques including technical sketches and drawings appropriately, in order to communicate ideas to a variety of interest groups.	
S12	Write computer programs to perform analysis of engineering problems.	
S13	Use commercial computer software for analysis and design.	
S14	Use published scientific / engineering	

	literature effectively.	**Assessment (see section 18)** Practical skills are assessed through coursework assignments (S9-S15), lab reports (S9), class tests (S13), group and individual project reports and presentations / interviews and design studio assessments (S10-S15)
S15	Prepare technical reports and give technical presentations.	
General Transferable Skills:		
S16	Use information technology for communication and presentation.	**Teaching / learning methods & strategies (see section 18)** General transferable skills are developed over the course of the 4-year programme as outlined above and in section 18. Communication and presentation skills (S16, S17) are developed through practice in group project work, design studios and feedback on reports, coursework assignments and in individual project work. Teamworking and planning and management skills (S18, S19) are developed throughout the programme, particularly through group design projects and design studio work. 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 (S21) in individual progress reviews with their personal tutor. Reflection on learning and personal and professional development forms part of the Y1 Skills module.
S17	Communicate effectively (in writing, orally and through visual techniques).	
S18	Collaborate with others in interdisciplinary teams and listen to, and respond appropriately to the views of others, as well as acknowledge the limits of their own skills and knowledge.	
S19	Plan and manage their time and resources efficiently.	
S20	Act resourcefully, gathering information, learning independently, thinking analytically and identifying problems together with logical and lateral ways of resolving them.	
S21	Review their experience and level of competence and plan further personal / professional development in a wide context throughout their career.	**Assessment (see section 18)** S16 and S17 are assessed through group and individual coursework submissions and project work / design studio assessments. S18 is assessed within group design projects, and design studio assessments S19 and S20 are assessed through the final year individual project, and other group design projects / studio work and individual coursework. S21 is mainly assessed through the Y1 skills module and the final year individual project.

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 individuals, small groups or a whole class to help students with their understanding and to resolve problems as they work through tutorial sheets in engineering or prepare for written assessments in architecture.
- **Design studio -** students work to solve design problems related to real engineering situations in order to learn design methods and to practise associated analytical techniques. Design studio work forms over half the architecture part of the programme. Design studio work is essentially problem-based learning that integrates the analytical, communication skills and knowledge of the students. Design studio is delivered through frequent small group and individual tutorials which are complemented with reviews where design work is discussed by student peers, postgraduate students, members of staff and invited reviewers to encourage discussion and reflection on the review as a learning process.
- **Individual investigative study -** independent study has a central role in the architectural design process, where a student's own proposals develop around issues identified in design tutorials or reviews. Additionally, a major individual study is carried out over two semesters of the final year of the programme, 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.
- **Engineering design projects -** teams, typically of 4 or 5 students, tackle an engineering problem by working through conceptual and detailed design stages.
- **Field trips and site visits –** are widely used in architecture to expand the students' experience of architectural design. Such visits support both analytical and design work. The students also attend a design based engineering field course in Year 1 of the programme.

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 –** designed to test subject knowledge and communication skills. They include design studies, computational assignments, laboratory reports and critical essays on architectural history and theory.
- **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 on group design projects.
- **Engineering design project reports –** written reports assembled by teams of students with shared authorship.

- **Design studio assessment** - Formative assessment occurs through dialogue with oneself, with other students, with and among tutors, where judgments concerning quality are reached by consensus. Summative assessment will generally occur through the submission of **coursework**, usually in the form of a **portfolio**.

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.

		TEACHING / LEARNING							ASSESSMENT						
LEARNING OUTCOME (abbreviated - see Section 17 for full text)	Lectures	Practical classes	Coursework assignments	Tutorials /examples classes	Design classes / Design Studio	Individual investigative project	Engineering design projects	Field Trips and site visits	Written examinations	Coursework submissions	Class tests	Oral presentations / interviews	Individual project reports	Engineering Design project reports	Design Studio Assessment
K1 Fundamental principles & mathematics	•	•	•	•		•			•	•	•	•	•	•	•
K2 Design Process	•				•			•		•				•	•
K3 Analytical / design methods	•		•	•	•		•		•	•	•	•		•	•
K4 Architectural Design	•		•	•	•			•	•	•					•
K5 Information technology		•	•		•		•			•				•	
K6 Industry / business operation	•		•						•	•					
K7 Professional & ethical responsibility	•		•						•	•					
S1 Analyse problems	•		•	•	•		•		•	•				•	•
S2 Analyse / interpret data	•	•	•	•	•	•	•			•			•	•	•
S3 Produce architectural designs			•	•	•			•		•					•
S4 Produce engineering designs					•		•					•		•	
S5 Make design judgements				•	•			•		•					•
S6 Display creativity / innovation					•	•	•			•		•	•	•	•
S7 Exercise independent thought			•		•	•				•		•	•		•
S8 Plan & perform technical investigation					•	•						•	•		
S9 Conduct experiments		•	•							•					
S10 Undertake surveying	•	•								•					
S11 Prepare sketches / drawings		•	•	•	•		•	•		•				•	•
S12 Write computer programs	•	•	•							•	•				
S13 Use commercial software			•		•		•			•					•
S14 Use published literature	•		•			•	•	•		•			•		

LEARNING OUTCOME (abbreviated - see Section 17 for full text)		TEACHING / LEARNING							ASSESSMENT						
	Lectures	Practical classes	Coursework assignments	Tutorials /examples classes	Design classes / Design Studio	Individual investigative project	Engineering design projects	Field Trips and site visits	Written examinations	Coursework submissions	Class tests	Oral presentations / interviews	Individual project reports	Engineering Design project reports	Design Studio Assessment
S15 Communicate technical info		•	•			•	•			•		•	•	•	•
S16 Use information technology		•	•		•	•	•			•		•	•		•
S17 Communicate effectively			•		•	•	•		•	•		•	•	•	•
S18 Collaborate in teams		•			•		•	•						•	•
S19 Manage time efficiently					•	•	•						•		•
S20 Learn independently					•	•	•	•		•			•	•	•
S21 Manage professional development			•					•		•				•	
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) and Institute of Highway Engineers (IHE), 2009
http://www.jbm.org.uk/uploads/JBM111_MEng.pdf

The Architects Registration Board (ARB) Prescription of Qualifications: ARB Criteria (2011). (This draws on the requirements of the European Commission Architecture Directive for Professional Education.)

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

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 aims to deliver a complementary mix of subjects from the two disciplines, Engineering and Architecture, focusing on the key subjects required by building designers (structural mechanics and design, geotechnics, mathematics, materials, management, drawing, critical appraisal, architectural design, architectural technology).

The programme structure is modular and in each year students study modules worth a total of 120 credits per Level. Over the four years, the teaching is split exactly 50/50 between the two disciplines, although the year-by-year balance varies. The philosophy behind the programme structure is that students should be fully immersed in both disciplines. They are taught engineering and architecture subjects alongside mainstream students in each of the separate disciplines, and, with a few exceptions for practical reasons, are assessed by the same criteria in common examinations or coursework submissions. For this reason, the introduction of modules designed to bridge between the two disciplines has been expressly resisted in the first three years of the course; the students themselves form the bridge between the engineering and architectural aspects of building design by being demonstrably competent in both. In the final year structural design is integrated with the architectural design modules, providing students with the opportunity to demonstrate their ability in both areas. In addition, the final year includes a 30-credit individual investigative project that provides the opportunity to extend knowledge and research experience into a specialist area.

At the end of the second and third years (Level 2 and 3) students not meeting specified progression targets will be required to transfer their registration to study for a BEng in Structural Engineering with Architectural Studies.

In year 4, for those students who are unable to demonstrate the required level of achievement in the modules prescribed by the Architects Registration Board (ARB), the degree of MEng in Structural Engineering with Architectural Studies can be awarded. This is equivalent in all respects to the degree of MEng in Structural Engineering and Architecture, except that it does not confer exemption from RIBA Part 1 examinations.

In addition to the credit-bearing modules, two non-credit-bearing, compulsory, cross-faculty engineering group projects are undertaken. In Year 1, students participate in a 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 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. Both project weeks 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.

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)	***Structural Engineering:*** Students will be introduced to the principal engineering subjects relevant to their programme (structural mechanics, geotechnics, materials, engineering mathematics) and will be able to apply standard methods to analyse relatively simple problems in these areas. They will undertake practical experiments and will be able to present, interpret and evaluate data reliably. They will also participate in engineering design exercises requiring conceptual thinking, logical argument and judgement, and allowing the development of communication skills and teamwork. ***Architecture:*** Students will follow lecture-based modules on the history and theory of architecture focusing on primary issues of cultural and technological significance.
Level 2 (2nd Year)	***Structural Engineering:*** Students will have more extensive knowledge and deeper understanding of structural analysis and associated mathematical tools. They will be able to select and apply established methods of analysis to solve more difficult problems. They will undertake more detailed design work and study conceptual structural design. Students’ practical and transferable skills will be further developed and through our Industrial Insight scheme, they are given the opportunity to meet and interact with industry practitioners, visit a site and/or office, and learn more about industry practice. ***Architecture:*** Students begin design studio work with investigating a wide range of skills and preconceptions about architecture. Building on the Level 1 architectural lecture courses the design

	studio creates an informed individual exploration and collective discussion as to what architecture may be and what skills are needed to develop as an architectural designer and in so doing offers a range of potential starting points for the design process.
Level 3 (3rd Year)	***Structural Engineering:*** Students will develop their knowledge of management and professional issues in the construction industry and develop a broad understanding of the professional role of structural engineers and architects and work on more realistic structural engineering design projects. ***Architecture:*** Longer and more detailed architectural design studio projects will build on skills from design studio Level 2 and develop the student's abilities to understand and generate architecture. Level 3 studio design work will increase the range and scope of analysis undertaken in order to enable students to design a wider range of building types and external spaces with more complex cultural, planning and technical requirements. Within the studio project work there is scope for the students to choose between different projects, thus allowing them some scope to develop their particular skills. Studio project work is supported and complemented by the series of history and theory and Environmental and Technology lecture courses which refine the students' ability to critically appraise both theoretical argument and design precedent.
Level 4 (4th Year)	***Structural Engineering:*** Students will undertake a major individual investigative project, demonstrating an ability to carry out independent research and critically evaluate the results. They will carry out and critically reflect on a synthesis of their architectural and structural engineering design skills built up throughout the course and they will also study advanced structural engineering. ***Architecture:*** Level 4 design studio generally seeks to develop greater complexity in its consideration of design philosophy, building design and technology, developing from the objectives of Levels 2 and 3. Students will be expected to be able to synthesise the knowledge gained during the degree programme and demonstrate this through integration in design projects. Students are encouraged to develop their own philosophies and approaches and take the initiative for pursuing their projects in greater depth. Modules on technology support the integration of students' knowledge and understanding into their design and develop a broad understanding of the professional role of an architect within the construction industry. On graduation, students will be well prepared for a career in structural engineering or architectural practice and a range of other careers. They will also be able to assess if they have the ability, motivation and interest to pursue post-graduate education in either discipline.

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 Structural Engineers for graduates aiming to become Chartered Engineers.

Dual students can (and are encouraged to) go on ARC field trips in years 2 to 4. Accommodation and travel for the trips in years 2 & 4 are paid for by the university however students need to cover the costs of the (optional) year 3 trip. Further information about both the programme and the School of Mechanical, Aerospace and Civil Engineering can be found on the internet atwww.sheffield.ac.uk/mac. Further information about the School of Architecture is available at https://www.sheffield.ac.uk/architecture-landscape

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.