Subject Benchmark Statement

Engineering

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SOS!UK

Contents

About this Statement

This document is a Quality Assurance Agency for Higher Education (QAA) Subject Benchmark Statement for Engineering that defines what can be expected of a graduate in the subject, in terms of what they might know, do and understand at the end of their studies. Subject Benchmark Statements are an established part of the quality assurance arrangements in UK higher education, but not a regulatory requirement. They are sector-owned reference points, developed and written by academics on behalf of their subject. Subject Benchmark Statements also describe the nature and characteristics of awards in a particular subject or area. Subject Benchmark Statements are published in QAA's capacity as an expert quality body on behalf of the higher education sector. A summary of the Statement is also available on the QAA website. There is a separate Subject Benchmark Statement for Computing.

Key changes from the previous Subject Benchmark Statement include:

- a revised structure for the Statement which includes the introduction of cross-cutting themes of:
    - equality, diversity and inclusion
    - accessibility and the needs of disabled students
    - education for sustainable development
    - employability, entrepreneurship and enterprise education
- a comprehensive review updating the context and purposes of Engineering, including course design and content in order to inform and underpin the revised benchmark standards.

How can I use this document?

Subject Benchmark Statements are not intended to prescribe any particular approaches to teaching, learning or assessment. Rather, they provide a framework, agreed by the subject community, that forms the basis on which those responsible for curriculum design, approval and update can reflect upon a course, and its component modules. This allows for flexibility and innovation in course design while providing a broadly accepted external reference point for that discipline.

They may also be used as a reference point by external examiners in considering whether the design of a course and the threshold standards of achievement are comparable with other higher education providers. They also support professional, statutory and regulatory bodies (PSRBs) with the academic standards expected of students.

You may want to read this document if you are:

- involved in the design, delivery and review of courses in Engineering
- a prospective student thinking about undertaking a course in Engineering
- an employer, to find out about the knowledge and skills generally expected of Engineering graduates

Relationship to legislation

The responsibility for academic standards lies with the higher education provider which awards the degree. Higher education providers are responsible for meeting the requirements of legislation and any other regulatory requirements placed upon them by their relevant funding and regulatory bodies. This Statement does not interpret legislation, nor does it incorporate statutory or regulatory requirements.

The regulatory status of the Statement will differ with regard to the educational jurisdictions of the UK. In England, Subject Benchmark Statements are not sector-recognised standards as set out under the Office for Students' regulatory framework. However, they are specified as a key reference point, as appropriate, for academic standards in Wales under Quality Assessment Framework for Wales and in Scotland as part of the Quality Enhancement Framework. Subject Benchmark Statements are part of the current quality requirements in Northern Ireland. Because the Statement describes outcomes and attributes expected at the threshold standard of achievement in a UK-wide context, many higher education providers will use them as an enhancement tool for course design and approval, and for subsequent monitoring and review, in addition to helping demonstrate the security of academic standards.

Additional sector reference points

Higher education providers are likely to consider other reference points in addition to this Statement in designing, delivering and reviewing courses. These may include requirements set out by PSRBs and industry or employer expectations. The QAA has also published Advice and Guidance to support the Quality Code which will be helpful when using this Statement, for example, in course design, learning and teaching, external expertise and monitoring and evaluation.

Explanations of unfamiliar terms used in this Subject Benchmark Statement can be found in the QAA's Glossary. Sources of information about other requirements and examples of guidance and good practice are signposted within the Statement where appropriate.

1 Context and purpose of an Engineering degree

What is Engineering?

1.1 Engineers seek to create, develop and apply technology, processes and systems which enhance the lives of people and protect them from harm. The word 'engine' stems from a triad of ingenuity, artfulness and creativity and the engineers of today require each of these skills alongside scientific and mathematical principles to work as part of a complex techno-socio system of innovation. A core aspect of the engineering mind is the ability and desire to put things together, to approach problems through systems thinking, and to design things that work and to design things that work better.

1.2 Engineering innovation is central to delivering equitable and sustainable solutions to the most pressing global challenges. This requires systems thinking to navigate interconnected environmental, social, and economic trade-offs. Sustainable solutions are not merely about the environment, but also addressing social and economic concerns at all levels in order to create a more robust and resilient world. Particular emphasis has been placed within this Statement on the ways in which engineers can meet the challenges defined in the United Nations Sustainable Development Goals together with the global challenges of cybersecurity, infrastructure, manufacturing, mobility and energy. Engineers of the future must be adaptable to new and emerging challenges as these arise, applying transformative approaches and systems thinking to address increasingly complex and interconnected problems. As a consequence, the engineering curriculum continues to evolve.

1.3 Engineering is a very broad subject covering many diverse disciplines. Within each discipline there are numerous specialisations. This Statement refers to courses of study in Engineering delivered by universities and other higher education providers. The courses include:

- a bachelor's degree with honours (often denoted as BEng (Hons)) in an engineering discipline
- an integrated master's degree (often denoted as MEng) in an engineering discipline
- a postgraduate taught master's degree (often denoted as MSc) in an engineering discipline or specialisation.

1.4 Many other courses of study in engineering exist. Apprenticeships tend to have a more applied focus and are often linked with work experience: more information about apprenticeships in general can be found in the Characteristics Statement: Higher Education in Apprenticeships, and for detail about engineering apprenticeships in particular, see Engineering Council. Foundation degrees are usually designed and delivered by a higher education provider in collaboration with industry or business partners. This type of degree combines academic learning with work-based skills. A foundation degree is a higher education qualification at Level 5 on the FHEQ. Students with a foundation degree may progress to higher apprenticeships or the final year of a bachelor's degree, often known as a top-up degree. More information about foundation degrees can be found on the QAA website.

1.5 A bachelor's degree with honours is a first cycle qualification in the overarching Qualifications Frameworks in the European Higher Education Area. It usually includes study equivalent to at least three full-time academic years (four in Scotland), of which study is equivalent to at least 90 credits at FHEQ Level 6 or SCQF Level 10. A bachelor's degree that does not have honours also exists but is not as common as a bachelor's degree with honours. A bachelor's degree that does not have honours includes an ordinary degree or a pass degree; these degrees consist of a smaller volume of credit and so meet the qualification descriptor in part at Level 6 or SCQF Level 10 but not in full. In everyday usage, the 'honours' or 'ordinary' part of the degree title is often omitted and both are simply referred to as bachelor's or BEng. This can lead to confusion, and providers should resolve such confusion through stipulating what is meant by various titles in their course information to prospective students and employers.

1.6 The integrated master's (MEng) course of study is designed as an integrated whole from entry to completion, although some of the earlier parts may be delivered in common with a parallel bachelor's degree with honours. It is a first and second cycle qualification. MEng degrees meet the expectations of the qualifications descriptor for master's degrees in The Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies, with the additional period of study at the lower level meeting the expectations of the bachelor's degree with honours descriptors. This generally includes study equivalent to at least four full-time academic years (five in Scotland), of which the equivalent of at least one full-time academic year (120 credits) is at FHEQ Level 7 or SCQF Level 11. Progression to MEng courses is subject to performance criteria that indicate likely progression to the more demanding outcomes expected for the award of a master's degree. Transfer between courses leading to bachelor's degrees with honours and MEng courses is usually possible within a higher education provider subject to students meeting certain academic requirements. MEng degrees are compatible with the completion of the second cycle within the Framework for Qualifications of the European Higher Education Area (QF-EHEA).

1.7 Although students typically graduate with a specialism in a single area, there are an increasing number of general and multidisciplinary BEng and MEng degree courses. These may combine different disciplines of engineering or have a component with a non-engineering subject.

1.8 Master's degrees in Engineering other than integrated master's (typically MSc degrees) vary significantly in nature and purpose. Master's degrees are second cycle qualifications within the QF-EHEA. With reference to the QAA characteristics statement on master's degrees, this includes:

- research master's degrees (often denoted as MRes), aiming to prepare students for the next stage in a research career
- specialised master's, providing students with opportunities to study in greater depth particular aspects or applications of a broader discipline
- professional and practice-based master's, including those that may attract entrants from a diverse range of undergraduate qualifications.

Characteristics of an Engineering degree

1.9 Degrees cover mathematical and scientific fundamentals together with the application of these fundamentals through design and/or realisation of products and systems. During an Engineering degree, students typically acquire knowledge, understanding and skills across five areas:

- science, mathematics and engineering principles
- engineering analysis, including use of computational tools and techniques
- design, creativity and innovation, including applying an integrated or systems approach to address complex, multidisciplinary challenges
- engineering and society, incorporating sustainability, ethics, risk, security and equity, diversity and inclusion
- engineering practice, including teamwork, project management, accessible design practices and use of practical equipment.

1.10 As students progress through an Engineering degree, depending on the nature of their course, they will either develop skills to solve broadly defined, single-domain problems, or develop skills to solve progressively more complex, integrated, socioeconomical and technological systems. Typically, broadly defined problems involve making appropriate assumptions and balancing needs of different requirements to achieve a goal. Such problems can be solved by the application of engineering science and learned analysis techniques. Complex problems, on the other hand, have no obvious, known or optimum solutions and may involve wide-ranging or conflicting technical, sustainability, or ethical issues and/or user needs that must be addressed through creativity and innovative application of engineering science and skills. Learners will need to be exposed to problems at an early stage in their course of study so that they have sufficient opportunities to develop their knowledge, confidence and skills.

1.11 Where appropriate, structured design tools and methods may need to be applied to understand, investigate, analyse and solve problems posed within an Engineering course. Engineering learning is therefore supported by practical activities. The amount and type of practical work varies by higher education provider and discipline. Typical practical activities normally include characteristics such as creativity, experimentation, imagination, curiosity and collaboration. These may or may not include elements of physical activity.

1.12 Graduate engineers possess skills which are attractive to a wide range of employers and, as a result, they are highly sought after.

Equality, diversity and inclusion

1.13 Better engineering solutions emerge when the diversity of engineers is representative of the societies in which they operate and a key challenge exists to diversify engineering to meet the rapidly growing demand for skills. This requires developing inclusive approaches that recognise the value of diverse perspectives and knowledge systems, both traditional and contemporary. In particular, the ability to design equitable solutions which meet the needs of people across the globe is a priority. This requires understanding and inclusion of the people within the societies that are served, or indeed underserved, by engineering.

1.14 Engineering teams can both practice and foster the importance of including diverse and underserved groups in engineering decision making in their students by:

- explicitly including work by (and the difficulties facing) engineers from marginalised backgrounds, especially when this has been plagiarised or

co-opted by White/Western/male/heterosexual engineers or those from an otherwise favoured background
- ensuring equitable care is taken to support the hiring and retention of staff from underrepresented backgrounds and characteristics including people of colour, women, and disabled people
- providing implicit bias training to staff and students
- creating space for staff and students to voice their concerns around and experiences of harmful stereotypes.

1.15 Additionally, entry to Engineering courses should be equitable and not influenced by any perceptions of staff or students or barriers to learning. Entry criteria can and should account for non-standard qualifications and non-academic or career based experience to allow students from more diverse educational backgrounds who still hold the prerequisite knowledge and skills to join the course.

1.16 The promotion of equality, diversity and inclusion (EDI) is a core expectation for professional engineers and a key learning outcome for accredited Engineering courses. The promotion and use of ethical principles, codes and national frameworks will support inclusive practices, leading to improved engineering outcomes and an inclusive society. Inclusive practice is embedded throughout this Statement, with particular reference to course design in paragraphs 2.4 and approaches to inclusive learning and assessment in paragraphs 3.7 and 3.15.

1.17 Equality, diversity and inclusion principles and practices are essential ingredients in engineering practice and should be embedded in all activities, from the composition of the team, the engineering process, to the solutions created for society. These principles ensure engineering solutions work effectively for diverse populations, including those traditionally underserved by technology. It is particularly valuable to consider how different cultural traditions and values can shape engineering design approaches. Especially for courses that include projects focused on design of solutions for developing or international contexts, it is vital that students thoroughly understand the technical and non-technical environment in which the solution will operate and ensure that cultural and user perspectives are included. Therefore, the development of Engineering curricula should foster global perspectives and facilitate the recognition of historic western assumptions.

1.18 The curriculum should cultivate global cultural competencies by addressing how colonial histories shape technology transfer patterns, such as infrastructure legacies in post-colonial contexts, and teach participatory design techniques that centre Global South communities. This includes critiquing neocolonial biases in emerging technologies (e.g., AI training datasets) and reciprocal innovation models that value Indigenous knowledge systems alongside engineered solutions.

Accessibility

1.19 Accessibility supports the promotion and implementation of EDI. Engineering solutions can transform lives and directly facilitate accessibility and remove barriers in society. Therefore, accessibility should be considered in terms of both access to Engineering education and within curricula. As noted in paragraph 3.14, this entails the use of flexible approaches to learning teaching and assessment.

1.20 Accessibility should be treated as a standard part of Engineering curricula, particularly in design, ensuring solutions remove barriers to access and facilitate inclusion. In addition, curricula should be designed with accessibility in mind, meeting statutory requirements as a minimum. For example, providers may:

- ensure their courses are well curated in that they promote good mental health and well-being and reduce the additional administrative burden and cognitive load on disabled students
- appropriately space assessments
- provide particular support when concepts and skills are initially introduced
- anticipate and potentially remove irrelevant or context-dependent barriers from assessments that are irrelevant to knowledge, skills or abilities measured by the assessment
- engage with students and the relevant student (or external) support services to discuss and implement reasonable adjustments where necessary
- ensure practical activities are safe for and accessible to all students, providing access to specialised equipment (see 1.21) or adapting the activity, while retaining the opportunity for the student to practise and perform key skills, where necessary.

1.21 Furthermore, creating educational environments with accessibility as a primary concern can enable disabled students to study Engineering when without such consideration, they would be unable to do so. Accessibility considerations should remove barriers to engagement and should extend beyond practical initiatives (such as access to laboratory and workshop environments) to all areas of the curriculum, including group work and placements. Accessibility considerations should also address hidden disabilities, financial barriers, and other non-disability related accessibility issues to ensure individuals or groups are not disadvantaged. For example, course teams should:

- include a mix of synchronous and asynchronous delivery including in-person, online, hybrid and live recordings of in-person delivery
- ensure visibility of display equipment and audibility of session leaders and presentation materials are sufficient so as those with visual and auditory conditions can fully access the sessions (with disability aids where appropriate)
- utilise associated technology to capture recordings including accurate captioning, clear visuals of presentations and extended written material
- ensure physical learning spaces have the space and provisions (e.g. ramps, handrails, specialised seating spaces) required for individuals (students, teachers, support staff or visitors) with or without mobility aids
- assist students in accessing specialised technology to better take part in activities and access resources for Engineering (e.g. through financial assistance, loaning schemes, technical support or training), extending this to adaptive versions of hardware and software where necessary
- provide learning materials in advance of teaching sessions to allow students to familiarise themselves with them and avoid cognitive overload or distraction during teaching
- design assessments which anticipate as many access-related student needs as possible, and adapt or provide alternative assessments which allow students whose needs are not covered by the original design to demonstrate that they meet the expected learning outcomes.

Sustainability

1.22 Sustainability and sustainable development are key considerations in the Engineering sector as they are vital not only to the long-term health and stability of the planet and all individuals living on it but also to prolonging the life of all materials used by engineers, allowing engineers to continue solving problems and allowing more individuals from diverse backgrounds with an interest in engineering to enter the field. It is important to note that sustainable development does not focus solely on the environment, but is an ongoing process of addressing social, environmental and economic concerns to create a better world. However, currently sustainable solutions in engineering are typically more costly (due to labour, materials, time etc.) in the short-term than standard practice and therefore less favoured by profit-driven engineering firms and their customers. Engineers should consider this when determining which firms they want to work with based on how their values align.

1.23 Engineering courses should inspire students in their journey to become more sustainable engineers by equipping them with the knowledge and skills to evaluate the environmental and societal impact of solutions and preparing them for careers where sustainability is not yet always the norm. This includes developing transformative approaches that challenge existing paradigms and embrace future-oriented perspectives in addressing sustainability challenges and advocating for the more regular use of such approaches whether at the level of one's individual team or firm's actions, or regional/national policy recommendations. Reference to the United Nations Sustainable Development Goals to inform curriculum design, pedagogy and assessment is encouraged. This includes the importance of digital accessibility and the promotion of resilience, adaptability and problem-solving. Engineering and sustainable development are closely linked, and the role of engineers is critical in building a sustainable future.

1.24 Education for Sustainable Development (ESD) supports the development of subject-specific knowledge and skills to promote sustainable development for the challenges of today and the future. ESD is an integral part of enhancing the quality of higher education and it stimulates Engineering students to make informed decisions and responsible actions towards more sustainable solutions for greener societies. The Education for Sustainable Development Guidance outlines pedagogic approaches for implementation in UK higher education institutions.

1.25 ESD should be incorporated into curriculum content and course delivery and practise. Examples of ESD in curriculum content are outlined in 3.3. Examples of ESD in course delivery and practise can include:

- working to switch to renewable energy sources and reducing energy consumption where possible
- reducing physical resource use, switching to digital resources and activities where possible and more sustainable, without removing key engagement and practical learning opportunities
- discussing efforts to replace chemicals, and other materials which can damage the environment or human health, with sustainable alternatives and highlighting examples of where this is already possible

- considering the sustainability of course delivery partners and transport to off-campus locations, improving the sustainability of these where possible
- encouraging and facilitating sustainable working and living practices amongst staff and students
- supporting engineering students from backgrounds and with identities which are under-represented (e.g. women, disabled students, non-white students, immigrant and refugee students) in the Engineering sector to succeed and access career opportunities on par with their better represented colleagues
- demonstrating to students the benefits of a more diverse and equitable workforce at all levels of the engineering sector for example, in terms of efficiency (better balance of skills and knowledge within teams) and client/customer understanding (wider variety of life experiences within teams)
- including discussions of ethics, environmental sustainability, social sustainability and inequality in project work and their assessment framework
- encouraging students to suggest sustainability improvements to course design and delivery and Engineering practices overall.

Ethics

1.26 Engineers should carry out their work in accordance with the ethical principles of the profession. A revised statement on these principles was jointly produced in 2017 by the Engineering Council and Royal Academy of Engineering and covers the principles of honesty and integrity, respect for life, law, the environment and public good, accuracy and rigour, and leadership and communication. Engineers should develop a comprehension of the ethical issues inherent in engineering through their course of study together with the ability to make judgements and justify ethical choices. To support the teaching of ethics within Engineering curricula, an Engineering Ethics Toolkit has been produced by the Engineering Professors Council and can be consulted for advice and guidance on how to embed and assess ethics within the curriculum. The toolkit includes a suite of case studies for use in Engineering education.

1.27 A key ethical consideration in engineering is the protection of life, which includes exercising professional judgement on the health and safety of engineering solutions. These engineering solutions may be legacy or may be newly created. Engineers typically have a day-to-day responsibility to protect the well-being of others and themselves and need a detailed understanding of both the legal frameworks that exist and have the skills to analyse and mitigate hazards.

1.28 Engineering curricula should empower students to navigate ethical dilemmas through critical case studies reflecting contemporary challenges such as AI bias, decarbonisation trade-offs, and inclusive design justice. This includes examining historical engineering failures through intersectional lenses to understand compounded impacts on marginalized communities.

Safety

1.29 Engineering degree courses should support students in developing a holistic approach to safety throughout their course of study. This requires an understanding of human behaviour, experience of risk monitoring and management approaches and the knowledge and skills to carry out specification and testing of these system qualities. They should understand the specific threats created in the light of increased automation and autonomy of systems.

1.30 The development of complex systems is made more challenging due to the unpredictability of behaviour and interactions, and the rapidly evolving risk climate posed by political, socio-economic and environmental change. The impact of failure on systems and the influence of human behaviour are challenging to model, yet it is essential to consider how people may act and interact with systems to ensure success. There are specific risks associated with safety which must be explicitly included in engineering design approaches - these are typically labelled as non-functional system attributes (or system qualities) and include reliability, resilience, performance and useability. Non-compliance with such requirements can result in system failure and there are often legal obligations to meet regulatory requirements. The Engineering X initiative from the Royal Academy of Engineering presents case-studies and reports for the development of safer complex systems which can be used to support teaching.

1.31 Engineering curricula must address systemic safety disparities arising from historical design biases. This includes:

- **Anthropometric mismatches** in safety-critical systems (e.g., crash test dummies based on 50th-percentile male physiology leading to 73% higher injury risk for women in vehicular impacts)
- **Cognitive bias in AI safety systems** (e.g., pedestrian detection algorithms failing to recognise darker skin tones at night)

- **Sensory exclusion** in warning systems (e.g., auditory alarms inaccessible to hearing-impaired users)

Security

1.32 Security can be defined as the state of relative freedom from threat or harm caused by deliberate, unwanted, hostile or malicious acts. It operates on a number of levels ranging from national security issues to countering crime. It includes preserving the value, longevity and ongoing operation and function of an enterprise's assets, whether tangible or intangible, and the handling of privacy issues, such as the protection of personally identifiable information.

1.33 Engineers know what security is and have an awareness of how deliberate, unwanted, hostile or malicious acts could affect engineering solutions. They are able to critically analyse the security implications of their own design choices and are able to work collaboratively with others to realise systems and solutions that are robust against security threats. In doing so they appreciate the need for a holistic approach addressing the physical, environmental, people, process and technology aspects.

1.34 Learners develop contextual knowledge of their subdiscipline within Engineering with an appropriate focus. As well as mitigating security issues in new engineering solutions, engineers are also able to resolve security problems that exist in legacy systems. This involves applying engineering thinking to problems that may have incomplete data and making design changes or developments to affect an improvement.

1.35 Engineers commonly handle sensitive data and have the skills and knowledge to safeguard it against direct potential security threats. They have an awareness of the importance of managing and protecting data and information and know the legal frameworks that exist. Sensitive data could come in the form of personal data, defence data or designs, or commercially sensitive information. Engineers also have an awareness of the ethical and legal implications of sharing information and can make informed decisions regarding security-minded communications.

Industry and entrepreneurship

1.36 The section below should be read in conjunction with the document published by QAA in 2018, Enterprise and Entrepreneurship Education: Guidance for UK Higher Education Providers.

1.37 Students undertaking an Engineering degree can expect industrial involvement in their course and this can occur in a number of ways. For example, students may receive guest lectures from people working in industry or they might work on industrially linked projects. Many higher education providers will have a formal industry advisory board comprising industrialists and this is considered good practice. Course teams should select industry experts with the characteristics of an engineer as listed above, and therefore create accessible, sustainable, ethical, safe and secure engineering solutions, to be involved in the teaching and learning of and role modelling towards students.

1.38 Some students take part in placements and internships which can be integrated into their degree course. Students who elect to take a formal industrial placement should receive continued support from their institution to ensure educational as well as financial benefit.

Professional accreditation of Engineering degrees

1.39 Engineers practice in a variety of professions; some of their roles require professional registration with a licensed engineering institution, while for many others registration is desirable. The academic course of study must meet specific requirements and standards if it is to contribute towards the student's professional registration and the course must undergo periodic accreditation. The accreditation length awarded is usually no more than five years. Readers are referred to the Engineering Council's Accreditation of Higher Education Programmes (AHEP) for more details.

1.40 Engineering accreditation in the UK is a rigorous peer-review process undertaken by one or more professional engineering institutions (PEIs) under license from the Engineering Council. Accreditation is applied to individual courses, not departments. Part of the process of accreditation is to ensure that specific educational courses, delivered at a specific site or sites, provide some, or all, of the underpinning knowledge and understanding for eventual professional registration in a particular category, such as Incorporated Engineer (IEng) or Chartered Engineer (CEng). This requires reviewing degree courses to ensure that all graduates satisfy the prescribed learning outcomes by viewing assessments, facilities for being taught the discipline, staffing and other factors. The standard expected for all learning outcomes is the minimum threshold level. Accredited degree courses also have to meet stringent requirements with regard to progression. The reason for this is to reduce the likelihood that degree graduates have gaps in their education which would make them unfit to practice the profession.

1.41 Engineering courses are not required to be accredited. There are a range of reasons why a degree course is not accredited, including:

- New degree courses may not be accredited until the first students have completed a full cycle from entry to the final year. In these cases accreditation is usually then backdated to include students from the initial cohorts who started studying before accreditation was gained.
- Some degree courses are not designed to meet all of the Engineering Council's learning outcomes. While these degrees are not intended to hold accreditation, they broadly follow the same study areas of accredited degrees. Non-accredited provision may still be informed by the expectations and practices set out in the UK Quality Code and the regulatory requirements for sector standards set out in each of the UK nations.
- Some institutions have degree regulations that allow students to fail more credit than the minimum levels defined by the Engineering Council. In this case a non-accredited degree may be awarded. The non-accredited degree will have a different title to distinguish it from the accredited degree.

2 Distinctive features of an Engineering degree

Curriculum design

2.1 Engineering degrees are designed to equip graduates with integrated knowledge, skills and judgement which will enable them to begin a professional career in the engineering sector. Engineering degrees usually have some industrial involvement in their design and delivery.

2.2 Engineering is a sector that works with and across multiple other technical and non-technical disciplines and within a variety of contexts. The design of an Engineering degree prepares graduates to navigate complex systems through transdisciplinary approaches and apply systems thinking to engineering products and processes, equipping them to unpick and predict system-level interactions that move beyond technical considerations to encompass economic, political, legal, social, environmental and ethical considerations. The curriculum should support engineers in analysing and mitigating the risks posed to a system (especially those concerned with safety and security). In doing so, Engineering graduates are equipped to optimise designs to prevent failure, reduce bias and be effective advocates for social and environmental justice.

2.3 The following course design features can develop Engineering graduates for the challenges of the future:

- For students to achieve a rounded competence in Engineering, the expectation is that they have significant exposure to practical work, including hands-on laboratory and project work. Experiential learning can help students to understand concepts, and gain an appreciation of the logistics and health, safety and well-being aspects of practical engineering.
- Students should be given sufficient opportunities to develop mathematic and scientific literacies relevant to their discipline or specialisation.
- The curriculum should offer plenty of opportunities for students to acquire and enhance digital and data literacy skills reflecting the societal needs in an increasingly digital and interconnected world.
- A balance of individual and facilitated group project work can help students develop those competencies in self-directed learning, teamwork and leadership that are required for graduate-level work. Students at

higher FHEQ/FQHEIS levels are expected to be increasingly autonomous learners and require less facilitation in groupwork.

- Engineering is a rapidly evolving sector with engineering innovation regularly resulting in new products and processes. Course design benefits from course review mechanisms to ensure that content and skills keep pace with sector, societal and sustainability-related developments.
- The curriculum typically includes both design and research-led projects informed by industrial and societal needs. These should incorporate aspects of inclusive and accessible design and practice and students should develop the ability to meet a combination of economic, social and environmental needs together with knowledge of their professional responsibilities as engineers.
- Uncertainty and competing factors are often an inherent part of engineering problem-definition and solving, and therefore an Engineering degree provides graduates with an ability to manage compromise. Students at higher FHEQ/FQHEIS levels are expected to be able to handle progressively more complex scenarios with an increasing amount of conflicting and/or missing information, and use critical reasoning to make sustainable, responsible, rational, effective and justified decisions. This approach can benefit from being applied beyond design modules in order to help students gain familiarity with working with complexity.
- The promotion and use of ethical principles, codes and national frameworks support inclusive practices. A strong foundation in ethical principles and decision making can aid engineers in exploring and assessing options leading to improved engineering outcomes, better environmental outcomes and a more inclusive society.
- The ability to evaluate the lifecycle and environmental impact of engineering decisions is necessary in designing within the global context of climate change. Alongside the understanding of low-carbon and clean technologies, students should also be able to evaluate the impact of exploitation of resources along with the ongoing environmental impact of their decisions as engineers and the designs they implement.
- Engineering courses within the UK attract a significant number of overseas students and students from the UK have the opportunity to work across the world and with international teams. Students should therefore possess cultural competencies to prepare them for working within a global sector.

2.4 Students can be significantly impacted by the way courses are structured, delivered and assessed. Understanding these potential impacts and how best to address them can be achieved through the use of inclusive education approaches. This means creating learning environments where students from all backgrounds can participate equally, with reasonable accommodations for different learning needs and abilities. Such an inclusive culture within Engineering courses requires nurturing, ongoing re-evaluation and an evidence-informed approach. Measures to promote an inclusive engineering community include.

- student-centred course design that facilitates an inclusive culture in which individual differences are recognised as a strength and incorporated, enabling all individuals to be successful across all protected characteristics
- course design that promotes belonging and ensure equitable experiences for all students, including accommodations and accessible learning environments, and do not disadvantage any students
- embedding opportunities to increase awareness and understanding of all aspects of EDI, including equity, justice and human rights, and decolonised perspectives through knowledge and experience
- building in key EDI elements for supporting collaboration and facilitating self-reflection and an understanding of others in order to appreciate a wide range of personal characteristics and identities.

Progression

2.5 Over the course of a bachelor's degree (FHEQ Level 6; FQHEIS Level 10) an Engineering student will progress from one level of study to the next, in line with the regulations and processes for each institution. However, it is expected that each level would see the attainment of certain levels of knowledge, expertise and experience that build towards the final achievement of meeting the threshold-level subject-specific and generic skills listed in this Statement. Upon graduation from an undergraduate degree, it would be expected that a student who had achieved a second-class degree or higher would be capable of, and equipped for, undertaking postgraduate study in Engineering or an associated subject. Entry requirements to postgraduate courses are, however, determined by individual providers and may require specified levels of achievement at undergraduate level.

2.6 In a standard three-year undergraduate honours degree course, students may exit earlier and be eligible for a Certificate of Higher Education, a Diploma of

Higher Education, or an honours degree depending upon the levels of study completed to a satisfactory standard. In Scotland, bachelor's degrees with honours are typically designed to include four years of study, which relates to the structure of Scottish primary and secondary education. For students following part-time routes, their study time would be the equivalent of the three or four-year degree.

2.7 Over the course of an integrated master's degree (FHEQ Level 7; FQHEIS Level 11) an Engineering student will progress from one level of study to the next, in line with the regulations and processes for each institution. However, it is expected that each year would see the attainment of certain levels of knowledge, expertise and experience that build towards the final achievement of meeting the threshold-level subject-specific and generic skills listed in this Statement. Integrated master's courses often have more stringent progression requirements than BEng (Hons) degrees, and students who do not meet the progression requirements may be transferred onto a corresponding bachelor's degree. Upon graduation from an integrated master's degree, it would be expected that a student who had achieved a third-class degree or higher would be capable of, and equipped for, undertaking postgraduate study in Engineering or an associated subject.

2.8 In a standard four-year integrated master's degree course, students may exit earlier and be eligible for a Certificate of Higher Education, a Diploma of Higher Education, or a bachelor's degree with or without honours, depending upon the levels of study completed to a satisfactory standard. Scottish integrated master's degree courses are typically designed to include five years of study, which relates to the structure of Scottish primary and secondary education. For students following part-time routes, their study time would be the equivalent of the four or five-year degree.

2.9 General and multidisciplinary undergraduate honours degrees will achieve core elements of the specific and generic skills for Engineering, and will add others according to the subjects covered in joint courses. Additionally, they may explore the overlap between their two subject areas, creating further opportunities for interdisciplinary study.

2.10 An Engineering degree is awarded as a result of a student demonstrating that they have met the learning outcomes of the course and the higher education provider regulations governing the award of degrees. An accredited degree is awarded when a student has also demonstrated the learning outcomes required by the applicable Accreditation of Higher Education Programmes (AHEP) regulations and any additional requirements for their discipline prescribed by their professional engineering institution. The overlay of these AHEP requirements may mean that students registered on an accredited degree course are required to meet these more challenging requirements until such time as the attainment of an accredited degree is no longer possible for the student. At which time, the standard higher education provider regulations will be applied.

Partnership

2.11 Engineering degree courses exist in a rapidly changing sector. Higher education providers need to therefore stay up to date with contemporary industry needs through active partnerships with industry. Engineering industry advisory boards provide an essential input into the design of Engineering courses. These boards can provide valuable insight into the knowledge, skills and experience that would be valuable in their industry and provide insight into sector innovation and contemporary skill needs.

2.12 The benefits of strong industrial relations include:

- advice on course content and structure to meet the sector's needs at graduate level
- active learning exercises based on workplace activities
- work placements for students
- site visits
- industry guest lectures
- mentoring and employability advice.

2.13 An industry-informed Engineering degree can help students to socialise into the expectations and norms of the engineering sector and prepare them for employment in industry. This partnership works both ways. For example, the Intergovernmental Panel on Climate Change (IPCC) cites the need to radically change industrial norms in order to meet the challenge of climate crisis. Therefore, while graduates need to be socialised into the sector in order to function effectively, industry can also benefit from students being equipped to challenge industry norms where practice is harmful to ambitions for net zero in 2050 - or other sustainability considerations.

2.14 There is a partnership between Engineering and the broader society that the sector serves. Partnerships with community groups impacted by engineering products and processes may help students to understand the needs of beneficiaries, as can taking human and community-centred approaches to design. Such approaches should explicitly consider EDI and ethical implications in serving the whole of society.

2.15 Industry advisory boards should reflect demographic and cognitive diversity, including representatives from NGOs, community groups, and accessibility advocates. This ensures real-world projects address societal needs beyond traditional commercial priorities, such as frugal innovation for low-resource contexts.

2.16 Providers should ensure partners delivering teaching and learning opportunities such as work placements practice inclusivity, diversity, equality, accessibility and sustainably to ensure all students engaging with them receive equitable, high quality education with insight into sustainable practise when working in the sector.

2.17 Students are co-creators of their educational experiences, and Engineering courses benefit from a partnership approach to learning and teaching. This can be achieved through regular dialogue with students and student representation on course management committees. Working with students as partners, and engaging in student-led initiatives, helps to develop deeper skills in graduates as well as improving learning and teaching experiences and outcomes. Courses can benefit from supporting a community of learners and facilitating peer relationships, through engagement with student-led societies and extracurricular events.

2.18 Partnerships include relevant PSRBs, and the Engineering Council is the regulatory body for the UK engineering profession. The Engineering Council sets and maintains standards of professional competence and commitment, and sets out the policy, context, rules and procedures for recognising learning and development for degrees and other qualifications recognised on behalf of the engineering profession. The Engineering Council grants licences to professional engineering institutions, allowing them to assess candidates for inclusion on the national register of professional engineers and technicians. Many professional engineering institutions are also licensed to accredit degrees and other educational programmes.

2.19 Engineering is a highly mobile profession, the Engineering Council ensures its standards, and hence UK Engineering degrees, are globally recognised. To achieve this the Engineering Council is the UK partner in the International Engineering Alliance (IEA), ENGINEERS EUROPE (formerly FEANI) and the

European Network for Accreditation of Engineering Education (ENAEE). Documents of particular relevance for this Statement from these organisations are the Graduate Attributes and Professional Competences published by the IEA and the EUR-ACE® Framework Standards and Guidelines from the ENAEE. The Engineering Council is party to several agreements that facilitate international recognition of its standards for education and competence, including the Washington Accord. Bachelors (honours) degrees which are accredited as fully meeting the academic requirement for IEng registration and partially meeting the academic requirement for CEng registration are aligned with the Washington Accord. The international recognition of standards for education is a complex issue and readers are advised to refer to AHEP for a brief summary or the Engineering Council's International Activity web pages for more detail.

2.20 Within the UK there are many organisations that provide resources and networking opportunities to develop and share best practice in Engineering education:

- the Royal Academy of Engineering (RAEng) is a charitable organisation and national academy supporting a community of engineering professionals; it offers a range of support to Engineering courses, including visiting professorships and industry and academic exchanges
- the Engineering Professors' Council represents engineering academics and conducts research in areas including admissions, skills and innovation
- the UK and Ireland Engineering Education Research Network and the European Society for Engineering Education (SEFI) provide conferences and networking opportunities for individuals engaged in Engineering education research
- there are over 35 professional engineering institutions (PEIs) of various sizes, each specialising in various areas of engineering. Many are engaged in education outreach and welcome student members.

Monitoring and review

2.21 A major feature of academic quality assurance and enhancement at a higher education provider is having in place monitoring and regular review processes for the courses it delivers. Degree-awarding bodies routinely collect and analyse information and undertake periodic course review according to their own needs. They draw on a range of external reference points, including this Statement, to ensure that their provision aligns with sector norms and needs for sustainable development. Monitoring and evaluation is a periodic assessment of a course, conducted internally or with the support of external independent evaluators. Evaluation uses information from both current and historic monitoring to develop an understanding of student achievement and satisfaction or inform future course planning.

2.22 Externality is an essential component of the quality assurance system in the UK. Higher education providers will use external reviewers as part of periodic review to gain an external perspective on any proposed changes and ensure threshold standards are achieved and content is appropriate for the subject. In particular, the periodic review of Engineering degrees should also draw in the expertise of industrial partners to ensure the currency of curriculum.

2.23 The external examination system currently in use across the UK higher education sector also helps to ensure consistency in the way academic standards are secured by degree-awarding bodies. Typically, external examiners will be asked to comment on the types, principles and purposes of assessments being offered to students. They will consider the types of modules on offer to students, the academic standards and quality of the assessments being set, the outcomes of a cohort and how these compare to similar provision offered within other UK higher education providers. External examiners are asked to produce a report each year and make recommendations for changes to modules and assessments, where appropriate. Subject Benchmark Statements, such as this one for Engineering, can play an important role in supporting external examiners in advising on whether threshold standards are being met in a specific subject area.

2.24 In the UK, most Engineering degrees are accredited. This process is periodically undertaken by a professional engineering institution, licensed by the Engineering Council, to review appropriate degree courses to judge whether or not they meet the defined standards set by the Engineering Council (for example, the Accreditation of Higher Education Programmes, AHEP). Accreditation therefore provides all stakeholders with assurance that an accredited degree meets the standards set by the engineering profession. Accredited status is most commonly applied to BEng, BEng (Hons) and master's degrees (MEng and MSc). The Engineering Council maintains a publicly available database of all current and previously accredited Engineering degree courses. Accreditation itself does not constrain Engineering courses in terms of their delivery methods.

2.25 The student voice should also play a significant role in all stages of course development, delivery, review and the overall student experience within

Engineering. The student voice can be listened to through departmental representatives, module evaluation and external student surveys such as the National Student Survey (NSS) and SDG and sustainability curriculum mapping. Furthermore, students can feed into, and collaborate with, their students' union, and many higher education providers offer public social media platforms to receive feedback from students and discuss current trends in the student experience.

2.26 Monitoring and reviews should include procedures to gather and assess feedback from minority and underrepresented communities to ensure their voices are not ignored within this process and that any discrepancies between their treatment or experience and that of majority communities are identified and can be addressed.

3 Content design and delivery

Content

3.1 Engineering degree courses are wide ranging and diverse in nature. Engineers are, by their very nature, professional problem-solvers who are able to apply their knowledge and skills to a wide range of applications. Consequently, the content of their courses cannot be easily prescribed.

3.2 The aim of all Engineering courses is to prepare the learner with the academic tools, digital and practical skills, necessary mindset and the ethical framework needed to become a practicing engineer.

3.3 In addition, Engineering courses should prepare learning to practice as the sustainable engineers needed by the modern world. Methods and examples of putting a sustainability lens on curricula are not limited to but can include:

- Infusing the importance of creating products (and performing repairs) which last and can be repaired/updated, rather than turning to built-in obsolescence and cheaper production
- Considering the environmental impact of materials and processes during project work so that students are prepared to do this in the real world when making larger decisions
- Covering how current engineering practices, and the sector overall, harm the environment and are detrimental to social justice efforts on a local or global scale and also how students will be able to effectively make the sector more sustainable and ethical once they enter it
- Covering how students, both currently as students and later as working professionals, can contribute to research, practices and movements pushing to remove sustainably detrimental practices and come up with more sustainable alternatives
- Critically analysing sustainability efforts to develop in students the ability to identify genuine efforts vs greenwashing in engineering projects (e.g. carbon-offset myths)
- Emphasising the role engineering must play in a just transition for workers in the sector, customers, and other communities impacted by the engineering sector, especially those which are globally or locally marginalised.

3.4 The practical component of any Engineering course is of particular significance as this distinguishes it from other applied sciences. It is not enough to be able to theorise how to solve a problem in an engineering context; the degree course needs to include opportunities for the learner to demonstrate their ability to make this work in practice. Thus, the practical components of an Engineering course can range from the build-and-test of a programming solution through to the build-and-test of a physical construction.

3.5 There is some flexibility within all Engineering degrees for higher education providers to develop specialist content and skills relevant to their local and institutional context. Higher education providers seeking accreditation should ensure that the learning outcomes are consistent with what is required by the relevant professional engineering institution and the Engineering Council. Engineering degrees have the flexibility to offer non-specialist content, from subjects beyond Engineering (language, humanities and so on) which can enhance a course of study, help students to gain interdisciplinary insights and offer more choice for course personalisation.

Teaching and learning

3.6 There is a holistic approach to the design of the curriculum. The methods of teaching and learning are constructed so that the learning activities and tasks are aligned with intended learning outcomes.

3.7 Existing Engineering courses deploy a diverse range of teaching and learning methods to enhance and reinforce the student learning experience. This diversity of practice is a strength of the subject of Engineering. Whichever methods are employed, strategies for teaching and learning deliver opportunities for the achievement of the learning outcomes, demonstrate the attainment of learning outcomes, and recognise the range of student backgrounds and diversity in their learning styles. The methods of delivery and the design of the curriculum are updated on a regular basis in response to generic and subject-specific developments, considering educational research, changes in national policy, industrial practice and the needs of employers.

3.8 Curriculum design is informed by relevant examples of current developments, reflecting appropriate research, scholarship and industrial practice, and an understanding of the potential destination of graduates. Accredited degree courses must also satisfy the requirements of Accreditation of Higher Education Programmes (AHEP).

3.9 For students on a bachelor's degree course to achieve a satisfactory understanding of Engineering, the expectation is that they have significant exposure to hands-on laboratory work and substantial individual and group project work. The curriculum includes both design, development and research-led projects, which develop in graduates both independence of thought and the ability to work effectively in a team. Teaching and learning needs to be placed within the context of social, ethical, legal, environmentally sustainable and economic factors relevant to engineering.

3.10 Teaching and learning methods within an integrated master's degree (MEng) course not only includes those in a bachelor's degree with honours but also goes further through the deepening of technical understanding, sustainability and design. There is additional emphasis on team/group working and communication, together with an increase in the use of industrially relevant applications of engineering analysis and an enhanced capability for independent learning. Case studies, design work and projects alongside industrial visits are generally utilised more extensively, especially towards the end of the course when they build upon earlier learning. The inclusion of such elements within the design of MEng courses prepares students for subsequent leading roles in technical and/or managerial activities.

3.11 Teaching and learning for other master's qualifications (typically MSc degrees) depends to a large extent on the focus of the course, but may include increased specialisation, breadth or depth of material. There are expectations that master's students will be increasingly self-reliant and self-directing, particularly during the later stages of their course.

3.12 Master's degrees often attract students who have not studied for their first degree within the UK higher education system. The learning outcomes they achieve in their first degree do not always align with those of students from the UK system and this difference should be taken into account in the design of individual courses.

3.13 Embedding employability and ways by which graduates can be prepared for life beyond academia are priorities for all interested parties within Engineering. Effectively embedding employability both in the curriculum and within extracurricular provision is key.

3.14 Flexibility of delivery can improve accessibility to learning for a diverse community. A mix of synchronous and asynchronous delivery can be beneficial for a broad range of learners who may face barriers, especially, but not limited to, disabled students.

Assessment

3.15 As stated in the [Frameworks for HE qualifications of UK degree awarding bodies](), assessment procedures should not allow for the award of a qualification when learning outcomes have not been achieved.

- All students graduating with Engineering degrees will be able to demonstrate that they have achieved the necessary output standards for the degree that they have been awarded. The higher education provider publishes course objectives and outcomes, and sets robust assessment standards and procedures to assess whether a graduate achieves the expected learning outcomes of the course.
- Assessment focuses on student learning and enables students to demonstrate their full range of abilities, both theoretical and practical. All assessments directly align to the learning outcomes and emphasise deep learning. The higher education provider offers a range of assessment methods that are accessible to all students and should also make reasonable adjustments for disabled students.
- A diversity of innovative assessment methods is encouraged and assessments can be carried out in-person or remotely using appropriate digital technology. Flexibility of assessment can improve accessibility to learning for a diverse community. Assessment design beyond traditional exams can allow students to showcase different strengths across the curriculum. Assessment methods in Engineering may include, but are not limited to:
    - examinations (both open-book and closed-book)
    - laboratory and project reports
    - case studies
    - literature reviews
    - dissertations
    - verbal and/or non-verbal presentations and examinations
    - peer and self-assessment
    - work-integrated assessments.
- Formative assessment can also be used for the enhancement of learning, particularly to support blended applications.

- The aims and requirements for each assessment should be clearly defined through using transparent marking criteria, and relevant feedback should be provided for all students in a timely manner. Students should have the opportunity to receive further clarification on or to challenge feedback and the procedures for how to do this should be clear and explained in advance. Assessment should be designed to ensure the highest possible standards while also preventing opportunities for academic misconduct - such as plagiarism and contract cheating. Policies and procedures published by the higher education providers for safeguarding academic integrity should also be actively promoted and applied consistently.
- Students should be given opportunities to demonstrate their skills through collaborative group work in addition to individual assessments. The fair assessment of groupwork is fundamental to supporting an inclusive curriculum. Consideration should be given to assessing the ability to work in a group (not just the academic output), including student actions within the group environment that promotes inclusivity while recognising the needs of learners who have different learning abilities and styles. Another priority involves peer assessment, including individual self-reflection about the ability to work effectively in a group when meeting learning outcomes.
- Authentic assessment, which will equip students for employment, is encouraged through considering communication methods, the assessment of technical skills, and cultural competences.

3.16 Accredited Engineering degrees are subject to strictly imposed limits on failure and marginal failure. These are more stringent than the standard credit recognition of most providers. Typically, students will have to pass most, or in some cases all, modules on the course in order to achieve an accredited degree.

4 Benchmark standards

Introduction

4.1 This Subject Benchmark Statement sets out the minimum threshold standards that a student will have demonstrated when they are awarded:

- a bachelor's degree with honours (often denoted BEng (Hons)) in an Engineering discipline
- an integrated master's degree (often denoted MEng) in an Engineering discipline
- a postgraduate taught master's degree (often denoted MSc) in an Engineering discipline.

4.2 Demonstrating these standards over time will show that a student has achieved the range of knowledge, understanding and skills expected of graduates in Engineering.

4.3 The vast majority of students will perform significantly better than the minimum threshold standards. Each higher education provider has its own method of determining what appropriate evidence of this achievement will be required.

4.4 The benchmark standards are defined relative to the appropriate FHEQ Level 6 or 7 (FQHEIS Level 10 or 11) specification and associated descriptors. As such, their application to an individual course is necessarily contextual. Many Engineering degrees are accredited by UK professional engineering institutions acting under license from the Engineering Council (see section 1 for more details). For degrees that are accredited, learning outcomes defined by the profession to support development of competences required for professional registration will apply.

Minimum threshold standards

4.5 For the purposes of this Statement, the learning outcomes set out in the relevant edition of Accreditation of Higher Education Programmes (AHEP), published by the Engineering Council, should be interpreted as the minimum threshold standards for accredited courses. These learning outcomes should be read in the context of the generic statements of competence and commitment for Incorporated Engineer (IEng) and Chartered Engineer (CEng) in UK Standard for Professional Engineering Competence and Commitment (UK-SPEC).

Undergraduate benchmark standards

4.6 For bachelor's degrees with honours, refer to Annex D: Outcome classification descriptions for FHEQ Level 6 and FQHEIS Level 10 degrees. This Annex sets out common descriptions of the four main degree outcome classifications for bachelor's degrees with honours classifications: 1st, 2:1, 2:2 and 3rd.

4.7 Integrated master's (MEng) degrees include the outcomes of bachelor's degrees with honours and go beyond them to provide a greater range and depth of specialist knowledge - often within a research and industrial environment - as well as a broader and more general academic base.

Bachelor's degree with honours

Threshold level (3rd class degree)

4.8 With regard to undergraduate courses, students graduating with a bachelor's degree with honours in Engineering must demonstrate at least a threshold-level of attainment across all outcome categories. Threshold-level attainment typically maps onto that associated with a 3rd class honours degree. Criteria for achievement at threshold level will be in line with the higher education provider's common or generic marking schemes for undergraduate courses and the sector-recognised standards that are in use in each of the nations of the UK. If the course is accredited, the threshold will also be determined by the relevant professional engineering institution(s).

On graduating with a BEng honours degree in Engineering, graduates will have demonstrated the following.

- **Knowledge and understanding:** a coherent knowledge and understanding of their engineering discipline and its practical application within global and local contexts.
- **Problem solving:** the ability to identify complex engineering problems, select the appropriate tools and go on to create safe, secure, sustainable and inclusive solutions designed to meet defined needs while considering societal and environmental impacts.
- **Analysis:** the skill to select and apply quantitative and computational analysis techniques recognising the limitations of the methods employed.

- **Delivery/skills/practice:** creativity, innovation, teamworking and communication.
- **Values and principles:** an appreciation of professional and commercial engineering practice, ethics and global social responsibility.

Typical level (2:2 or 2:1)

4.9 Criteria for achievement above threshold level at 2:1 and 2:2 will be in line with the higher education provider's common or generic marking schemes for undergraduate courses and the sector-recognised standards that are in use in each of the nations of the UK.

Excellent level (1st class)

4.10 Criteria for excellent (1st class achievement) will be in line with the higher education provider's common or generic marking schemes for undergraduate courses and the sector-recognised standards that are in use in each of the nations of the UK.

Integrated master's degree

Threshold level (3rd class degree)

4.11 With regard to undergraduate courses, students graduating with an integrated master's degree in Engineering must demonstrate at least a threshold-level of attainment across all outcome categories. Threshold-level attainment often maps onto that associated with a 3rd class honours degree. Criteria for achievement at threshold level will be in line with the higher education provider's common or generic marking schemes for integrated master's courses. If the course is accredited the threshold will also be determined by the relevant professional engineering institution(s).

On graduating with an MEng degree in Engineering, graduates will have demonstrated the following.

- **Knowledge and understanding:** a broad and coherent knowledge and understanding of their engineering discipline and its practical application within global and local contexts.
- **Problem solving:** the ability to identify complex engineering problems, select the appropriate tools and go on to create safe, secure, sustainable

and inclusive solutions designed to meet defined needs while considering societal and environmental impacts.

- **Analysis:** the skill to select and apply quantitative and computational analysis techniques in the absence of complete data, discussing the limitations of the methods employed.
- **Delivery/skills/practice:** creativity, innovation, effective teamworking, leadership and communication.
- **Values and principles:** an appreciation of professional and commercial engineering practice, ethics and global social responsibility.

Typical level (2:2 or 2:1)

4.12 Criteria for achievement above threshold level at 2:1 and 2:2 will be in line with the higher education provider's common or generic marking schemes for integrated master's courses.

Excellent level (1st class)

4.13 Criteria for excellent (1st class achievement) will be in line with the higher education provider's common or generic marking schemes for integrated master's courses.

Postgraduate master's degrees benchmark standards

4.14 Students graduating with a postgraduate master's degree in Engineering must demonstrate at least a threshold level of attainment across all relevant course outcome categories. Attainment at a threshold level usually maps onto that associated with a pass award.

4.15 At threshold level, MSc graduates must demonstrate awareness of how their specialisation intersects with UN SDGs. Distinction-level work should propose actionable strategies to address these intersections.

Threshold level (pass degree)

4.16 With regard to postgraduate courses, students graduating with a master's degree in Engineering must demonstrate at least a threshold-level of attainment across all relevant outcome categories. Threshold-level attainment typically maps onto that associated with a pass degree. Criteria for achievement at threshold level will be in line with the higher education provider's common or generic marking schemes for integrated master's courses. If the course is accredited the threshold will also be determined by the relevant professional engineering institution(s).

On graduating with an MSc in Engineering, graduates will have demonstrated the following.

- **Knowledge and understanding:** a coherent knowledge and understanding of their engineering discipline or specialisation within local and global contexts.
- **Problem-solving:** the ability to identify complex engineering problems, select the appropriate tools and go on to create safe, secure, sustainable and inclusive solutions designed to meet defined needs while considering the societal and environmental impacts.
- **Analysis:** the skill to select and apply quantitative and computational analysis techniques in the absence of complete data, discussing the limitations of the methods employed.
- **Delivery/skills/practice:** creativity, innovation, research, effective teamworking, leadership and communication.
- **Values and principles:** an appreciation of professional and commercial engineering practice, ethics and global social responsibility.

Typical level (merit)

4.17 Criteria for merit achievement above threshold level will be in line with the higher education provider's common or generic marking schemes for master's courses.

Excellent level (distinction)

4.18 Criteria for excellent level (distinction) will be in line with the higher education provider's common or generic marking schemes for master's courses.

5 List of refences and further resources

Engineering Council

The Accreditation of Higher Education Programmes (AHEP):
http://www.enqc.org.uk/ahep

Approval and Accreditation of Qualifications and Apprenticeships (AAQA):
www.engc.org.uk/aaqa

Glossary of terms: www.engc.org.uk/glossary-faqs/glossary International activity:
www.engc.org.uk/international

List of current and previously accredited courses:
www.engc.org.uk/education-skills/course-search/recognised-course-search

Statement on Ethical Principles:
www.engc.org.uk/standards-guidance/guidance/statement-of-ethical-principles

UK Standard for Professional Engineering Competence and Commitment (UK-SPEC): www.engc.org.uk/ukspec

QAA

Characteristic Statement: Foundation Degrees
www.qaa.ac.uk/docs/qaa/quality-code/foundation-degree-characteristics-statement-2020.pdf

Characteristic Statement: Higher Education in Apprenticeships
www.qaa.ac.uk/docs/qaa/quality-code/higher-education-in-apprenticeships-characteristics- statement.pdf

Characteristic Statement: Master's Degrees
www.qaa.ac.uk/docs/qaa/quality-code/master's-degree-characteristics-statement.pdf

Education for Sustainable Development (ESD) Guidance
www.qaa.ac.uk/the-quality-code/education-for-sustainable-development

Enterprise and Entrepreneurship Education: Guidance for UK Higher Education Providers
www.qaa.ac.uk/quality-code/education-for-sustainable-development

The Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies
www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf

Annex D: Outcome classification descriptions for FHEQ Level 6 and FQHEIS Level 10 degrees
www.qaa.ac.uk/docs/qaa/quality-code/annex-d-outcome-classification-descriptions-for-fheq- level-6-and-fqheis-level-10-degrees.pdf

Others

Engineering Professors Council, Engineering Ethics toolkit:
epc.ac.uk/resources/toolkit/ethics-toolkit

European Network for Accreditation of Engineering Education (ENAEE) - EUR-ACE® Framework Standards and Guidelines:
www.enaee.eu/eur-ace-system/standards-and-guidelines/

International Engineering Alliance - Graduate Attributes & Professional Competencies:
www.ieagreements.org/about-us/iea-unesco-and-wfeo-collaboration/

International Engineering Alliance - Washington Accord:
www.ieagreements.org/accords/washington/

Royal Academy of Engineering, Engineering X:
https://engineeringx.raeng.org.uk

United Nations Sustainable development Goals:
www.un.org/sustainabledevelopment

6 Membership of the Advisory Groups for the Subject Benchmark Statement for Engineering

Membership of the Advisory Group for the Subject Benchmark Statement for Engineering (2023)

Professor Alistair Greig (Chair)	University College London
Dr Vaibhav Gandhi (Deputy Chair)	Middlesex University
Professor Claire Lucas (Deputy Chair)	King's College London
Professor Gill Cooke	University of Warwick
Dr Timothy John Coole	University Centre Newbury
Catherine Elloitt	Engineering Council
Dr Karin Ennser	Swansea University
Dr James Flint	Loughborough University/IET
Professor Kelum Gamage	University of Glasgow
Professor Frank Haddleton	University of Hertfordshire
Professor Georgina Harris	Arden University Limited
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Professor Colin Turner	Ulster University
Gemma Williams	Engineering Council
Dr Patricia Xavier	Swansea University

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Membership of the review group for the Subject Benchmark Statement for Engineering (2019)

The fourth edition, published in 2019, was revised by QAA to align the content with the revised UK Quality Code for Higher Education, published in 2018. Proposed revisions were checked and verified by the Chair of the Subject Benchmark Statement for Engineering review group from 2015.

Professor Kel Fidler (Chair)	Fellow of the Royal Academy of Engineering, formerly Vice-Chancellor and Chief Executive of Northumbria University and Chairman of the Engineering Council
Dr Alison Felce	QAA

Membership of the review group for the Subject Benchmark Statement for Engineering (2015)

Details provided below are as published in the third edition of the Subject Benchmark Statement.

Dr Rob Best	London South Bank University and Accreditation of Higher Education Courses steering group
Professor David Cleland	Queen's University Belfast
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Professor Kel Fidler (Chair_	Fellow of the Royal Academy of Engineering, formerly Vice-Chancellor and Chief Executive of Northumbria University and Chairman of the Engineering Council
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Professional, statutory and regulatory body representative	
Deborah Seddon	Engineering Council
Employer representatives	
Nicola Price	Rolls Royce
Dr Mike Cook	Buro Happold Ltd and Royal Academy of Engineering
Student reader	
Joshua Mullins	University of Exeter

Membership of the review group for the Subject Benchmark Statement for Engineering (2006)

Details provided below are as published in the second edition of the Subject Benchmark Statement.

Professor Helen Atkinson	University of Leicester (nominated by the Office of Science and Technology)
Janet Berkman	EEF
Professor David Bonner (Chair)	University of Hertfordshire
Dr Sarah Carpenter	Higher Education Academy Engineering Subject Centre
Professor Graham Davie	University of Birmingham (nominated by Royal Academy of Engineering)
Professor John Dickens	Higher Education Academy Engineering
Günter Heitmann	Technical University Berlin
Professor Fred Maillardet	Engineering Professors' Council
Professor Alistair Sambell	University of Northumbria
Mr Richard Shearman	Engineering Council UK
Mr David Young (deceased)	Universities UK
Professor Ian Freeston (observer)	Engineering Council UK

Membership of the original benchmarking group for engineering (2000)

Details provided below are as published in the original Subject Benchmark Statement.

Dr R Best	South Bank University
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Professor K Filder	The University of York
Professor E Fisher	University of Newcastle upon Tyne
Professor J Flower	University of Warwick
Professor D Green	University of Glasgow
Mr D Heffer	Southampton Institute
Dr D Morrey	Oxford Brookes University
Dr D Pollard (Chair)	University of Surrey

Dr R Prager	University of Cambridge
Professor A Purvis	University of Surrey
Professor N Syred	University of Wales, Cardiff
Professor G Taylor	Leeds Metropolitan University
Professor C Thomas	University of Birmingham

*(resigned due to ill health)

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www.qaa.ac.uk/membership