The University Of Sheffield.

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

Programme Details

1. Programme title	Manufacturing Technology (Apprenticeship Rolls-Royce)
2. Programme code	AMRU23
3. QAA FHEQ level	5
4. Faculty	Engineering
5. Department	AMRC
6. Other departments providing credit bearing modules for the programme	None
7. Accrediting Professional or Statutory Body	IMechE, (to be sought)
8. Date of production/revision	Revised February 2022

Awards	Type of award	Duration
9. Final award	Foundation Degree (FD)	2 years
10. Intermediate awards		

Programme Codes

11. JACS code(s) *Select between one and three codes from the HESA website.*	H700		
12. HECoS code(s) *Select between one and three codes from the HECoS vocabulary.*	100209		

Programme Delivery

13. Mode of study	Full-time
14. Mode of delivery	

15. Background to the programme and subject area

The Foundation Degree in Manufacturing Technology will be offered to students (via their employers) as the foundation phase knowledge element of a degree apprenticeship. Degree apprenticeships offer an apprentice the opportunity to combine working while studying for a work-based academic or vocational high-level qualification.

These apprenticeships include the achievement of academic and vocational qualifications and learning from Level 4 upwards. Degree apprenticeships:

- are the latest model to be developed as part of degree apprenticeship standards, with apprentices achieving a full bachelor's or master's degree as a core component of the apprenticeship.
- combine both higher and vocational education and fully test both the wider occupational competence and academic learning, either using a fully-integrated degree co-designed by employers and Higher Education Institutions, or using a degree plus separate end test of professional competence.

This programme has been developed with employers and with reference to the Apprentice Standards which are developed by employer groups (known as 'trailblazers') and approved by Government.

It has been designed as a progression route for Advanced Apprentices (working in local engineering and manufacturing firms), for Degree Apprentices either with significant experience or as new employees, and/or entrants to Engineering, with A levels, and aims to provide the specialist knowledge and skills to complement the professional competence that the apprentices will be required to demonstrate.

Manufacturing Technology is the study of processes through which raw materials are transformed into a final product. The manufacturing process begins with the product design, material selection and specification and continues with the processes and systems through which the product is modified to become the final part.

The aim of the Foundation Degree in Manufacturing Technology is to equip students with the knowledge and expertise for the efficient and effective production of all manufactured goods, encompassing production processes, engineering materials, design and manufacturing systems. Developed with employer input for students who are already working in a manufacturing environment, the relation between manufacturing process, material properties and product performance is a cross-cutting theme, underpinned by a firm foundation in mathematics and engineering principles. Alongside technical knowledge, students will develop their understanding of broader economic, social and environmental implications of manufacturing technology, enabling them to contribute to a competitive and sustainable manufacturing industry. In addition to developing critical thinking and robust analytical skills, students will develop teamwork, communication, practical laboratory skills and technical report writing.

Student will develop the range of skills, knowledge and practical application needed to work towards Incorporated Engineer registration within a range of manufacturing and engineering contexts.

In addition to the vocational emphasis of the programme, students will also benefit from the AMRC's research activity, which informs its teaching. The AMRC lecturers are active researchers solving real-life industrial problems in a variety of disciplines from design, tooling, factory layouts and manufacturing systems, machining and material selection. Their knowledge is up-to-date and includes relevant, current case studies.

16. Programme aims

The University's Mission is to educate others and ourselves and to learn through doing so, as a civic institution proud of its urban character, driving growth and vibrancy for the city, the region, and the globe. Our vision is research, teaching and learning together create a positive culture of higher education.

The AMRC implements this through a strong commitment to local industry, with a large number of employers both within Sheffield and the region working with the AMRC to address the engineering skills gap by training and educating Advanced, Higher and Degree Apprentices. The AMRC has a strong commitment to both teaching and research and works to create and stimulate a commitment to self-learning and development in its students.

The aims of the Foundation Degree are to:

1. Provide access to an engineering foundation degree to students from a range of academic and social backgrounds;
2. Provide students with a relevant, modern education based on the fundamental principles of manufacturing;
3. Develop students within their professional working career in manufacturing;

4. Foster safe and good laboratory practice;
5. Develop interpersonal, problem solving and transferable skills appropriate to an engineer;
6. Encourage students to think for themselves and develop a social awareness of the impact of manufacturing on society;
7. Engender attitudes and provide skills which will promote lifelong learning.
8. Develop students' appreciation of the wider engineering context and commercial considerations affecting their work;
9. Preparing students for Incorporated Engineer status through further study on a top up programme.

17. Programme learning outcomes

Science and Mathematics (SM)	
SM1i	Knowledge and understanding of the scientific principles underpinning relevant technologies, and their evolution.
SM2i	Knowledge and understanding of mathematics and an awareness of statistical methods necessary to support application of key engineering principles.
Engineering Analysis (EA)	
EA1i	Ability to monitor, interpret and apply the results of analysis and modelling in order to bring about continuous improvement.
EA2i	Ability to apply quantitative methods in order to understand the performance of systems and components.
EA3i	Ability to use the results of engineering analysis to solve engineering problems and to recommend appropriate action.
EA4i	Ability to apply an integrated or systems approach to engineering problems through know-how of the relevant technologies and their application.
Design (D)	
D1i	Be aware of business, customer and user needs, including considerations such as the wider engineering context, public perception and aesthetics.
D2i	Define the problem identifying any constraints including environmental and sustainability limitations; ethical, health, safety, security and risk issues; intellectual property; codes of practice and standards.
D3	Work with information that may be incomplete or uncertain and be aware that this may affect the design.
D4i	Apply problem-solving skills, technical knowledge and understanding to create or adapt designs solutions that are fit for purpose including operation, maintenance, reliability etc.
D5i	Manage the design process, including cost drivers, and evaluate outcomes.
D6	Communicate their work to technical and non-technical audiences.
Economic, Legal, Social, Ethical and Environmental Context (EL)	
EL1	Understanding of the need for a high level of professional and ethical conduct in engineering and a knowledge of professional codes of conduct.
EL2	Knowledge and understanding of the commercial, economic and social context of engineering processes.
EL3i	Knowledge of management techniques that may be used to achieve engineering objectives.
EL4i	Understanding of the requirement for engineering activities to promote sustainable development.
EL5	Awareness of the relevant legal requirements governing engineering activities, including personnel, health & safety, contracts, intellectual property rights, product safety and liability issues.
EL6i	Awareness of risk issues, including health & safety, environmental and commercial risk.

Engineering Practice (P)	
P1i	Knowledge of contexts in which engineering knowledge can be applied (e.g. operations and management, application and development of technology, etc.).
P2i	Understanding of and ability to use relevant materials, equipment, tools, processes, or products.
P3i	Knowledge and understanding of workshop and laboratory practice.
P4i	Ability to use and apply information from technical literature.
P6i	Ability to use appropriate codes of practice and industry standards.
P7	Awareness of quality issues and their application to continuous improvement.
P11i	Awareness of team roles and the ability to work as a member of an engineering team.
Additional General Skills (G)	
G1	Apply their skills in problem solving, communication, information retrieval, working with others, and the effective use of general IT facilities.
G2	Plan self-learning and improve performance, as the foundation for lifelong learning/CPD.
G3i	Plan and carry out a personal programme of work.
G4i	Exercise personal responsibility, which may be as a team member.

18. Learning and teaching methods

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

Students will be trained on practical skills at the AMRC Training Centre including machining and tooling, material handling and health and safety, which will support the practical learning outcomes throughout the course.

All of the students taking this course of study will be in full time employment with an engineering employer. The professional skills developed during the students' employment, e.g. operation of manufacturing processes, professional conduct and social responsibility, report writing, team work and communication are expected to support many of the learning outcomes assessed through the course. Where specific opportunities arise for students to develop their learning based on their employment, job related skills will be embedded into the module design. Where students are working in the areas of industry which are studied in the course, students will be actively encouraged to contribute knowledge and experience from their employment to enrich group learning, for example by bringing videos, examples of products or practical engineering projects.

The main teaching, learning and assessment methods adopted for each learning outcome are shown below. In most cases a combination of methods is used.

The blended learning pedagogical model will be adopted where appropriate, with instructional content provided for independent study time so that contact time can be used for exercises, problem cases and discussion.

Independent study is relevant to all modules and is intended to be used by students to watch pre-recorded lectures, with quizzes, available on-line through computers, laptops and tablets; read chapters from nominated textbooks and other material; prepare for contact time i.e. tutorials, problem classes, seminars; and develop coursework to improve the understanding of presented topics during the classes.

Lectures (whether during contact time or recorded) are the principal means of imparting knowledge. Some lectures will be pre-recorded for independent study or captured by My Echo and made available on-line through computers, laptops and tablets.

Tutorials will be used to briefly and formatively assess independent study (the instructional content from lecture captures, case study examples and reading material). The main aim of tutorials is to explore topics in more detail either through structured discussion or case studies.

Problem solving classes will provide time for students to identify specific problems, difficulties and solutions, to develop their confidence and competence in problem solving. Students will also be given more complex problems to solve in small groups or individually, with lecturer support.

Laboratory classes provide opportunities for students to practice and develop a range of discipline-based techniques; apply and investigate theoretical and conceptual knowledge; develop experimental techniques and approaches, analysing, interpreting and presenting their findings and data; developing personal and transferable skills such as problem solving, team working, following protocols and working safely.

Design classes enable students to practice design methods and to offer a design solution relevant to their workplace. The students will test their creativity, problem solving skills and will utilise team working, communication and presentation skills. Tackling a design challenge within their own organisation will also test students' commercial awareness.

In addition to planned teaching and learning activities, students are also expected to learn through the preparation of coursework assignments and other assessment activities which generally require students to seek additional information and work on their own, or in small groups, to develop understanding of the subject matter.

19. Assessment and feedback methods

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

Knowledge and understanding are primarily assessed through written examinations and coursework, which includes oral presentations and written reports.

Written examinations – unseen examinations.

Coursework submission – designed to test knowledge and communication skills; these include design studies, computing assignments, and laboratory reports.

Oral presentations – these take the form of individual oral presentations or group presentations in which each group member plays a part.

20. Programme structure and student development

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

The first year of the Foundation Degree programme is taught through a series of compulsory 10 and 20 credit modules and an elective 10 credits which are shared with students registered on the Foundation Degree programmes in Mechanical Manufacture and Maintenance Engineering. The core syllabus of six key threads (mathematics; electrical systems, manufacturing systems and materials, mechanical science, design, engineering practice) aim to develop the essential skills and knowledge in the fundamentals of engineering science, mathematics, professional engineering practice and design required of a professional engineer. The common first year also provides students with an opportunity to apply to transfer to either of these programmes at any time up the end of the first year, with the agreement of their employer.

The second year continues with compulsory 20 credit modules within the six threads such as Further Mathematics and Computing for Engineering; Further Engineering Science; Control and Automation; Professional Responsibility and Sustainable Manufacturing and Multidisciplinary Design, which are shared with other Foundation Degree programmes. There is also a 10 credit module which is shared with the Maintenance engineering programme, Manufacturing Systems and a 10 credit module which is particular to the Manufacturing Technology programme: Machining, joining and thermal processing.

All modules on the Manufacturing Technology foundation degree will ensure that students acquire the necessary knowledge, understanding and skills to meet the programme objectives and sufficient preparation for the top up degree year, if they choose to continue their education.

Students may graduate with a Foundation Degree or continue to take a top up degree in Manufacturing Technology which will allow them to graduate with a BEng degree in Manufacturing Technology. Graduates may then take an MSc or equivalent in suitable subjects to meet the full educational requirements for CEng, giving additional flexibility and choice of career options.

Level 1 (1st year)	Students will consolidate their mathematical and engineering science knowledge and begin their academic introduction to manufacturing processes and materials engineering, professional development for engineers, operations management, electrical engineering and instrumentation, and design and CAD CAM. They will embark on practical experiments and be able to present, interpret and evaluate data. Design will require conceptual thinking, analysis, logical problem solving and presentation of a solution, enabling the development of communication and presentation skills. Students will develop their independent learning skills, team working and time management. The assessments will, where possible, relate to the student's employment and job roles to enable the integration of the academic and work-based elements.
Level 2 (2nd year)	Students will develop a more extensive knowledge and deeper understanding of the principal areas of manufacturing technology, continuing with the main themes (mathematics, electrical systems, manufacturing and materials, mechanical science, design and engineering practice). Students will apply their knowledge to more advanced problem solving in multidisciplinary design.

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.

21. Criteria for admission to the programme

A minimum of two A-Levels at grade B or above, including a mathematical based subject and a science, technology, engineering or an additional mathematics related subject; an Engineering BTEC level 3 with 120 credits at distinction and merit level; or equivalent qualifications such as Cambridge Technicals.

Plus five GCSEs at grades 4 to 6, including mathematics, English and a science, technology or engineering related subject.

22. 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 (2014)
https://www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf

University Strategic Plan
http://www.sheffield.ac.uk/strategicplan

Learning and Teaching Strategy (2016-21)
https://www.sheffield.ac.uk/polopoly_fs/1.661828!/file/FinalStrategy.pdf

23. Additional information

Further information is available at https://amrctraining.co.uk/apprenticeships/degree-apprenticeships-level-6

This specification represents a concise statement about the main features of the programme 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.