Programme Specification

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

1	**Programme Title**	Manufacturing Technology (Top Up)
2	**Programme Code**	AMRU24 (Apprenticeship Rolls-Royce)
3	**JACS Code**	H700 / HECOS 100209
4	**Level of Study**	Undergraduate
5a	**Final Qualification**	BEng
5b	**FHEQ Level**	6
6	**Intermediate Qualifications**	None
7	**Teaching Institution** (if not Sheffield)	Not applicable
8	**Faculty**	Engineering
9	**Department**	AMRC
10	**Other Departments involved in teaching the programme**	None
11	**Mode of Attendance**	Full-time
12	**Duration of the Programme**	12 months
13	**Accrediting Professional or Statutory Body**	IMechE, IET (both to be sought)
14	**Date of production/revision**	Revised February 2022

15. Background to the programme and subject area

The Top up Degree in Manufacturing Technology will be offered to students (via their employers) as the development phase technical element of a degree apprenticeship (as the follow on qualification from the Foundation Degree or Higher National Diploma). 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 higher 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 students completing the Foundation Degree in Manufacturing Technology (in work in local engineering and manufacturing firms), or students with a Higher National Diploma, and aims to provide the specialist knowledge and skills to complement the professional competence that the apprentices will be required to demonstrate.

The foundation degree (a pre-requisite) introduces students to the methods, processes and systems used in modern manufacturing. The top up degree further develops specialist knowledge and techniques and introduces management tools and techniques.

From this foundation, students will be ready for the top up degree which includes supply chain management; mould and tooling design; additive manufacturing or wear, lubrication and tribology, further composite manufacturing; further engineering science and an industrial project which will be a work-based project (as apprentices the students are in employment) to enable students to apply their knowledge to their own organisation and for employers to realise a return on their investment.

Students will continue to develop the range of skills, knowledge and practical application needed to work

towards Incorporated Engineer registration within a range of 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. It 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 top up degree are to:

1. provide access to a bachelor's degree in manufacturing technology to degree apprentices from a range of academic, social and employer backgrounds;
2. produce manufacturing technology graduates who are equipped with the technical and scientific knowledge, understanding and skills appropriate to graduate roles in their organisations, developing students within their professional working career;
3. develop in students an independent thought, intellectual curiosity and critical approach to evidence, theories and concepts and their application;
4. develop in students a range of subject specific and generic skills appropriate to their employment;
5. develop in students the social, commercial and ethical awareness necessary for a professional engineer;
6. enabling students to maximise their potential throughout the programme;
7. assess a range of student skills, identify and support academic excellence and their application to work-based situations;
8. develop in students interpersonal, problem solving and transferable skills appropriate to an engineer;
9. develop students' appreciation of the wider engineering context, including the social, business and commercial considerations necessary for a professional engineer;
10. engender attitudes and provide skills which will promote lifelong learning;
11. prepare students for Incorporated Engineer status, post-graduate work and their career in manufacturing.

17. Programme learning outcomes

Knowledge and Understanding:	
By graduation students will have a knowledge and understanding of:	
K1	the concepts, theories and principles of manufacturing technology;
K2	mathematics necessary to apply engineering science to manufacturing technology;
K3	analytical methods used in engineering;
K4	use information technology for analysis, design and simulation/modelling;
K5	Operation of the manufacturing engineering industry, including business practice and project management.

Skills and other attributes:	
Intellectual Skills - Students will be able to:	
I1	use engineering science, mathematics and, where appropriate, information technology to analyse engineering problems;
I2	analyse and interpret experimental and other numerical data;
I3	carry out a health and safety risk assessment and devise a safe system of working;

I4	demonstrate creativity and innovation in solving unfamiliar problems;
I5	exercise independent thought and judgement;
I6	solve unfamiliar problems using creativity and innovation.

Practical Skills - Students will:	
P1	use appropriate mathematical methods for modelling and analysing manufacturing technology problems;
P2	conduct experimental laboratory work and analyse the results;
P3	use IT tools for computational and analytical purposes;
P4	prepare technical reports and presentations.

Transferable Skills - Students will:	
T1	use information technology effectively;
T2	communicate effectively, orally and in writing;
T3	collaborate with others in teams;
T4	manage their time efficiently;
T5	find information and learn independently;
T6	solve problems logically;
T7	scope out and manage a work-based project.

18. Teaching, learning and assessment

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 ie 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. They 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 and 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.

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.

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.

LEARNING OUTCOME (abbreviated - see Section 17 for full text)	Teaching/Learning					Assessment					
	Lectures	Tutorials, problem solving class	Laboratory practicals	Coursework, presentations	Tutorials	Formal unseen examination	Laboratory reports	Coursework and presentations	Design portfolio	Industrial project	Individual presentations
K1 concepts, theories	·	·	·	·	·	·	·	·			
K2 mathematics	·	·		·	·	·	·	·			
K3 analytical methods		·		·	·	·	·			·	
K4 IT		·		·	·		·	·	·	·	·
K5 operation of manufacturing	·	·		·	·			·		·	·
I1 analyse problems		·	·	·	·	·	·	·		·	
I2 analyse / interpret data		·	·	·	·	·	·	·		·	
I3 risk assesments			·	·			·	·		·	
I4 creativity		·	·	·	·	·	·	·		·	
I5 independent thought		·	·	·	·	·	·	·		·	
I6 solve problems		·	·	·	·	·	·	·		·	
P1 mathematical methods		·	·	·	·	·	·	·			
P2 lab work			·	·	·		·	·		·	

P3 IT tools		·	·	·	·		·	·		·	
P4 reports and presentations			·	·	·		·	·		·	
T1 use IT effectively		·		·			·	·		·	
T2 communicate effectively		·		·	·	·	·	·		·	
T3 collaborate in teams		·		·							
T4 manage time efficiently	·	·	·	·	·	·				·	
T5 learn independently	·	·	·	·	·			·		·	
T6 solve problems logically		·	·	·	·	·	·	·		·	
T7 manage a project		·		·	·					·	

19. Reference points

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

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

Framework for Higher Education Qualifications (2014)
https://www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf

University Vision
https://www.sheffield.ac.uk/vision

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

Advanced manufacturing engineering apprenticeships
https://www.gov.uk/guidance/advanced-manufacturing-engineering-apprenticeships

Degree apprenticeship standards and frameworks
http://semta.org.uk/careers/higher-apprenticeships

20. Programme structure and regulations

The programme structure is modular with a total of 120 credits. The programme runs for 12 months to allow adequate time for the students to scope a relevant work-based project within their own organisation.

Student will study the fundamental science and mathematics relevant to manufacturing technology in the preceding foundation degree.

The top up degree will continue the engineering practice, mechanical science and manufacturing materials threads in the supply chain management; mould and tooling design; additive manufacturing or wear, lubrication and tribology; further composite manufacturing; project management; and a 30 credit industrial project which will be work-based in the student's own organisation.

Students will 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.

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. Student development over the course of study

Level 3	The top up degree will continue the engineering practice, mechanical science and manufacturing materials threads in the supply chain management; mould and tooling design; additive manufacturing or wear, lubrication and tribology; further composite manufacturing; project management; and a 30 credit industrial project which will be work-based in the student's own organisation. Students will develop more extensive specialist knowledge of the principal areas of mechanical manufacture.

22. Criteria for admission to the programme

A pass in the Foundation Degree in Manufacturing Technology, or equivalent qualification, or relevant Higher National Diploma qualification.

23. Additional information

Further information is available at http://www.amrctraining.co.uk/higher-education