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**	Aerospace Materials
2	**Programme Code**	CMBT013
3	**JACS Code**	J511, H400
4	**Level of Study**	Postgraduate
5a	**Final Qualification**	Master of Science in Engineering (MSc(Eng))
5b	**QAA FHEQ Level**	Masters
6	**Intermediate Qualification(s)**	Postgraduate Diploma (PG Dip), Postgraduate Certificate (PG Cert)
7	**Teaching Institution** (if not Sheffield)	Not applicable
8	**Faculty**	Engineering
9	**Department**	Materials Science and Engineering
10	**Other Department(s) involved in teaching the programme**	None
11	**Mode(s) of Attendance**	Full-time
12	**Duration of the Programme**	1 year starting September / October each session
13	**Accrediting Professional or Statutory Body**	The Engineering Council through the Institute of Materials, Minerals and Mining
14	**Date of production/revision**	March 2016, March 2021, March 2026

15. Background to the programme and subject area

This programme is designed to provide in-depth and up-to-date understanding of the materials used in Aerospace Engineering and the developments currently underway. Students on this programme will be expected to have a strong background in a relevant engineering discipline and the course will build on this foundation to provide knowledge of the manufacturing, processing, and properties of a wide variety of metals and composite materials for potential use in airframes and aeroengines. Students will be expected to use the information they gain in case studies and as a basis for an extended research project on materials behaviour or development.

The Aerospace industry has especially high demands for its recruits and requires, among this cohort, well-qualified engineering graduates who also have an in-depth knowledge of aerospace materials and potential developments. Such people are in short supply.

16. Programme aims

The aims of the programme are to:

1. provide an advanced course in materials aspects of Aerospace Engineering suitable for graduate students from a range of first-degree backgrounds and disciplines.

2. provide students with in-depth understanding and practical knowledge and training in fundamental areas of Aerospace Materials, ranging from processing, through characterisation, microstructure and properties, to behaviour and applications.

3. provide students with specialist knowledge, understanding and expertise in a selection of areas of particular relevance, such as the design and applications of materials for airframes and aeroengines. (MSc and PG Dip only).

4. provide students with an opportunity to undertake and report upon a selected, advanced practical or modelling project in a topical area of Aerospace Materials (MSc only).

5. equip students with the experience and knowledge to make distinctive contributions in future careers in the Aerospace and related fields whether in industry (small and large) or academia.

6. improve and augment the existing transferable skills of students, especially in areas of data acquisition and handling, literature searching, report writing and oral presentational skills.

17. Programme learning outcomes

Knowledge and understanding:	
Candidates for MSc, PG Dip and PG Cert will gain:	
K1	A sound knowledge and understanding of the important principles that underpin the design, processing microstructure, properties, behaviour and applications of Aerospace Materials.
K2	Familiarity with essential primary and secondary source materials appropriate to the programme of study.
In addition, candidates for MSc or PG Dip will gain:	
K3	A sound knowledge and understanding in specialist areas of Aerospace Materials, especially in design, production and performance of materials for airframes and aeroengines.
In addition, candidates for MSc will gain:	
K4	A detailed knowledge and critical understanding in a current and topical area of research in Aerospace Materials.

Intellectual skills	
On successful completion of the programmes, candidates for MSc, PG diploma and PG Cert will be able to**:**	
I1	Select appropriate materials for aerospace components based on an understanding of their production and performance.
I2	assimilate information from a variety of sources, and précis it in reports, both written and oral.
I3	manipulate and critically evaluate experimental data acquired through practical work.
I4	be resourceful, think analytically and construct and sustain logical argument in both oral and written forms.
In addition candidates for MSc will be able to:	
I5	design experiments that achieve the desired outcomes in optimum fashion.

Practical skills	
On successful completion of the programmes, candidates for MSc, PG Dip and PG Cert will be able to**:**	
P1	produce or process aerospace materials for research on a laboratory scale.
P2	characterise the performance of aerospace materials by measuring relevant properties.
In addition candidates for MSc will be able to:	
P3	design and execute an original research project.

Transferable skills	
On successful completion of the programmes, candidates for MSc, PG Dip and PG Cert will be able to**:**	
T1	report the results of practical work in a coherent and easily assimilated manner, both orally and in writing.
T2	use word processing, spreadsheet and presentation software and a range of appropriate packages to a high standard.
T3	carry out individual directed and self-directed study, and participate effectively in group activities such as seminars and workshops.
T4	find information and learn independently.
In addition candidates for the MSc will be able to:	
T5	prepare an extended written dissertation, to a deadline, based upon an original research project.

18. Teaching, learning and assessment

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

1. **Induction procedures** in the first few weeks of the programme are designed to familiarise students with the important facilities and services within the University. These procedures include an introduction to library resources, and to departmental stores, workshop and laboratory facilities. Valuable information is available also through the relevant departmental web pages and in the Student Handbook for the programme.

2. Traditional **lectures** are used to impart essential knowledge relating to K1 - K3 above.

3. **Seminars** which may be staff-led or student-led, are used throughout the programmes to reinforce material imparted through lectures by allowing students to undertake problem-solving exercises, both ahead of the class and during the class, designed to reinforce understanding and to aid confidence in discussion. Seminars and workshops thus contribute both to the attainment of knowledge and understanding, K1 - K4, and to the development of key skills, particularly T1, I1 and I4.

4. **Tutorials** are smaller-group versions of the seminar and they serve a similar purpose and deliver similar learning outcomes. However, tutorials can also better address individual learning needs and allow discussion of individual problems. They particularly address skills I1, T3 and I4 but elements also of T2.

5. **Practical classes** are held in connection with the modules taught in Semester 1 of the programme. These are designed to reinforce material taught in lectures and discussed in seminars and tutorials. The specific learning outcomes addressed are K1, K2 and P1, P2, T1, I1, I3, I5.

6. The individual **research project** is viewed as a very important contributor to the learning outcomes of the MSc programme, contributing to all elements of knowledge and understanding, K1-K4, and to all skills, I1-5, P1-3, T1-5. Each project is carried out under the guidance of at least one supervisor.

7. **Independent study** is essential to the successful completion of the programme. New students are introduced to study skills during the induction procedures and these are reinforced through seminar, workshop, tutorial and practical assignments. Such study is vital to the proper attainment of all the knowledge, understanding and skills outcomes. Students are positively encouraged to undertake independent study, and are given feedback on the results of this study, particularly through seminars, workshops and tutorials, but also by supervisors during practical classes and (for students on the MSc programme) during the extended research project.

LEARNING OUTCOME (abbreviated – see Section 17 for full text)	**TEACHING**								**ASSESSMENT**					
	Lectures	Practical classes	Coursework assignments	Tutorials/examples classes	Industrial seminars/visits	Group project	Individual research project		Written examinations	Coursework submissions	Laboratory reports	Oral presentations	Group project report	Individual project report
K1 Aerospace materials principles	·	·	·	·	·	·	·		·	·		·	·	·
K2 Source materials	·		·	·		·	·		·	·		·	·	·
K3 Key topics	·	·	·	·	·	·			·	·	·			
K4 Research area	·		·	·	·	·	·		·	·		·	·	·
I1 Find information			·	·		·	·		·	·		·	·	·
I2 Assimilate and précis			·	·		·	·		·	·		·	·	·
I3 Analyse/interpret data		·				·	·				·	·	·	·
I4 Think analytically	·	·	·	·	·	·	·		·	·	·	·	·	·
I5 Design experiments			·			·	·				·		·	·
P1 Produce materials		·					·				·	·		(·)
P2 Characterise materials		·	·	·		·	·		·	·	·	·	·	(·)
P3 Undertake individual research		·					·				·	·		·
T1 Communicate effectively		·	·	·		·	·		·	·	·	·	·	·
T2 Use IT effectively		·	·	·		·	·			·	·	·	·	·
T3 Work individually/in teams		·	·	·		·	·			·	·	·	·	·

T4 Learn independently	·		·	·		·	·		·	·	·	·	·	·
T5 Manage projects/time		·		·		·	·		·	·	·	·	·	·

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

The research interests of the academic staff and the research strategies of the Department of Materials Science and Engineering

20. Programme structure and regulations

The MSc(Eng) consists of eight taught modules which contribute 120 credits to the programme. MSc students will undertake an extended research project (MAT6040) principally during the Summer but with a start during the Spring Semester. The project contributes a further 60 credits, making 180 credits for the overall programme.

Students registered for the PG Dip are offered the same combination of taught modules (120 credits) plus they undertake a research project.

Students registered for PG Cert take a combination of taught modules worth a minimum total of 60 credits.

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

21. Student development over the course of study

The modules taken in the Autumn Semester provide the basic knowledge required for the course and are designed to provide a bridge between existing knowledge possessed by the student and that required by those graduating from the programme. These modules also include training in practical aspects of aerospace materials covering aspects of manufacturing, microstructure, properties and applications, and provide many opportunities to improve on transferable skills, including language skills for overseas students. These modules total 60 credits and success in these is a prerequisite to progression on either the MSc or PG Dip programmes. There is a possible exit point at this stage with the award of PG Cert (requires 60 credits).

Students registered for the MSc will undertake a research project (MAT6040) in a selected area or topic, principally during the Summer period. The choice, which requires appropriate consultation with members of staff contributing to the course, is made early in the Autumn Semester so that 1) skills development activities can be related to the project and 2) you can undertake any necessary preliminary work. To graduate with MSc, students are required to pass also this project which contributes a further 60 credits to the programme, making 180 in total.

22. Criteria for admission to the programme

Detailed information regarding admission to the programme is available at http://www.shef.ac.uk/study

23. Additional information

For further information, students are directed to the Materials Science and Engineering web site at http://www.shef.ac.uk/materials

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.