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

1	**Programme Title**	Polymers and Composites
2	**Programme Code**	MATT03
3	**JACS Code**	J400, F000
4	**Level of Study**	Graduate
5	**Final Qualification**	MSc
6	**Intermediate Qualification(s)**	Postgraduate Diploma, Postgraduate Certificate
7	**Teaching Institution** (if not Sheffield)	Not applicable
8	**Faculty**	Engineering
9	**Home Department**	Materials Science and Engineering
10	**Other Department(s) involved in teaching the programme**	Chemistry
11	**Mode(s) of Attendance**	Full-time
12	**Duration of the Programme**	1 year
13	**Accrediting Professional or Statutory Body**	The Engineering Council through the Institute of Materials, Minerals and Mining
14	**Date of production/revision**	July 2016, Revised March 2022

15. **Background to the programme and subject area**

Polymer science and engineering are fast moving and expanding disciplines, with increasing emphasis being placed on the design of polymers and polymer-based materials with controlled architectures for applications in a variety of high technology areas. A variety of organisations have recently issued statements highlighting the need for more graduates trained in polymer science and engineering, e.g. the British Plastics Federation and the Polymer National Training Organisation. This interdisciplinary, cross-faculty programme focuses on these new developments, as befits one being offered by a research-led university with an international reputation in polymer science and engineering,

Distinctive features of the MSc, PG Dip and PG Cert programmes are that:

- they are offered under the auspices of the internationally renowned Polymer Centre at Sheffield and are informed by the research carried out in the Centre;
- they are jointly taught by staff from the Departments of Chemistry and Materials Science and Engineering, both are rated top 10 for research output in their respective disciplines (REF 2014);
- the MSc contains a substantial research project which is carried out in one of the laboratories of the Polymer Centre.

Further information is available at https://www.sheffield.ac.uk/postgraduate/taught/courses/2022/polymers-and-composites-msceng

16. Programme aims

The aims of the programme are to:

1) provide a broadly based course in modern aspects of polymer science and engineering suitable for graduate students from a range of first-degree backgrounds and disciplines;

2) provide students with firm understanding and practical knowledge and training in fundamental areas of polymer science and engineering ranging from synthesis, through characterization and properties, to behaviour and applications, and life cycle assessment;

3) provide students with more specialist knowledge, understanding and expertise in a selection of high technology areas of particular timeliness and relevance, such as applications of polymers in biomedicine, “smart”

polymer behaviour, synthesis of polymers with controlled architectures, polymeric materials with applications in electronics, etc. (MSc and PG Dip only);

4) provide students with an opportunity to undertake and report upon an advanced practical project in a topical area of polymer science or engineering of their choosing (MSc only);

5) equip students with the experience and knowledge to make distinctive contributions in future careers in emerging areas of polymer science and engineering, whether in industry 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	Sound knowledge and understanding of the important chemical, physical and engineering principles that underpin the synthesis, properties, behaviours, applications and sustainability of polymers.
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	Sound knowledge and understanding in several specialist, high technology, areas of polymer science and engineering.
In addition, candidates for MSc will gain:	
K4	Sound knowledge and critical understanding in a current and topical area of research in polymer science or engineering.

Skills and other attributes:	
Candidates for MSc, PG Dip and PG Cert will gain:	
S1	Practical laboratory and workshop skills in important aspects of polymer synthesis, behaviour and characterization, including in the use of instrumental methods.
S2	The ability to plan experiments so as to achieve the desired outcomes in optimum fashion.
S3	Skills in manipulating, critically evaluating and presenting experimental data acquired through practical work.
S4	Skills in reporting the results of practical work in a coherent and easily assimilated manner, both orally and in writing.
S5	The ability to critically evaluate information contained within source materials, to assimilate it and to precis it in reports, both written and oral.
S6	The ability to carry out individual directed and self-directed study, and to participate effectively in group activities such as seminars and workshops.
S7	Subject specific IT skills such as effective use of chemical drawing software, and ability to retrieve relevant material via electronic databases such as SciFinder, Web of Science, MDL Crossfire, etc.
S8	Further transferable skills, valuable for employment, including the development of individual resourcefulness, analytical thinking, the ability to construct and sustain logical argument, and presentation in both oral and written forms.
In addition, candidates for MSc will gain:	
S9	Skills in designing and executing an original piece of research.
S10	Skills in preparing an extended written report/dissertation, to a deadline, based upon an original piece of research.

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 programmes are designed to familiarise students with the important facilities and services within the University and within the Departments contributing to the course. 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**, along with pre-recorded and live online sessions, backed by other online course materials and exercises, are used to impart essential knowledge relating to K1-K3 above.

3. **Seminars and workshops**, which may be staff-led or student led, are used throughout the programmes to reinforce material imparted through lectures. They allow students to undertake problem-solving exercises, both ahead of the class and during the class, which are 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 S4, S5 and S8.

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 S5, S6 and S8 but elements also of S7.

5. **Practical classes** are held in connection with the units taught in Semester 1 of the programmes. These are designed to reinforce material taught in lectures and discussed in seminars and tutorials. The specific learning outcomes addressed are K1, K2 and S1 - S5.

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, S1-S10. Each project is carried out under the guidance of two supervisors, one of whom has relevant specialist knowledge and who is the main supervisor. As part of the project assessment, the students will make a poster presentation of their respective projects (S8).

7. **Independent study** is essential to the successful completion of the programmes. 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.

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

Regular formative assessment, in the form of periodic tests, written exercises prepared for discussion in seminars, workshops and tutorials, and the preparation of reports of practical exercises, is used to monitor student progression through the taught units of the programmes, and to pick up and rectify areas of potential weakness, especially with regard to K1, K3 and S1-S5.

Summative assessment is mainly through the medium of conventional, end-of-semester, written examinations, but course work elements also contribute. Semester 1 units also have a practical component, which is examined through the medium of written laboratory reports.

Formal assessment of the taught units uses a combination of:

1) written examinations, which will allow students to demonstrate core and specialist subject knowledge (K1-K3),

2) essays, numerical exercises, other written and oral presentations, designed to test not only knowledge (K1-K3) but also important subject-specific and transferable skills (S4-S8), and,

3) assessed practical exercises, which will allow students particularly to demonstrate attainment of skills S1-S4, and (in part) S5, S7 and S8,

The division of assessment of taught units between examinations and continuously assessed work (CAW) may vary for different modules, typically 0.75 examination and 0.25 CAW.

The assessment of the extended research project is via a dissertation. Students will be able, through this, to demonstrate specialist knowledge (K4) and a wide range of skills (S2, S3, S5, S6 (in part) and S7-S10). Project

supervisors (for students on MSc programme) are able to monitor student performance during the research project and to provide feedback to students and to arrange additional tuition if this proves necessary.

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 Departments of Materials Science and Engineering, Chemistry, Physics and Astronomy;

The aims and objectives of the outreach programme of the University of Sheffield Polymer Centre as expressed to HEFCE (HEIF grant HIF069, 2002 - 2005);

The needs of the UK economy for graduates trained in polymer science and engineering as expressed through various publications arising from the British Plastics Federation and the Polymer National Training Organisation;

The needs of national and international companies seeking graduates with experience of polymer science and engineering, especially as expressed by members of the Industrial Advisory Panel of the Polymer Centre (Avecia, Unilever, UCB Films, Cytec, and ICI/National Starch)

20. Programme structure and regulations

The Programme for MSc consists, in Semester 1, of five compulsory (core) units (15 credits each), **three** compulsory units in Semester 2 (15 credits each).

These taught units, between them, contribute 120 credits to the programme.

Also, starting in Semester 2 and running through the summer period, students undertake, in one of the Departments contributing to the programme, an extended research project. This project contributes a further 60 credits, making 180 credits for the programme as a whole.

Students registered for the PG Dip are offered the same combinations of taught units (120 credits in total) plus they undertake a research project.

Students registered for PG Cert take a combination of taught courses (normally in Semester 1) worth a total of 60 credits.

Through the combination of core taught units, and (where applicable) through the medium of the research project, the MSc and PG Dip programmes offer both **coherence** and **student choice**. The programme for PG Cert is naturally more circumscribed, especially with respect to student choice.

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. Progression through the programme structure

The five core/compulsory units taken in Semester 1 provide the “vocabulary and grammar” of polymer science and engineering, and a bridge between the existing knowledge possessed by the student and that required by those graduating from the programmes. They give the necessary background to the more specialist units offered in Semester 2. These modules also include training in practical aspects of polymer science and engineering covering aspects of synthesis, characterization, properties, behaviour and applications, and provide many opportunities to improve on transferable skills. These modules total 75 credits and success in these is a necessary prerequisite to progression on either the MSc or PG Dip programmes. There is a possible exit award at this stage of PG Cert (requires 60 credits).

In Semester 2, the three more specialized modules allow students to further their knowledge in polymer composites science and engineering. There is a further exit award at this stage of PG Dip. Students graduating with PG Dip are required to succeed in two Semester 2 units (totalling a further 30 credits) in addition to the Semester 1 units.

Also in Semester 2, but extending into the summer, students registered for MSc undertake a research project in an area, and on a topic, of their choosing. This choice, which is made after appropriate consultation with members of staff contributing to the course, can be made early in the programme. To graduate with MSc, students are required to pass also this project unit 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 polymers course web site at https://www.sheffield.ac.uk/postgraduate/taught/courses/2022/polymers-and-composites-msceng

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.