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	Polymer Chemistry
2. Programme code	CHMT01
3. QAA FHEQ level	Level 7
4. Faculty	Science
5. Department	Chemistry
6. Other departments providing credit bearing modules for the programme	Materials Science and Engineering
7. Accrediting Professional or Statutory Body	None
8. Date of production/revision	Revised for 2022-23 Session

Awards	Type of award	Duration
9. Final award	Master of Science (MSc)	1 year
10. Intermediate awards	PGDip (120 credits)	9 months
	PG Cert (60 credits)	9 months

Programme Codes

11. JACS code(s) *Select between one and three codes from the HESA website.*	F162	J410	
12. HECoS code(s) *Select between one and three codes from the HECoS vocabulary.*	100417	101053	

Programme Delivery

13. Mode of study	Full-time
14. Mode of delivery	Face to face

15. Background to the programme and subject area

Since their invention in the early 20th century, polymers have proven to be a highly successful class of materials that quickly expanded to be a hugely significant sector of the chemistry industry. Consequently, polymers have become ubiquitous in modern life with applications in our clothes, food packaging and storage materials, healthcare and cosmetic products, electronic devices, aerospace, and beyond.

However, it is now understood that this success has come at a price, as the environmental impact of these materials has been discovered. In response, the polymer industry in the 21st century needs to move beyond developing new materials with ever improving properties and ease of production to address both environmental challenges and the need to make our petrochemical feedstocks work much harder than providing low-cost single-use throwaway materials.

This MSc in Polymer Chemistry aims to provide a route for BSc graduates in Chemistry and Chemistry-allied disciplines to develop their understanding of these important materials. They will not only get a firm grounding in the chemistry of making and characterising polymers, but they will also learn about the environmental challenges of the modern polymer industry, and learn how the latest research in polymer chemistry addresses current challenges while also developing new high performance materials. They will enhance their employability, and undertake a cutting-edge research project.

The programme is suitable for candidates who wish to undertake higher level polymer research study, or follow a career in polymer research, as a subject specialist in chemical education, or as a professional (scientist) in the polymer industry.

The Department of Chemistry in Sheffield has an international reputation in research and teaching and polymer chemistry is a particular area of strength. The MSc programme enables students to tailor their study to their individual needs and interests through a selection of optional lectured modules, in their choice of topic for their substantial research project, and in their research and professional skills training.

More information about the Department, the staff, and admissions is to be found on the Web at http://www.shef.ac.uk/chemistry/.

16. Programme aims

MSc Polymer Chemistry aims to:	
A1	Provide a strong grounding in the essential knowledge and understanding needed for careers in polymer chemistry, as well as more in-depth knowledge and understanding in more specialised areas of polymer chemistry through exposure to advanced concepts in research-led teaching.
A2	Enhance competence in practical polymer chemistry including specialist skills in experiment planning, chemical manipulation, data acquisition and analysis used in research at the forefront of the discipline through the medium of a laboratory-based project.
A3	Prepare students for a professional career in polymer chemistry through the development of professional skills and attributes including knowledge of disciplinary norms of conduct such as ethical and moral implications of chemical research on society.

A4	Prepare students for a research career in polymer chemistry through the completion of research at the forefront of the discipline, following established research methodology to design and carry-out an extended project including use of the literature and communication of results in oral and written media.

17. Programme learning outcomes

Knowledge and understanding

On successful completion of the programme, students will be able to demonstrate knowledge and understanding of:

1. Polymer chemistry concepts and demonstrate critical awareness of specialised area(s) at the forefront of contemporary polymer chemistry.
2. The design, execution, evaluation, and reporting of the results of a substantial original research project applying the appropriate knowledge within and up to the frontiers of the discipline.
3. Using chemical concepts and methods to interpret phenomena in society, technology, and the natural world. Articulating moral and ethical implications of chemical research for the researcher in and on society.
4. how to solve a range of problem types by applying a range of specialised chemistry principles and knowledge, using logical methodology, demonstrating creative and analytical thinking, and including situations with limited information. Demonstrate competence in decision making in a chemical context including critical evaluation of potential options applied within a complex environment
5. Planning, conducting and accurately recording the results of experiments using advanced practical laboratory techniques and following safe laboratory practice.
6. the analysis and representation of chemical data using contemporary information technology packages appropriate to the research subdiscipline
7. finding, communicating and critically evaluating information from the frontiers of polymer chemistry, through a variety of written and oral media using discipline-specific conventions where appropriate.
8. how to work independently and as part of a team deploying effective organisation, personal responsibility, and planning skills.
9. how to describe their skills, attributes and experience, and critically reflect on professional development to foster lifelong learning skills.

		Links to Aim(s)
K1	Fundamentals of polymer chemistry, as well as at the frontiers of research, demonstrating critical awareness of the field.	A1
K2	The ability to apply the basic methodology of research.	A1, A3, A4
K3	Key laboratory techniques for use in polymer chemistry for collecting experimental data in a safe and responsible manner.	A2
K4	Techniques and methods used in analysing and reporting of experimental data.	A2
K5	Contemporary information technology packages and specific conventions of polymer chemistry used in the communication of scientific information in written and oral media.	A2, A4
K6	Scientific research ethics and integrity.	A3, A4

K7	Platforms and mechanisms for communicating and advertising skills attributes and experience in a professional environment.	A3
Skills and other attributes On successful completion of the programme, students will be able to:		
S1	Apply polymer chemical principles to the solution of problems at the frontiers of knowledge in the specialism.	A1-4
S2	Demonstrate relevant practical laboratory skills including risk and safety consideration.	A2, A4
S3	Plan research.	A3, A4
S4	Demonstrate skills in the oral and written presentation of experimental results.	A2-4
S5	Demonstrate competence in decision making in the context of polymer chemistry including critical evaluation of potential options and in a complex environment.	A2-4
S6	Demonstrate quantitative and qualitative problem solving, including situations with limited information.	A1-4
S7	Show data literacy and skills in numeracy and computation, including error analysis and different formats of presenting data.	A1-4
S8	Use scientific information sources, including information retrieval and critical analysis of the published literature.	A1-4
S9	Work independently and as a member of a team.	A2-4
S10	Work effectively, to plan work, and to manage their time.	A1-4
S11	Reflect on their own development and communicate their skills, attributes and experiences to others and build skills and attributes for lifelong learning.	A3
S12	Design experiments to test a hypothesis.	A4
S13	Carry out science with the highest ethical and moral standards.	A3, A4

18. Learning and teaching methods

The MSc course comprises 180 credits of study and includes a 60 credit research project.

The taught part of the programme consists of core lecture modules, a choice of optional modules, a taught laboratory programme, and a module focussed on developing research, presentation and professional skills.

The core modules give students a grounding in the fundamental principles of what polymers are, why they behave as they do, and the principal methods they are synthesised. They also learn about the environmental impacts of polymers, and how new technologies are addressing these issues. They also get real-world appreciation of how polymers can be designed to meet the needs of specific applications by studying case-studies.

Students will choose 2 optional modules (2 x 15 credits) from a range of topics, allowing them to tailor their studies to reflect their interests and strengths.

The lecture modules are designed to stretch students' knowledge and understanding to more advanced levels and into cutting-edge areas of research. Each module will be supported by class workshops, which develop students' abilities to apply their knowledge of the fundamental principles to

solving problems and other polymer chemistry-related skills.

The students will take part in a taught laboratory course, which will begin with structured experiments where they develop key laboratory skills, before moving onto an open-ended laboratory-based mini-project. The students perform the project in groups under the direction of a staff project director, organising their own divisions of time and labour in order to achieve success. An important part of this module is to learn about and practice the communication of scientific results in preparation for their main 60-credit research project.

Additional preparation for the project and for graduation as a professional chemist will be undertaken in the "Research and Presentation and Professional Skills" module. This will develop essential skills for employability, research, the communication of research and the attributes of a professional scientist. This module is designed to also allow project and person specific training and development after a training needs analysis. The portfolio produced in the module will serve as a sound foundation for the project and progression after graduation. This module involves a variety of different learning and teaching methods including lectures, group and individual work and some self-directed learning.

The 60-credit research project is carried out during late spring and summer under the direction of a member, or a team, of academic staff from the Chemistry Department. These projects can lead to research publications in peer-reviewed journals.

19. Assessment and feedback methods

Lecture modules are assessed by coursework with the exception of the core Essential Polymer Chemistry Module which has a "competency exam" covering the absolute essentials of polymer science in addition to coursework. The coursework assessments are designed to test not only the students' knowledge and understanding of the subject, but also their ability to apply that knowledge to solving problems. A variety of coursework formats allows students to develop and demonstrate various writing and presentation skills. The workshops are a formative assessment, where the students' knowledge is reinforced, and essential problem solving skills are developed. In some cases workshops are also designed to equip students with specific sub-discipline skills.

The lab module consists of short skills-development experiments, followed by a group mini-project. The skills-development experiments are assessed formatively. These will give opportunities to practice short sections of scientific writing, and receive feedback on these. The mini-project is assessed via a carefully structured scheme in which students submit a written report following standard conventions in the discipline. Peer assessment and a group mark are also awarded. Feedback on all marks will be given.

During the skills module students undertake a written literature review and produce an oral presentation under the supervision of a member of academic staff. Interim feedback on both of these activities will be available. In addition, students will produce a portfolio of work for assessment evidencing compulsory and elected training and development for research, employability and professional activity. Full guidance and an interim feedback session on each students' portfolio will be available to students.

Research projects are assessed using a combination of panel interviews and research reports, as well as an assessment of practical ability and student intellectual input by the project supervisor. The assessment scheme is carefully structured and uses well-defined criteria agreed with external examiners. The project supervisor will provide feedback on a writing sample and will provide general project performance feedback half way through the project.

In addition to the formalised feedback points in modules, the Department runs a comprehensive personal tutor system for PGT students including guidance on the choice of modules and projects. Tutors are available to discuss study techniques and strategies and academic progress with students on request and students are asked to attend at least one tutor meeting per semester.

20. Programme structure and student development

The MSc Polymer Chemistry programme comprises 180 credits of study in total and includes a 60 credit research project.

The programme seeks to provide a strong grounding in the fundamental knowledge and skills needed to work in the modern polymer industry, and to undertake careers in polymer research. Students will develop advanced polymer chemistry laboratory skills and the ability to communicate scientific results (30 credits) alongside developing the skills necessary to undertake research and act as a professional scientist (30 credits). Part of the skills modules allows students to tailor their development of training to prepare for their particular research project and to meet their personal needs through conducting a training needs analysis. These modules are undertaken during the autumn and spring semesters.

The taught sections of the course are divided into core and optional components. Aside from skills development as mentioned above, all students will be taught the fundamentals of the subject area, and the key experimental skills needed to work with these materials. The core also contains a sustainability module, to equip students for the future needs of the polymer industry, and an application-led module to give students the insight into how their knowledge can be used to address a variety of situations through the study of case-studies.

The optional components will allow students to tailor their learning to suit their interests, strengths, or future career plans. They will be able to study the chemistry of polymers more deeply, explore biological applications of these materials, or study more applied engineering properties of polymers.

Finally, students will undertake the 60 credit research project under the supervision of a member, or a team of academic staff, in the field of polymer chemistry. The project takes place from late spring through the summer semester. These projects can lead to the creation of chemical knowledge and research publications in peer-reviewed journals.

Through their studies students will be guided by their personal tutor who will meet with them at least once per semester, but more frequently as required. The tutor will provide guidance on module and project choice as well as support with study skills and development.

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

21. Criteria for admission to the programme

The entry requirements for MSc Polymer Chemistry are:

BSc (Hons) 2:1 or equivalent in chemistry or a chemistry-related subject.

Entry requirements for international students

Overall IELTS score of 6.5 with a minimum of 6.0 in each component, or equivalent.

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

None

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.