Polymer Chemistry MSc

Full-time Taught Masters Programme
2017-18
Warwick’s International Community contributes greatly to the vibrant, cosmopolitan atmosphere on campus. With over 100 different nationalities represented you will be working and living with people from all over the world.

Accommodation consists of modern, comfortable rooms on campus, mostly en-suite and with high-speed internet and network access. Residences are set in pleasant parklands close to all the campus facilities.

Warwick’s Students’ Union is one of the largest in the country with over 250 societies to choose from. Student events such as ‘one world week’ are internationally recognised and mirror the University’s reputation for innovation and dynamism.

Warwick Sport provides every opportunity for you to try something new or compete in your sport. It offers over 70 different sports clubs, a swimming pool, gym, indoor climbing wall, all-weather tennis courts, 60 acres of outdoor playing fields and much more.

Warwick Arts Centre houses two theatres, a cinema, a 1,400 seat concert hall, the Mead Art Gallery, and a specialised music centre. It is nationally recognised as an outstanding venue for both famous and new artists.

The International Office provides a wide range of services for both prospective and current students, including immigration advice, welfare support and an orientation programme for those new to the UK.

Warwick University’s Campus is an award-winning 700 acre, self-contained campus in the heart of England yet just one hour from London. With fantastic facilities and excellent access to local towns, cities and countryside, it provides an attractive, safe and supportive environment in which to live and study.
A member of the Russell Group, Warwick has consistently been ranked within the UK ‘top ten’ and is positioned within the top 50 universities in the world.

The Library holds over 1 million printed titles and 16,000 electronic journals and offers outstanding resources. The University’s acclaimed ‘Learning Grid’ provides a 24/7 relaxed learning environment with an impressive range of multimedia equipment.

Warwick Careers Service gives students a real head-start in their job searches. Voted by students as the best in the country, the careers service provides outstanding guidance and support. Warwick University is widely recognised by employers as an ideal recruiting ground.

Language Support is offered by The Centre for Applied Linguistics. The Programme in English for Postgraduate Studies (PEPs) prepares students in academic English over 1, 2 or 3 terms. Six or ten week pre-sessional English courses may also be offered if you narrowly miss the English language criteria for Master’s study.

Worship is encouraged by the multi-faith Chaplaincy which welcomes all members of the University community. It is home to Christian, Jewish and Muslim chaplains who, as a valued part of the University’s welfare network, offer spiritual and emotional support.
About the Polymer Chemistry MSc

The success and reputation of Masters study at Warwick is measured through track record; attracting the very best students for over ten years and having world leading academics in their fields.

General Overview
The Polymer Chemistry MSc is delivered by internationally leading experts from the Department of Chemistry, Warwick Manufacturing Group and Physics as well as guest lectures from our industrial partners.

Students gain hands-on practical experience with a range of equipment relevant to each discipline, enabling our graduates to work in any modern laboratory.

This Royal Society of Chemistry MSc will give you excellent opportunity to start your career in a range of areas from pharmaceutical, personal care or automotive, where knowledge in polymer chemistry is highly valued.

Learning Style
The taught component of the programme is a blend of formal lectures, seminars, syndicate work and practical exercises, which encourages teamwork and practical grounding of the material. E-learning and forum activities are widely used to complement these.

Modules are usually taught in an intensive block, allowing you to be fully immersed in each subject area. Tutors are highly qualified and work at the forefront of their specialisation.

A 20 week research project enables you to immerse yourself in a real research project, once again supervised by renowned academics in their field.

Assessment
Performance in modules is assessed by both module assignments and post module examinations. The research component is assessed through a 15,000 word thesis and a presentation of your work.

Industrial interactions
We have a module (CH970) which involves a weekly seminar from an industrial expert. This lets you gain insight into industrial polymer chemistry, but also expands your personal network to accelerate your future career.

Careers
Polymer related industries contribute up to 15% of the UK’s GDP, with around 200,000 jobs. The UK is also a global hub for polymer chemistry research in universities. This course will prepare you for all careers in this exciting field.

The Polymer Chemistry MSc is delivered by internationally leading experts from the Departments of Chemistry, Physics and WMG as well as guest lectures from our industrial partners.
The academic programme is both highly challenging and rewarding. Innovative teaching methods are used to ensure our students engage practically with their studies and are well equipped on graduation to apply this to real world scenarios.

The Polymer Chemistry MSc is structured so that each student takes a combination of ten taught modules and completes a major 20 week research project.

**Help at hand**
A personal tutor is assigned to you from the outset of your MSc, whose role is to provide general academic advice on: (i) progress/development; (ii) pastoral/non-academic matters; (iii) assist you with induction and orientation into university life at Warwick; and (iv) a range of other advice from course changes to financial and accommodation issues.

**Modules**
Modules consist of nominally 50 hours of directed tuition usually delivered in an intensive, fully immersive block. A variety of innovative teaching methods are used to maximise learning and ensure students are well equipped to apply their knowledge in the work place on completion of the course.

Core modules are compulsory and relate specifically to the Polymer Chemistry MSc. There is also a transferrable skills module that is common to all our MSc programmes as we recognise the crucial importance that these skills play in the real world.

**Research Project**
Each student has to undertake a major individual research project. This accounts for 40% of the overall credit and is submitted in the form of a dissertation of approximately 15,000 words. A presentation is held upon completion.

Near the mid point of the course you will be provided with a list of projects relevant to your degree course. However, we can also usually accommodate supervision of projects proposed by students specifically focused on their individual career paths or aspirations.

The project must fulfill the academic requirements of the course. All projects are supervised by a contributing department member of staff and many relate closely to research developments in industry or research at Warwick.

Work on your project runs subsequently to your module work, and offers you an opportunity to immerse yourself in an exciting and modern area of Polymer Chemistry.
Polymer Chemistry MSc Modules

Core Modules

CH967 Fundamentals of Polymerization
Topics covered in this module include: history of polymers and polymerization, terminology in polymer synthesis and characterization techniques, free radical polymerization including kinetics, statistical copolymers and heterogeneous polymerization, step growth polymerization mechanisms, living polymerization techniques including ionic and radical polymerization techniques, and Ziegler-Natta polymerizations.

CH974 Advanced Polymer Synthesis
This module is focussed on the introduction to the state-of-the-art in synthetic polymer chemistry and supramolecular assembly. The material is derived from current research and presented through lectures and seminars with directed reading. Topics include current research into: advanced polymer synthesis and functionalization, polymer architecture, degradable and sustainable polymers or directing polymer self-assembly.

CH969 Physical Properties of Macromolecules
This module aims to comprehensively introduce the unique macroscopic properties of polymer materials, outlining the underlying theory of how polymers behave in bulk and describe characterization methods. Macroscopic properties of polymers are related to the material properties and will provide a critical understanding on plastic materials. Therefore, in the majority of this module, we will focus on the thermal properties, mechanical properties and phase separation of polymers. Students will advance in quantification of each of these properties and the details of the corresponding analysis techniques.

CH975 Advanced Colloidal Materials
This module focuses on introducing the area of colloid chemistry and its underlying and founding physical principles. Capillary forces, wetting/dewetting, interfacial tension, Brownian motion, electrostatic/steric and depletion forces will be discussed in the colloidal regime. These physical phenomena will be linked to colloid particle synthesis (both organic and inorganic), and the formation of emulsions, bubbles and foams as well as discussing colloidal stability and characterization techniques that are required to master the area. Students will also complete an assessed research proposal in the area of the course.

CH970 Polymers in the Real World
This module aims to demonstrate current and real-world applications of polymeric materials that have been described in other modules of the Polymer Chemistry taught masters program and rationalize how different properties are required for different applications. This module is delivered by internal and invited external lecturers from industry and academia, and covers a diverse range of topics from personal care, agrochemicals, publishing and intellectual property.

CH916 Magnetic Resonance
Nuclear magnetic resonance (NMR) in both solution and the solid state as well as electron paramagnetic resonance (EPR) will be described. The module will cover the underlying theory of the experiments as well as practical aspects of recording spectra and their interpretation. The importance of magnetic resonance across science, in e.g., organic chemistry, pharmaceuticals, proteins and polymers will be demonstrated.
CH911 Chromatography and Separation Science
During this interdisciplinary module, students will learn about theory and practice of different types of chromatography and their application in real-world scenarios. They will develop the skills necessary to decide which methods are the most appropriate for a given separation problem – whether for analysis or purification of, for example, synthetic polymers, biomolecules, or biopharmaceuticals. The module includes workshops on data interpretation and lab sessions providing students with hands on experience with several different chromatography techniques.

CH948 Transferrable Skills
This module is designed to be integrated with all the other modules and research work you undertake during your MSc. CH948 aims to help you realise the skills that you have learned during your MSc that ‘transfer’ across the boundaries of any particular module. Its content is the kind of skills that future employers whether in academia or industry or elsewhere are concerned about. Frequently employers are less concerned about your specific technical skills than the fact that you can acquire such skills and use them in a diverse range of future projects.

CH972 Group Research Project
The aim of this module is to make students aware of how the material from the preceding modules needs to be integrated in order to be applied to real polymer chemistry problems. Essential parts of the module are critical problem analysis, independent literature research, evaluation of a programme of experimental work, preparation of progress presentations and reports. These tasks are tackled in small teams (ca. 5/6 persons), thus providing an opportunity to develop teamwork skills.
Polymer Chemistry MSc Modules

Elective Modules – choose 1

CH915 Principles and Techniques in Quantitative and Qualitative Analysis
This module covers theoretical and practical fundamentals of qualitative and quantitative analysis. We will discuss sources of errors in chemical and instrumental analysis, and will consider practical aspects of sampling and calibration techniques. Theory and instrumentation of a range of spectroscopic techniques will be covered in lectures. Practical sessions will include quantitative analyses using volumetry, gravimetry, uv/visible spectroscopy, atomic absorption spectroscopy, and state-of-the art inductively coupled plasma spectroscopy (ICP) techniques (OES and MS).

CH982 Polymer Processing and Nanocomposites
This module aims to introduce the concepts of nanocomposites, processing and expand students’ knowledge in the characterization of bulk/solid phase polymer materials. This will be put in the context of both commodity and non-commodity materials, widely used in the polymer (and other) industries. The ability to characterise polymers/composites and link this to their observable properties is crucial, and this module will cover many advanced aspects of this. In particular, diffraction and scattering techniques and how polymer physical properties affect their processibility. Students will be given the chance to obtain real data in the laboratories and link this to the lecture material.

CH908 Mass Spectrometry
This module introduces the student to the many facets of modern mass spectrometry. Emphasis is placed both on the interpretation of spectra and also on instrumental methods, covering modern methods of ionisation (including ESI and MALDI) and mass analysis (including orthogonal TOF and FT-ICR) and the use of linked methods such as GC/MS, HPLC/MS and tandem mass spectrometry. Practical sessions include practice at interpretation and experiments using various mass spectrometric techniques.

CH926 Molecular Modelling
This module introduces students to molecular modelling techniques as applied to biophysical systems with particular emphasis on the methods used and their underlying theory. The student should gain a basic understanding of the available computational methods and their theoretical foundations; what time scales and length scales are accessible; what properties can be computed and to what level of accuracy; and what methods are most appropriate for different molecular systems and properties.

Research Project

CH962 Research Project
Upon successful completion of the modules you will be working on a MSc level research project in one of the research labs for 20 weeks. Students will be able to choose a supervisor and project in an area of Polymer Chemistry that most closely matches their interests, with either an industry or academic focus. Examples of recent projects are:

- Synthesis, characterisation and application of hyperbranched polymers.
- Synthesis and assembly of functional polymers for enhance cellular uptake and potential theranostic applications.
- Using ROMP to prepare precision polymers.
After you graduate

The diverse skills-set that you acquire during your Masters course will help shape your career. Former graduates have secured PhD studentships or positions within industry, the latter leveraged by our strong industrial links with some of the leading chemical companies.

Finding a job

Our greatest resource is the knowledge and network base of our world leading academics, which they have built over many years. They will provide you with guidance in making sure you utilise your skills-set to your fullest potential. The well established links with leading research groups, both in the UK and world wide, along with the strong links with chemical and pharmaceutical industries will ensure that a career path in academia or industry is well within your grasp. Our academics will assist you in many aspects of career advice including preparing your CV to providing you with practice interviews. Our track record of success speaks for itself!
"My favourite module was polymers in the real world because I had the opportunity to meet chemists from other universities and industry who talked about their research."

Annette Christie
2015 Graduate
Entry Requirements and Application

Warwick is a world class university that will provide you with a qualification that is recognised internationally. While our standards are very high, we encourage you to contact us to discuss your potential study with us.

Entry Requirements
Admission onto the Polymer Chemistry MSc programme requires at least a British Second Class Honors Degree or Overseas equivalent. The Polymer Chemistry MSc programme requires a physical sciences background but candidates from other disciplines may also be considered – please feel free to contact us if you have any questions.

English Language Requirements
Non-native speakers of English must satisfy the English language requirements:
- IELTS 6.5*
- PTE (Pearson) 62*
- Three years of UG study in an English speaking country
*minimum element scores apply

Course Duration
- 12 months duration
- Start date: 25 September 2017

How to Apply
Applications are made online at: www2.warwick.ac.uk/pgapply

The cost of a single application is £50.

The following supporting documents are required:
- Academic transcripts and certificates
- Two academic references
- English language qualifications

Tuition Fees (2017-18)
- UK and EU fee payers £8,170
- Overseas fee payers £23,460
- New PGT loans information at: www.warwick.ac.uk/chemistry/masters/fees

Scholarships
The Department of Chemistry will be awarding scholarships for the October 2017 intake. For more details, www.warwick.ac.uk/chemistry/masters/fees

Dr Nikola Chmel
Polymer Chemistry
Course Director

Christina Forbes
PGT Course
Coordinator

Dr Vasilios Stavros
Admissions Tutor

Contact us at: chem-pgt@warwick.ac.uk
Getting to Warwick

Warwick is located in central England, making it easy to reach by road, rail or air. Public transport links are plentiful, with bus stops across campus, train stations a short distance away and a national coach service operating close to our campus.

- 1 hour to London by train
- Nearest airport: Birmingham International 20 minutes
- Nearest train: Coventry
Getting in touch

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