Analytical & Polymer Science Msc

Full-time Taught Masters Programme
2018-19
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The University of Warwick

The success and reputation of the University of Warwick lies in a unique blend of entrepreneurial spirit and commitment to absolute academic excellence.

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 Analytical & Polymer Science 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 graduated over 100 students in the process.

General Overview
The Analytical & Polymer Science MSc is delivered by internationally leading experts from the departments across campus 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 and also the chance to study business/management modules.

This MSc will give you an excellent opportunity to start your career in a range of areas from agrochemical and pharmaceutical to personal care, where analytical and polymer science are highly valued and is suited to someone with an interest in both fields.

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 an optional module (CH970) which involves a weekly seminar from an Industrial expert. This lets you gain insight into industrial polymer science, but also expands your personal network to accelerate your future career. As part of Warwick Centre for Analytical Science (WCAS) we have regular guest speakers from industry also.

Careers
Polymer and Analytical Sciences make up a huge proportion of science jobs in the UK ranging from traditional polymer science to pharmaceutical formulations. This degree will give you the grounding to work in either of these fields in the future.

The Analytical & Polymer Science MSc is delivered by internationally leading experts from the Departments of Chemistry, physics and life sciences, 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 Analytical & Polymer Science 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 Analytical Polymer Science 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 area of science at the interface of analytical and polymer science.
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.

CH921 Frontier Instrumental Techniques for Molecular Analytical Science

This module introduces students to advanced analytical science techniques, such as NMR, mass spectrometry, circular and linear dichroism, Raman spectroscopy, surface spectroscopies and sensor techniques. Aspects of instrument construction and design will be explored, with the aim of answering questions such as: What happens to the sample to create a signal that is recorded? What signal does the instrument produce and how is this transformed into the output the user receives? How is the instrument output used to deduce molecular structure or other analytical information.

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.

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.

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.

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 analytical/polymer science 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.

CH913 Team Research Project: Real World Analysis
Research questions in academia and industry generally require the development and integration of several analytical techniques. The aim of this module is to make students aware of these requirements. It is the culmination of the taught part of the course, and constitutes the ideal preparation for the research project and future careers in analytical laboratories. The practical work for this module involves team work to solve real analytical problems using at least two techniques and professional data analysis. Literature work will be required as the basis of method development. Research work is complemented by interactive sessions with industrial visitors.

CH908 Mass Spectrometry
Students will learn how to interpret electrospray ionization mass spectra, will learn about new ionisation methods and will get insight into some of the instrumentation used. Students will also learn how to sequence peptides and determine post-translational modifications in proteins. You will gain a good understanding of the physical principles used in mass spectrometry. Understanding of the use of modern MS in current research regarding material and biological sciences.

CH914 Electrochemistry and Sensors
This module provides a grounding in the fundamentals of electrochemistry, electroanalytical techniques and sensor technology of use in many different industries including fuel cells, batteries, sensors, waste water treatment, cleaning, electroplating etc. The module encompasses potentiometric methods, voltammetric/amperometric techniques, microfluidic devices, lab-on-a-chip methods, and electronic noses and tongues.

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.
### Analytical & Polymer Science MSc Modules

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<th>Elective Modules continued</th>
<th>Research Project</th>
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<td><strong>CH916 Magnetic Resonance</strong></td>
<td><strong>CH962 Research Project</strong></td>
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<td>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.</td>
<td>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 Analytical &amp; Polymer Chemistry that most closely matches their interests, with either an industry or academic focus. Examples of recent projects are:</td>
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<td><strong>CH970 Polymers in the Real World</strong></td>
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<td>This module aims to demonstrate current and real-world applications of polymeric materials that have been described in other modules of the Analytical &amp; Polymer Science MSc taught masters program and rationalize how different properties are required for different applications. This module will be delivered by internal and invited external lecturers from industry and an academia and covers a diverse range of topics from personal care, agrochemicals, publishing and intellectual property.</td>
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<td><strong>CH925 Computational Modelling</strong></td>
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<td>Students will learn fundamental numerical methods for root finding, solving single and multivariable ordinary and partial differential equations. They will understand how to use numerical methods to solve particular biological problems arising in population dynamics, chemical reaction kinetics and pattern formation (reaction diffusion systems). The will develop a critical awareness of current best practice in application of numerical methods to a range of problems in research at the physical/life sciences interface.</td>
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<tr>
<td><strong>CH922 Microscopy and Imaging</strong></td>
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<td>This module provides a foundation in the principles and applications of microscopy, starting with basics of light microscopy and progressing to state of the art confocal microscopy, electron microscopy and scanned probe microscopy. The latter includes atomic force microscopy and electrochemical imaging techniques for which Warwick is particularly well-known. The module includes workshops on image analysis and seminars that cover the most recent developments in the field.</td>
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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!
“The MSc is quite an intense period of study, but you should accept the challenge and make the most of it!”

Nikos Engelis
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 Analytical & Polymer Science MSc programme requires at least a British Second Class Honors Degree or Overseas equivalent. The Analytical & Polymer Science 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: 24 September 2018

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 (2018-19) for reference
Please check warwick.ac.uk/chemistry/masters/fees for the most up to date fee information
- UK and EU fee payers £8,580
- Overseas fee payers £24,640
- New PGT loans information at: www.warwick.ac.uk/chemistry/masters/fees

Scholarships
The Department of Chemistry will be awarding scholarships for the October 2018 intake. For more details, www.warwick.ac.uk/chemistry/masters/fees

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

![Map of the UK showing Warwick's location and major cities](image)
Getting in touch

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