MRes in Green Chemistry at Imperial College

The MRes course in Green Chemistry at Imperial College is a multidisciplinary one-year course features the involvement of several world-class departments. Taught modules cover topics as diverse as clean solvents, renewable chemical feedstocks, environmental chemistry, biotechnology, renewable energy resources (including solar devices and fuel cells), biofuels, water treatment, carbon capture strategies and environmental technologies. In addition to lectures, you will spend nine months working on a cutting edge research project, typically with supervisors from at least two different departments.

Graduates of this course can expect to have all the necessary skills and experience to apply green chemical technologies in either commercial or academic laboratories, the research project in particular equipping them admirably for PhD studies.

The entry requirement is an honours degree in Chemistry (or equivalent overseas qualification) at the upper second (or equivalent) level. Imperial College Registry will determine the corresponding grade for non-UK qualifications.

The course is based around a large research component (70% of the course marks, 9-month project), which is far greater than most normal MSc courses. The remaining 30% consists of a literature report, an energy project and exams on specialist courses. Further details can be found in the frequently asked questions (FAQ) document on the MRes in Green Chemistry website: https://www.imperial.ac.uk/study/pg/courses/chemistry/green-chemistry/

All applications must be submitted through the Registry website: http://apply.embark.com/grad/imperial/grad/

Tuition fees are different for UK/EU students and those who come from outside the EU. Information on the current fees can be found at: https://www.imperial.ac.uk/study/pg/courses/chemistry/green-chemistry/

There are scholarships from the Department for UK/EU students who have studied in the UK to contribute towards tuition fees.

Other sources of funding are described in the link below: https://www.imperial.ac.uk/study/pg/fees-and-funding/scholarships/scholarships-search-tool/

Successful applicants will also be considered for the Climate-KIC initiative (www.climate-kic.org), which runs alongside the course. The scheme aims to train climate change entrepreneurs and innovators with the multidisciplinary skills to develop economically, environmentally and socially sustainable approaches to mitigate the effects of global warming. This involves a fully funded 6-week summer school, access to e-learning throughout the MRes course and support in spinning out ideas to a commercial level.

Submit your application (deadline for applicants requiring visas is usually the start of July for starting the following October) and we will get in touch once your application has been processed. We conduct a rolling programme of interviews (in person or by telephone) as required. Offers are made throughout the year and within two weeks of interview.

If you have any queries not covered on the website, please contact the MRes Coordinator, Dr Mike Ray (michael.ray@imperial.ac.uk) if you have queries regarding the application process, eligibility or funding or the Course Director, Dr James Wilton-Ely (j.wilton-ely@imperial.ac.uk) if your query is regarding the academic content of the course.
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Exams | Exams
Research Projects

These should be viewed as an indication of some of the areas typically offered as projects to the students. Each year we have 40-45 projects available for the 20 students on the course to choose from. One-page abstracts for all projects will be gathered into a single PDF file and sent to the students holding offers in August before arriving in London. The students are then encouraged to arrange meetings with the supervisors of the projects they find most interesting to find out more before choosing their top 5 choices. The students start their projects in early November.

Geopolymers – A carbon-free concrete.
Treatment of ligno-cellulose.
Ionic Liquids - the new super solvents?
Photochemical water splitting – the role of photocatalyst morphology.
Combating climate change: New technologies for carbon dioxide capture.
Bacterial cellulose nanocomposite coatings for corrosion protection.
Catalytic electrophilic bromination of deactivated aromatics in ionic Liquids.
Novel processing methods for organic materials, device structures, and their application in OPV.
Electrodestruction of ionic liquid impurities.
Synthesis of semiconducting polymers by continuous flow chemistry.
Siloxanes as Solvents for Synthesis.
Elucidating the composition, development and potential applications of silica materials from plants.
Covalently Linked Lewis Pairs as Materials for Hydrogen Storage and Transfer.
Construction of a ligand library for biopolymer synthesis.
The conversion of biomass into useful platform chemicals.
Environmentally friendly organic electronics – what happens when you upgrade your mobile?
Water purification – one of the major environmental challenges.
Supramolecular approaches for next generation photovoltaic devices.
Biomedical materials from biodegradable ionic liquids.
Electrochemical and Chemical Methods for the Destruction of Metal Complexes.
Optimality and control in bio-reactions: a systems approach.
Investigating the electrochemical properties of ionic liquids.
The effects of water contamination in ionic liquids.
A generic platform for computer-aided solvent design for selectivity in catalytic reactions
Contact printed organic solar cells from water-based formulations
Renewable polymers using biobased alternatives to phthalic anhydride
Frustrated Lewis pairs for clean green catalysis
Separation of biobutanol for green fuels using novel porous nanomaterials
Ionic liquid biorefining
Catalytic in flow: Aerobic oxidation of alcohol
Detection of toxins in drinking water
Visible-light photocatalytic reactions of tetrahydropyridines
Quantifying triplets in polymeric blend films for Organic Photovoltaics (OPVs)
Butyl-3-hydroxybutyrate as a sustainable solvent for chemicals synthesis
Synthetic routes to novel organometallic precursors of earth abundant, non-toxic metal sulfides for use in low-cost solution processed solar cells.
A Quantitative Structure function relationship to probe the challenge of watersplitting.
Development of green catalytic oxidation reactions in the multiphase
Cause and resolution of anomalous hysteresis in organic-inorganic perovskite solar cells
Functionalised gold nanoparticles for catalysis
Enzymatic lignin re-polymerisation
Green metal free conversion of H₂ and CO₂
Enantioselective selenocatalytic transformations of chiral diselenides: Enantioselective oxidations of activated C–H bonds, including photoredox co-catalyzed aerobic oxidations
Generating new covalent materials for carbon dioxide capture
Understanding of Cu-catalysed coupling reactions leading to reliable and scalable processes
Screening porous materials for uptake of environmentally harmful gases
Detection of carbon monoxide in air using chromo-fluorogenic probes
Silanols, silanediols and silanetriols as novel catalysts for direct amide bond formation from carboxylic acids and amines
Generation of an oxidant by electrochemistry
Fabrication of organic-metal halide perovskite solar cells based on non-toxic metals
Enantioselective selenocatalytic transformations of chiral diselenides: Enantioselective alkene difunctionalizations, including photoredox co-catalyzed anaerobic oxidations
Protein-friendly ionic liquids
Ionic liquids for technological applications
Viscosity of ionic liquids: iodide vs triiodide
Next generation “frustrated” Lewis pairs: Towards methane activation.
Enantioselective selenocatalytic transformations of chiral selenides: Redox neutral β,γ-difunctionalizations of electron-deficient alkynes and allenes
Nitrogen-rich framework materials for carbon capture technologies
Photovoltaic devices based upon hybrid inorganic-organic nanocomposite films composed of earth-abundant materials
Catalytic upgrading of lignin obtained from ionic liquid treatment of biomass
Transition Metal C–H activated Carbonylation Reactions in Flow
Redox-neutral approaches to C–O bond activation
Ionic liquids for green applications
Solar water splitting with semiconductor/molecular hybrid electrodes
Mechanistic studies on the stereo-retentive C–H oxidation of aliphatics with iron complexes
Discrete subnanometer gold clusters for catalysis
Ionosolv pseudolignin: What is it and where does it come from?
Nanoengineered layered double hydroxides on graphene oxide supports as regenerable sorbents and catalysts for clean energy systems
Renewable energy from biomass: Valorising contaminated wastes into renewable fuels
Silicon nanowire/ionic liquid technology for energy storage
Fluorescent molecular rotors measure viscosity of ionic liquids
Improving copper catalysis: Well-defined catalysts for 'green' N-arylation reactions
Literature Projects
Each student also chooses a literature Project on a different subject to their research topic with a different supervisor. This allows them to gain an insight into a different area of green, sustainable or environmental science. Some topics from recent years are given below:

Not used here – Prize-winning processes that fail to reach commercial production.
Use of solvents derived from biomass.
The chemistry of CO₂ absorption systems.
Are current goals for hydrogen storage in porous materials realistic, or too ambitious?
The chemistry of biodiesel.
The use of ionic liquids in solar cells.
How "green" are ionic liquids?
Which is the more efficient biofuel: ethanol or butanol?
Green Chemistry – it’s all relative.
Environmental traffic lights for solvents.
Sustainable plastics: new routes to polymers using renewable resources such as biomass and carbon dioxide.
Environmental legislation – a global issue.
The relationship between energy and fuel – is biomass the chemical plant of the future?
Industrial carbonylation – from a green chemistry perspective.
Supercritical carbon dioxide – a truly green solvent?
Which is greener - homogenous or heterogeneous catalysis?
Organic synthesis in water.
The catalysis of organic reactions mediated by compounds of gold.
Green applications of olefin metathesis.
Making our waste safer - how can we design biodegradability?
Organohalide-free alkylation chemistry.
Less hazardous reduction chemistry – a future without LiAlH₄?
How sustainable are alternative energy sources?
How 'green' is chemical synthesis in/on water?
Methods for the early detection of bio-hazards in water
SERS Bio-detectors
Strategies for Carbon Capture – Providing a Greener Future
Singlet oxygen as a clean reagent in chemical synthesis
Computational screening of porous materials for carbon dioxide capture
Edible materials: biorenewable precursors to environmentally relevant materials
Gas storage in renewable bioclathrates: from biomass to tomatoes
Organometallic reagents for C–O bond activation
Catalytic hydrogen-shuttling approaches to upgrading polyols and sugars
Protic Ionic Liquids: Properties and Applications
Exploring New Anions for Novel Ionic Liquids
Not your normal hydrogen-bond
Water: More Complicated Than You Think
The Application of Quantum Chemistry to Chemical Reactivity: Case Studies
Frustrated Lewis Pairs: a Revolution in Reactivity?
Carbon concentrating mechanisms in natural Photosynthesis – a route to increasing crop yields?
Solvent Effects on Catalytic Reaction Selectivity
Pathways to non-toxic organo-metal trihalide perovskite solar cells
How can we improve the efficiency of Copper zinc tin sulphide (CZTS) solar cells?
Do quantum dot solar cells have a future?
Printed Organic Solar Cells
Water Soluble Organic Semiconductors
1. How do I know if I am eligible?

The course organisers cannot comment on this as this will be decided by the Imperial College Registry. The minimum academic standard for this course is an upper second class degree in the UK or the equivalent from an overseas institution. Very occasionally candidates with a lower second class degree will be considered at the discretion of the course organisers if the candidate has significant additional experience or mitigating circumstances. We recommend you submit your application and the Registry will contact you regarding your eligibility.

2. What is the application procedure?

All applications must be done online through the Imperial College site: [http://apply.embark.com/grad/imperial/grad/](http://apply.embark.com/grad/imperial/grad/)

3. Is the MRes in Green Chemistry a taught or a research masters programme?

The course consists principally of research (70%) with a mixture of core and optional lecture courses on relevant topics making up the remaining 30%. Lectures are not confined to the Chemistry Department but also include ones offered by the Centre for Environmental Policy and the Sustainable Energy Futures course. Research projects commence in January after a proposal has been devised between student and supervisor. The projects can be based in one department or jointly between supervisors in various departments across the University such as Chemistry, Chemical Engineering, Materials, Physics, Biology and Biochemistry.

4. Do I need to choose a supervisor for my research project when applying?

Contact is made between students and supervisors once the course has started. A range of projects will be offered and you will have the chance to talk to those offering projects and your choices will be used to allocate projects in the first term.

5. Are scholarships available?

Departmental funding for scholarships is limited and is currently only open to UK-based applicants holding an EU passport. However, a number of external scholarships are available, which can provide funding to both UK and overseas applicants:

6. What reading material related to the course would you recommend?

A good source is the book ‘Green Chemistry: An introductory text’ by Mike Lancaster (RSC paperbacks, ISBN: 0854046208). On the topic of energy, we recommend ‘Without the Hot Air’ by David MacKay, which is available as a free download (consider before printing that the book consists of 370 pages including appendices!) in a number of languages ([http://www.withouthotair.com/download.html](http://www.withouthotair.com/download.html)).

7. What are the career prospects after graduation?

Environmental concerns have never been more prominent on the international stage, making this field of study particularly relevant. Around 60-70% of students follow this course by studying for a PhD while others go on to use what they have learnt in fields related to Green Chemistry in industry, consulting or governmental organisations.

8. How much are living costs in London?

It is recommended that you budget £14,000 per annum for living costs in London.
9. Is it possible to do a part-time job while attending the course.

The course is full time so we only suggest that, if you wish to work while attending the course, you only take a part-time job at weekends.

10. What literature and research projects are typically available?

See above for a typical selection of literature and research projects from previous years.

11. Can I apply if I do not hold a Chemistry degree?

Those with a degree in Chemistry do have a greater familiarity with some of the lecture material but we have had many engineers (mostly chemical engineers), who have done very well on the course. You will be expected to pass exams (at 50%) on material equivalent to fourth year advanced courses. Applications are considered on an individual basis.

12. Do you interview everyone who applies?

Yes, we interview all candidates who meet the entry requirements, either in person or by telephone.

13. How many students are accepted onto the course and how many apply.

The number on the course is usually around 20 students. They are selected from around 60 self-selecting applicants (i.e. those with an upper second class or higher degree) who apply each year. We prefer not to expand the course beyond 20 students as this starts to undermine the very strong cohort dynamic which we seek to achieve, where everyone knows and supports each other.

14. Is there a closing date for applications?

We recommend that overseas applicants try to apply as soon as possible and certainly before the beginning of July due to the time needed to obtain a visa. Applications will be considered after July but these are typically EU students who do not need visas. These dates give us time to process your application, conduct the interview and let you know whether we can make you an offer in good time for those requiring a visa. Applications are assessed as they are received.

15. What are the current fees for the course?

The tuition fees for the MRes course can be found here: https://www.imperial.ac.uk/study/pg/courses/chemistry/green-chemistry/

16. What do I need to do for Academic Technology Approval Scheme (ATAS) clearance?

This applies only to non-UK/EU students. Once an offer has been made, we will send you a letter for you to use in your ATAS clearance application. Instructions will also be provided on how to do this. It is important to allow 3-4 weeks to receive ATAS clearance as this is required for the visa application.

17. What are the language requirements for the course?

Imperial College requires an English language test as part of the entry requirements. The information below comes from the website (https://www.imperial.ac.uk/study/pg/apply/requirements/english):

IELTS: An overall score of 6.5 is required, with at least 6 in all modules. The College is able to verify your IELTS scores online. Please provide us with your Test Report Form Number or a scanned copy of your certificate, emailed to the appropriate admissions team. Please ensure you quote your CID number in the email (this will be emailed to you within 10 working days of submitting your application).
**TOEFL:** We can only accept TOEFL (iBT) tests from students who do not need Tier 4 visa sponsorship. If you require Tier 4 visa sponsorship please arrange to take another accepted English language test.

You will also be assessed by the College’s Academic English Language Support Unit after you have registered and arrived at College. This will allow the College to provide any help required with scientific English. You may attend internal classes (free of charge).

18. What is the Climate-KIC scheme?

Successful applicants will also be considered for the Climate-KIC initiative (www.climate-kic.org), which runs alongside the course. The scheme aims to train climate change entrepreneurs and innovators with the multidisciplinary skills to develop economically, environmentally and socially sustainable approaches to mitigate the effects of global warming. This involves a fully funded 6-week summer school, access to e-learning throughout the MRes course and support in spinning out ideas to a commercial level.