Programme Specification for:
MRes in Green Chemistry: Energy and the Environment

PLEASE NOTE. This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. This specification provides a source of information for students and prospective students seeking an understanding of the nature of the programme and may be used by the College for review purposes and sent to external examiners. Detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the course handbook or online at http://www3.imperial.ac.uk/chemistry/postgraduate/mres/greenchemistry. The accuracy of the information contained in this document is reviewed by the College and may be checked by the Quality Assurance Agency.

1. Awarding Institution: Imperial College London
2. Teaching Institution: Imperial College London
3. External Accreditation by Professional / Statutory Body: n/a
4. Name of Final Award (BEng / BSc / MEng etc): MRes
5. Programme Title (e.g. Biochemistry with Management): Green Chemistry: Energy and the Environment
6. Name of Department / Division: Chemistry
7. Name of Faculty: FoNS
8. UCAS Code: F1U7 (JACS code F140)
9. Relevant QAA Subject Benchmarking Group:
Chemistry
10. Level(s) of programme within the Framework for Higher Education Qualifications (FHEQ):

<table>
<thead>
<tr>
<th>Course Type</th>
<th>Level</th>
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<tbody>
<tr>
<td>Bachelor's (BSc, BEng, MBBS)</td>
<td>Level 6</td>
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<tr>
<td>Integrated Master's (MSci, MEng)</td>
<td>Levels 6 and 7</td>
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<tr>
<td>Master's (MSc, MRes)</td>
<td>Level 7</td>
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11. Mode of Study
Full time
12. Language of Study:
English
13. Date of production / revision of this programme specification (month/year):
January 2015

1. MRes in Green Chemistry: Energy and the Environment
14. Educational aims/objectives of the programme:

This course is designed to introduce graduate-level scientists (most likely chemists and chemical engineers, but not to the exclusion of graduates of other physical sciences) to the rudiments of Green Chemistry, which covers a variety of topics including catalysis, green solvents, environmental chemistry and the impact of modern industry on the environment and the use of renewable feedstocks and renewable energy.

In more detail, this MRes aims to:

- develop a knowledge of a range of fundamental and advanced concepts relating to sustainable chemistry;
- develop the student's ability to undertake research in multidisciplinary teams;
- develop research and analytical skills related to multi-disciplinary chemical research;
- develop oral and written scientific presentation skills;
- train chemistry and chemical engineering postgraduates capable of working in multi-disciplinary environments and of introducing the concepts of sustainability to external organisations (e.g. commercial, academic, public sector), and equipped to pursue careers within their chosen fields;
- attract the most motivated graduates, both from within the UK and from overseas;
- develop new areas of teaching in response to the advance of scholarship and the needs of vocational training.

15. Programme Learning Outcomes:

1. Knowledge and Understanding

Knowledge and Understanding of:

1. Core and specialised concepts in green chemistry, including sustainability, life-cycle analysis, catalysis, reaction solvents, biotechnology, environmental chemistry and, environmental impact analysis and renewable energy sources.

2. Research techniques including the collection and manipulation of experimental data, design and refinement of experiment, synthetic techniques, analytical methods and characterisation, technical report writing and effective oral presentation.

3. Detailed knowledge and understanding of the essential facts, concepts, principles and theories relevant to the student’s chosen research project.

4. Management and communication skills, including problem definition, project design, decision processes, critical analysis, teamwork, written reports (including scientific publications) and oral presentation skills.

2. Skills and other Attributes

Intellectual Skills:

Students are required to develop their ability to:

Apply their knowledge of sustainability to new production processes and new research projects.

Analyse existing chemical processes, assess their sustainability and propose more sustainable amendments and / or commercially viable alternatives.
Absorb new information, critically analyse scientific studies and reports and evaluate accordingly.

Propose and investigate their hypotheses using appropriate experimental design and statistical analysis of data.

Plan, conduct, write-up and present the findings of a lengthy programme of original research.

**Practical Skills:**

Students should be able to:

- Effectively plan and execute scientific research (particularly synthetic chemistry) in a safe and productive manner.
- Use laboratory methods and/or computer-based tools to generate data.
- Analyse results, determine their strength and validity, interpret conclusions and make recommendations for future experimental studies.
- Search and use the scientific literature (including electronic resources).
- Prepare technical reports and scientific publications.
- Deliver effective technical presentations and discuss their work orally (viva).

**Transferable Skills:**

1. Communicate effectively through oral presentations, an oral exam (viva), computer processing and presentations (e.g. posters) and written reports.
2. Group work and inter-personal skills.
3. Personal development.
4. Organisation of resources and time.
5. Management skills (e.g. decision-making, establishing objective criteria, problem definition, project/experiment, design and evaluation).
6. Information gathering from a variety of sources.
7. Effective use of Information and Communications Technology.
8. Transfer techniques and solutions from one discipline to another.
9. Learn independently with open-mindedness and critical enquiry.
10. Learn effectively for the purpose of continuing professional development

16. The following reference points were used in creating this programme specification:

- Student Handbook for Course approved by Senate of Imperial College
- Previously approved programme specifications (2008) for MRes in Green Chemistry

17. Programme structure and features, curriculum units (modules), ECTS assignment and award requirements:

**Year One (1 year course):**

**Term one:**
Taught lecture modules (a mixture of compulsory and optional, which span the first two terms) and Journal Club – 25 ECTS units (includes Renewable Energy Poster project in Term Two).
Research Proposal (counted as part of the Research Project ECTS total)

**Term Two:**
Taught modules continue.
Renewable Energy Poster project (part of the taught section of the course)
Research Project (continues until end of September) – 65 ECTS units.

**Term Three:**
Research project continues.
One day symposium of research presentations (counted as part of the Research Project ECTS total)
Viva oral exam (counted as part of the Research Project ECTS total)

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18. Support provided to students to assist learning (including collaborative students, where appropriate):

- **Student Handbook**, which includes course and project descriptions.
- **A Welcome Induction pack**, which the Course Director presents on Day 1.
- **Staff:student ratios** for research training of 2:1 or greater.
- A large community of postgraduate research students and postdoctoral research workers working in several areas of sustainable science across a range of departments and faculties at Imperial College.
- **Library and other learning resources and facilities** at South Kensington campus.
- **Dedicated student computing facilities** in the Chemistry Department.
- Extensive laboratory-based research facilities for the research projects.
- **A postgraduate staff - student committee**, which meets three times per year.
- Numerous additional seminars in the Chemistry Department and other departments.
- In addition to the postgraduate tutor, the Course Director will assist students with personal problems and may advise on pastoral and academic issues, and will ensure sexual and racial equality.
- **Student email and open personal access to staff including the Course Director.**
- **Access to student counsellors** on the South Kensington site.
- **Access to Teaching and Learning Support Services**, which provide assistance and guidance, e.g. on careers.
- **Blackboard virtual learning environment.**
- **Transferable skills courses** (compulsory and optional) offered by Graduate School.
- Future career possibilities will be promoted by continuous industrial input into the programme (research project co-supervisors and guest speakers) and collaborations between academic staff and industrialists.

19. **Criteria for admission:**

_The minimum qualification for admission is normally at least an Upper Second Class Honours degree in Chemistry or (on a case by case basis) Chemical Engineering from an UK academic institution or an equivalent overseas qualification. All UK applicants (and where possible overseas applicants) will be invited to Imperial College for a site tour and interview. Offers made to students will be initiated by the Course Director. Where an applicant has a lesser degree qualification but has presented well at interview, a special case for admission may be considered by the Course Director._

20. **Processes used to select students:**

- Students who display a genuine enthusiasm for the subject will be contacted shortly after receipt of their application for an interview (face-to-face where possible; telephone if not).

21. **Methods for evaluating and improving the quality and standards of teaching and learning:**

_a) Methods for review and evaluation of teaching, learning, assessment, the curriculum and outcome standards:_

The external examiner system and Boards of Examiners are central to the process by which the College monitors the reliability and validity of its assessment procedures and academic standards. Boards of Examiners comment on the assessment procedures within the College and may suggest improvements for action by relevant departmental teaching Committees.

The Faculty Studies Committees and the Graduate School’s Master’s Quality Committees (MQC) review and consider the reports of external examiners and accrediting bodies and conduct periodic (normally quinquennial) and internal reviews of teaching provision. Regular reviews ensure that there
is opportunity to highlight examples of good practice and ensure that recommendations for improvement can be made.

At programme level, the Head of Department/Division has overall responsibility for academic standards and the quality of the educational experience delivered within the department or division.

Most of the College's undergraduate programmes are accredited by professional engineering and science bodies or by the General Medical Council. Accreditation provides the College with additional assurance that its programmes are of an appropriate standard and relevant to the requirement of industry and the professions. Some postgraduate taught courses are also accredited.

b) Committees with responsibility for monitoring and evaluating quality and standards:

The Senate oversees the quality assurance and regulation of degrees offered by the College. It is charged with promoting the academic work of the College, both in teaching and research, and with regulating and supervising the education and discipline of the students of the College. It has responsibility for approval of changes to the Academic Regulations, major changes to degree programmes and approval of new programmes.

The Quality Assurance and Enhancement Committee (QAEC) is the main forum for discussion of QA policy and the regulation of degree programmes at College level. QAEC develops and advises the Senate on the implementation of codes of practice and procedures relating to quality assurance and audit of quality and arrangements necessary to ensure compliance with national and international standards. QAEC also considers amendments to the Academic Regulations before making recommendations for change to the Senate. It also maintains an overview of the statistics on completion rates, withdrawals, examination irregularities (including cases of plagiarism), student appeals and disciplinaries.

The Faculty Studies Committees and Graduate School Master's Quality Committees are the major vehicle for the quality assurance of undergraduate / postgraduate courses respectively. Their remit includes: setting the standards and framework, and overseeing the processes of quality assurance, for the areas within their remit; monitoring the provision and quality of e-learning; undertaking reviews of new and existing courses; noting minor changes in existing programme curricula approved by Departments; approving new modules, changes in module titles, major changes in examination structure and programme specifications for existing programmes; and reviewing proposals for new programmes, and the discontinuation of existing programmes, and making recommendations to Senate as appropriate.

The Faculty Teaching Committees maintain and develop teaching strategies and promote inter-departmental and inter-faculty teaching activities to enhance the efficiency of teaching within Faculties. They also identify and disseminate examples of good practice in teaching.

Departmental Teaching Committees have responsibility for the approval of minor changes to course curricula and examination structures and approve arrangements for course work. They also consider the details of entrance requirements and determine departmental postgraduate student numbers. The Faculty Studies Committees and the Graduate School Postgraduate Quality Committees receive regular reports from the Departmental Teaching Committees.

c) Mechanisms for providing prompt feedback to students on their performance in course work and examinations and processes for monitoring that these named processes are effective:

All feedback on taught materials / submitted work for assessment is provided by the Course Director. Dates for feedback are stated at the same time that the students are given submission deadlines.

d) Mechanisms for gaining student feedback on the quality of teaching and their learning experience and how students are provided with feedback as to actions taken as a result of their comments:
Students meet with the course director weekly in formal meetings (informally often more than weekly). Most feedback is therefore given informally. Online evaluation (PG SOLE) also available.

e) Mechanisms for monitoring the effectiveness of the personal tutoring system:
N/A

f) Mechanisms for recognising and rewarding excellence in teaching and in pastoral care:

Staff are encouraged to reflect on their teaching, in order to introduce enhancements and develop innovative teaching methods. Each year College awards are presented to academic staff for outstanding contributions to teaching, pastoral care or research supervision. A special award for Teaching Innovation, available each year, is presented to a member of staff who has demonstrated an original and innovative approach to teaching. Nominations for these awards come from across the College and students are invited both to nominate staff and to sit on the deciding panels.

g) Staff development priorities for this programme include:

Increased contact with relevant sectors of industry

22. Regulation of Assessment:

a) Assessment Rules and Degree Classification:

The Pass Mark for postgraduate taught courses is 50%. In order to be awarded a result of merit, a candidate must obtain an aggregate mark of 60% or greater; a result of distinction requires an aggregate mark of 70% or greater.

Where appropriate, a Board of Examiners may award a result of merit where a candidate has achieved an aggregate mark of 60% or greater across the programme as a whole AND has obtained a mark of 60% or greater in each element with the exception of one element AND has obtained a mark of 50% or greater in this latter element.

Where appropriate, a Board of Examiners may award a result of distinction where a candidate has achieved an aggregate mark of 70% or greater across the programme as a whole AND has obtained a mark of 70% or greater in each element with the exception of one element AND has obtained a mark of 60% or greater in this latter element.

b) Marking Schemes for postgraduate taught programmes:

The Pass Mark for all postgraduate taught course modules is 50%. Students must pass all elements in order to be awarded a degree.

c) Processes for dealing with mitigating circumstances:

A candidate for a Master’s degree who is prevented owing to illness or the death of a near relative or other cause judged sufficient by the Graduate Schools from completing at the normal time the examination or Part of the examination for which he/she has entered may, at the discretion of the Examiners:

(a) enter the examination in those elements in which he/she was not able to be examined on the next occasion when the examination is held in order to complete the examination (next academic year if necessary)

or

(b) be set a special examination in those elements of the examination missed as soon as possible and/or be permitted to submit any work prescribed (e.g. report) at a date specified by the Board of Examiners concerned. The special examination shall be in the same format as specified in the course regulations for the element(s) missed.
Applications, which must be accompanied by a medical certificate or other statement of the grounds on which the application is made, shall be submitted to the Academic Registrar who will submit them to the Board of Examiners.

d) Processes for determining degree classification for borderline candidates:

Candidates should only be considered for promotion to pass, merit or distinction if their aggregate mark is within 2.5% of the relevant borderline. Nevertheless, candidates whom the Board deems to have exceptional circumstances may be considered for promotion even if their aggregate mark is more than 2.5% from the borderline. In such cases the necessary extra marks should be credited to bring the candidate’s aggregate mark into the higher range.

e) Role of external examiners:

The primary duty of external examiners is to ensure that the degrees awarded by the College are consistent with that of the national university system. External examiners are also responsible for approval of draft question papers, assessment of examination scripts, projects and coursework (where appropriate) and in some cases will attend viva voce examinations. Although external examiners do not have power of veto their views carry considerable weight and will be treated accordingly. External examiners are required to attend each meeting of the Board of Examiners where recommendations on the results of individual examinations are considered. External examiners are required to write an annual report to the Rector of Imperial College which may include observations on teaching, course structure and course content as well as the examination process as a whole. The College provides feedback to external examiners in response to recommendations made within their reports.

23. Indicators of Quality and Standards:

The course was evaluated as ‘Good’ (the highest grade) by the Graduate School in 2013.

24. Key sources of information about the programme can be found in:

Departmental websites:
http://www3.imperial.ac.uk/chemistry
http://www3.imperial.ac.uk/chemistry/postgraduate/mres/greenchemistry