

**MRes Nanomaterials**

This document provides a definitive record of the main features of the programme and the learning outcomes that a typical student may reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities provided. This programme specification is primarily intended as a reference point for academic and support staff involved in delivering the programme and enabling student development and achievement, for its assessment by internal and external examiners, and in subsequent monitoring and review.

**Programme Information**

|  |  |    |           |
|--|--|----|-----------|
| Programme Title  | Nanomaterials  |    |           |
| Award(s)   | MRes   |    |           |
| Programme Code   | F1Y4   |    |           |
| Associateship  | Royal College of Science   |    |           |
| Awarding Institution   | Imperial College London  |    |           |
| Teaching Institution   | Imperial College London  |    |           |
| Faculty  | Faculty of Natural Sciences  |    |           |
| Department   | Department of Chemistry  |    |           |
| Main Location of Study   | South Kensington and White City Campuses   |    |           |
| Mode and Period of Study   | 1 calendar year, full time   |    |           |
| Cohort Entry Points  | Annually in October  |    |           |
| Relevant <a href="#">QAA Benchmark Statement(s)</a> and/or other external reference points | <a href="#">Master's Degree in Chemistry</a>   |    |           |
| Total Credits  | ECTS:  | 90 | CATS: 180 |
| <a href="#">FHEQ Level</a>   | Level 7 - Master's   |    |           |
| <a href="#">EHEA Level</a>   | 2 <sup>nd</sup> cycle  |    |           |
| External Accrator(s)   | None   |    |           |
| <b>Specification Details</b>   |  |    |           |
| Student cohorts covered by specification   | 2017/18 entry  |    |           |
| Person Responsible for the specification   | Prof. Nicholas Harrison, Programme Director<br>Dr. Saif Haque, Programme Co-Director |    |           |
| Date of introduction of programme  | October 2002   |    |           |

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|--|-------------|
| Date of programme specification/revision | August 2017 |
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### Programme Overview

Nanotechnology represents a fundamental change in the way we interact with the natural world, and is set to deliver major scientific and technological advances.

The massive global investment in nanotechnology means that scientists who are trained to work effectively in an interdisciplinary environment that bridges the diverse fields of chemistry, physics, materials science, biology and engineering, will play a vital role in shaping the future.

Combining interdisciplinary teaching with cutting-edge research, this flagship course will train the next generation of nanotechnologists, and provide the background required for a career in industrial or academic research.

### Learning Outcomes

#### Knowledge and Understanding of:

- Core concepts in nanomaterials – semi-conductor nanostructures, nanomaterials for solar energy conversion, optical and electrical properties, nanotubes, advanced materials characterisation and theory modelling and simulation;
- Specialised concepts in nanomaterials – molecular nanobiotechnology, colloidal semiconductors, patterning techniques, photonic and optoelectronic applications, quantum theory of nanoscale systems, modelling of charge transport and recombination, modelling of colloidal systems and wetting phenomena;
- Research techniques, including information retrieval, experimental design, modelling, materials characterisation techniques, and laboratory safety;
- Detailed knowledge and understanding of the essential facts, concepts, principles and theories relevant to the student's project;
- Management and communication skills, including problem definition, project design, decision processes, teamwork, written and oral reports, scientific publications.

#### Intellectual Skills:

- Analyse and solve problems in nano-materials science using an integrated multidisciplinary approach;
- Integrate and evaluate information;
- Formulate and test hypotheses using appropriate experimental design and analysis of data;
- Plan, conduct and write-up a programme of original research.

#### Practical Skills:

- Plan and execute safely a series of experiments;
- Use laboratory-based methods to generate data;
- Analyse experimental results and determine their strength and validity;
- Prepare technical reports;
- Give technical presentations;
- Use the scientific literature effectively;
- Use computational tools and packages.

**Transferable Skills:**

- Communicate effectively through oral presentations, computer processing and presentations, written reports and scientific publications;
- Apply statistical and modelling skills;
- Management skills: decision processes, objective criteria, problem definition, project design and evaluation, risk management, teamwork and coordination;
- Integrate and evaluate information from a variety of sources;
- Transfer techniques and solutions from one discipline to another;
- Use Information and Communications Technology;
- Manage resources and time;
- Learn independently with open-mindedness and critical enquiry;

Learn effectively for the purpose of continuing professional development.

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial College degree programme. The Graduate Attributes are available at: [www.imperial.ac.uk/students/academic-support/graduate-attributes](http://www.imperial.ac.uk/students/academic-support/graduate-attributes)

**Entry Requirements**

|                              |  |
|------------------------------|--|
| Academic Requirement         | The requirement is a 2:1 UK Bachelor's Degree with Honours or higher in a relevant subject such as Chemistry, Physics, Mathematics, Materials, Biochemistry, Engineering or related subject (or a comparable qualification recognised by the College). |
| Non-academic Requirements    | None   |
| English Language Requirement | <a href="#">Standard requirement</a> : IELTS score of 6.5 overall (minimum 6.0 in all elements)  |

The programme's competency standards documents can be found at:

<http://www.imperial.ac.uk/chemistry/postgraduate/mres-courses/>

**Learning & Teaching Strategy**

|                                       |  |
|---------------------------------------|--|
| Scheduled Learning & Teaching Methods | <ul style="list-style-type: none"> <li>• Lectures</li> <li>• Seminars</li> <li>• Workshops</li> <li>• Conference</li> <li>• Journal Clubs</li> </ul> |
| E-learning & Blended Learning Methods | • <b>N/A</b>   |
| Project Learning Methods              | • Individual research project  |

**Assessment Strategy**

|                    |  |
|--------------------|--|
| Assessment Methods | <ul style="list-style-type: none"> <li>• Coursework</li> <li>• Written examinations</li> <li>• Project work</li> </ul> |
|--------------------|--|

|   |   |
|---|---|
|   | <ul style="list-style-type: none"> <li>• Research project plan</li> <li>• Reports</li> <li>• Presentations</li> <li>• Oral presentations</li> <li>• Dissertation</li> </ul> |
| Academic Feedback Policy  |   |
| <p>Feedback will be provided within 2 weeks for small pieces of coursework (journal clubs, poster project) and within 3 weeks for larger assessments (research proposal, bespoke courses). For lectures courses attended alongside final year UG (MSci) students, feedback will be provided at the same time as for the MSci students. In all cases, the MRes students will be provided with information on when they can expect the feedback to be provided. If there is any delay, the students will be informed.</p>   |   |
| Re-sit Policy   |   |
| <p>The College's Policy on Re-sits is available at: <a href="http://www.imperial.ac.uk/registry/exams/resit">www.imperial.ac.uk/registry/exams/resit</a></p>  |   |
| Mitigating Circumstances Policy   |   |
| <p>The College's Policy on Mitigating Circumstances is available at: <a href="http://www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/">http://www.imperial.ac.uk/student-records-and-data/for-current-students/undergraduate-and-taught-postgraduate/exams-assessments-and-regulations/</a></p>  |   |
| <b>Assessment Dates &amp; Deadlines</b>   |   |
| Written Examinations  | Spring  |
| Coursework Assessments  | Continuous  |
| Project Deadlines   | Summer  |
| Practical Assessments   | Spring  |
| <b>Assessment Structure</b>   |   |
| Rules of Progression  |   |
| Not applicable  |   |
| Marking Scheme  |   |
| <p><b>Pass:</b></p> <ul style="list-style-type: none"> <li>• The Pass Mark for all <b>postgraduate</b> taught programme elements is 50%.</li> <li>• Students must pass all elements in order to be awarded a degree.</li> </ul> <p><b>Merit:</b></p> <ul style="list-style-type: none"> <li>• In order to be awarded a result of merit, a candidate must obtain an aggregate mark of 60% or greater.</li> <li>• 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</li> </ul> |   |

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.

**Distinction:**

- In order to be awarded a result of distinction, a candidate must obtain an aggregate mark of 70% or greater.
- 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.

| Module Weightings  |  |                         |
|--|--|-------------------------|
| Element<br>(% Weighting)   | Module   | % Module Weighting      |
| Taught Element (40%)   | Chemistry Core Courses   | 50%                     |
|  | Materials Characterisation Courses   | 12.5%                   |
|  | Advanced Journal Club  | 37.5%                   |
| Research Element (60%)   | Research Proposal (9%), Research Project Report (42%), Project Oral Presentation (9%). Numbers in brackets represent proportion of the overall programme credit. | 100% within the element |
| Module   |  |                         |
| <p><b>Chemistry Core Courses</b></p> <ul style="list-style-type: none"> <li>Nanomaterials, 12 Lectures, Prof. Milo Shaffer, Prof. Nic Harrison and Prof. James Durrant</li> <li>Plastic Electronics: from materials chemistry to device applications, 12 Lectures, Prof. Martin Heeney, Prof. Iain McCulloch, Dr Saif Haque, Prof. John de Mello and Prof. James Durrant</li> <li>Renewable Energy: from solar cells to fuel cells: the chemistry of sustainable energy, 12 Lectures, Prof. Anthony Kucernak &amp; Prof. James Durrant</li> <li>Biological Chemistry, 8 Lectures, Prof. Tony Cass</li> </ul> |  |                         |
| <p><b>Materials Characterisation Materials Department</b></p> <ul style="list-style-type: none"> <li>24 lectures, Dr. Stephen Skinner, Dr. Michelle Moram, Mr. Richard Chater and Mr. Richard Sweeney</li> </ul>   |  |                         |
| <p><b>Advanced Lectures Journal Club</b></p> <ul style="list-style-type: none"> <li>Cellular Nanobiotechnology (A. Cass)</li> <li>Computer-aided design of porous materials (K. Jelfs)</li> <li>Organic electronic Materials (S Haque)</li> <li>Nanofluidics (N. Quirke)</li> <li>Single Molecule Detection (J. Edel)</li> <li>Nanomechanics (F. Giuliani)</li> <li>New Tools to measure Microscopic Viscosity (M. Kuimova)</li> <li>Design &amp; Synthesis of Semiconducting Polymers (M. Heeney)</li> <li>Dr Piers Barnes</li> </ul>   |  |                         |

| Indicative Module List |  |                   |      |              |                        |                         |                |                      |                      |                |               |      |
|------------------------|--|-------------------|------|--------------|------------------------|-------------------------|----------------|----------------------|----------------------|----------------|---------------|------|
| Code                   | Title  | Core/<br>Elective | Year | L&T<br>Hours | Ind.<br>Study<br>Hours | Place-<br>ment<br>Hours | Total<br>Hours | %<br>Written<br>Exam | %<br>Course-<br>work | %<br>Practical | FHEQ<br>Level | ECTS |
|                        | Lecture courses and examinations   | Core              | 1    | 71           | 600                    | 0                       | 671            | 50%                  | 50%                  | 0%             | 6 & 7         | 32   |
|                        | Advanced Journal Club  | Core              | 1    | 16           | 113                    | 0                       | 129            | 0%                   | 100%                 | 0%             | 7             |      |
|                        | Research Project (includes Research Proposal, Research Project Report and Project Oral Presentation) | Core              | 1    | 0            | 400                    | 1600                    | 1450           | 0%                   | 100%                 | 0%             | 7             | 58   |

## Supporting Information

The Programme Handbook is available at:

<http://www.imperial.ac.uk/chemistry/postgraduate/mres-courses/nanomaterials/>

The Module Handbook is available at:

<http://www.imperial.ac.uk/chemistry/postgraduate/mres-courses/nanomaterials/>

The College's entry requirements for postgraduate programmes can be found at:

[www.imperial.ac.uk/study/pg/apply/requirements](http://www.imperial.ac.uk/study/pg/apply/requirements)

The College's Quality & Enhancement Framework is available at:

[www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance](http://www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance)

The College's Academic and Examination Regulations can be found at:

<https://www.imperial.ac.uk/about/governance/academic-governance/regulations/>

Imperial College is an independent corporation whose legal status derives from a Royal Charter granted under Letters Patent in 1907. In 2007 a Supplemental Charter and Statutes was granted by HM Queen Elizabeth II. This Supplemental Charter, which came into force on the date of the College's Centenary, 8th July 2007, established the College as a University with the name and style of "The Imperial College of Science, Technology and Medicine".

<http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters-statutes-ordinances-and-regulations/>

Imperial College London is regulated by the Higher Education Funding Council for England (HEFCE)

<http://www.hefce.ac.uk/reg/register/>