# Programme Specification for the MRes in Biomedical Research

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. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the course handbook or on-line at [http://www1.imperial.ac.uk/medicine/teaching/postgraduate/taughtcourses/mres_biomedical_research](http://www1.imperial.ac.uk/medicine/teaching/postgraduate/taughtcourses/mres_biomedical_research). The accuracy of the information contained in this document is reviewed by the College and may be checked by the Quality Assurance Agency.

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<tr>
<th>1. Awarding Institution:</th>
<th>Imperial College London</th>
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<td>2. Teaching Institution:</td>
<td>Imperial College London</td>
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<td>3. External Accreditation by Professional / Statutory Body:</td>
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<td>4. Name of Final Award (BEng / BSc / MEng etc):</td>
<td>MRes and DIC</td>
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<td>5. Programme Title (e.g. Biochemistry with Management):</td>
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<td>6. Name of Department / Division:</td>
<td>Surgery and Cancer</td>
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<td>7. Name of Faculty:</td>
<td>Faculty of Medicine</td>
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<td>8. UCAS Code (or other coding system if relevant):</td>
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<td>9. Relevant QAA Subject Benchmarking Group(s) and/or other external/internal reference points</td>
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<td>10. Level(s) of programme within the Framework for Higher Education Qualifications (FHEQ):</td>
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<td>Master’s (MSc, MRes)</td>
<td>Level 7</td>
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<td>11. Mode of Study:</td>
<td>Full Time</td>
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<td>12. Language of Study:</td>
<td>English</td>
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<td>13. Date of production / revision of this programme specification (month/year):</td>
<td>November 2015, December 2014</td>
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14. EDUCATIONAL AIMS & OBJECTIVES OF THE PROGRAMME

**Aim of the Course**

The aim of the course is to provide students with a broad research training to prepare them for a career in biomedical research.

**Course Objectives**

The emphasis is on a research-oriented approach to biomedical science and comprises both theoretical and practical elements. The course embraces cutting edge developments in the field and by way of two mini research projects, students will experience some of the most technologically advanced approaches currently being applied to biomedical research. Specifically the course will:

a. Provide an excellent background in biomedical research, and will integrate chemical, biological and physiological aspects in a unified approach.

b. Derive and teach a mechanistic approach to the problems encountered in molecular and cellular biomedical science.

c. Emphasise an investigative as well as an empirical approach to the practical problems encountered in experimental and human biomedical science.

d. Impart theoretical and practical knowledge and competence that will prepare the student for employment in a variety of biomedical environments.

**Individuals who successfully complete the course will have:**

a. Developed an understanding of specific issues that are currently topical in molecular, cellular and physiological science.

b. Acquired an understanding of the principles and practice of modern molecular and cell science through both theory and practical exposure.

c. Demonstrated practical dexterity in the commonly employed and more advanced practical techniques of biomedical science.

d. Performed novel laboratory based research, accumulated experimental findings and have exercised critical scientific thought in the interpretation of those findings.

f. Successfully written and defended two research reports, which appraise the results of laboratory based scientific study conducted by the individual.

f. Successfully designed and written a grant application on an original research topic.

g. Acquired the theoretical and practical skills necessary to obtain employment in modern biomedical science laboratories.

h. Acquired the communication skills necessary in written, oral and IT to facilitate further study or employment in molecular, cellular and physiological science.

i. A range of transferable skills

**This will be achieved by providing:**

- A course of lectures, seminars, tutorials and technical workshops that will cover both "core" issues and more specialised topics, which reflect the particular needs and interests of the student. The programme is underpinned by the breadth and depth of scientific expertise in the participating departments covering biological chemistry, biochemistry, cell biology, structural cell biology, genetics, gene therapy, physiology, pharmacology, toxicology, cancer biology and oncology, pain medicine, anaesthesia, reproductive biology, developmental
biology, cardiovascular and respiratory science, biophysics, microscopy, stem cell biology, clinical biochemistry, bioinformatics and biostatistics.

- Hands-on experience of a wide repertoire of scientific methods, including statistical techniques and bioinformatics
- Training in core transferable skills
- Two research projects

**15. PROGRAMME LEARNING OUTCOMES**

**Knowledge and Understanding**

A. Knowledge and understanding of:

1. Issues which are currently topical in molecular, cellular and physiological science.
2. Management and communication skills, including problem definition, project design, decision processes, teamwork, written and oral reports, scientific publications.
3. Ethics of animal and human experimentation.
4. Intellectual property issues.
5. The principles and practice of modern molecular, cellular and physiological science through both theory and practical exposure.
6. Advanced practical techniques of molecular, cellular and physiological science.
7. Research techniques including information retrieval, experimental design, statistics, bioinformatics and laboratory safety.

**Teaching/learning methods and strategies**

- Acquisition of A1 to A4 is through a combination of lectures, seminars, technical workshops, grant writing exercise, computer-based work and coursework in the core and transferable skills courses that run through the year.
- Acquisition of A5 to A7 is principally through the two twenty four week full-time individual, supervised research projects (October to September)
- Throughout, the students are encouraged to undertake independent reading both to supplement and consolidate what is being taught/learnt and to broaden their individual knowledge and understanding of the subject.
- Assessment of the knowledge base is through a combination of individual research project reports, poster and oral presentations, (A1-7), grant application and a final viva with external examiners at the end of the year.

**Skills and other Attributes**

**Intellectual Skills** (lateral and critical thinking, logic):

Able to:

1. Critically evaluate current developments in the fields of molecular, cellular and physiological science using an integrated multidisciplinary approach involving a number of scientific disciplines.
2. Integrate and evaluate information.
3. Formulate and test hypotheses using appropriate experimental design and statistical analysis of data.
4. Plan, conduct and write-up two independent programmes of original research
Teaching/learning methods and strategies

- Intellectual skills are developed through the teaching and learning methods outlined above and in section 14.
- Experimental design and statistical skills are introduced in the core course and developed and implemented in the individual research projects and the grant writing. Individual feedback is given to students on project reports and presentations.
- Assessment is through the individual research projects (laboratory skills and project report), the grant writing and an oral examination at the end of the course.

Practical Skills

Able to:

1. plan and execute safely a series of experiments;
2. use laboratory methods to generate data;
3. analyse experimental results and determine their strength and validity;
4. prepare technical reports;
5. give technical presentations;
6. use the scientific literature effectively;
7. use computational tools and packages.

Teaching/learning methods and strategies

- Practical skills are developed through the teaching and learning programme outlined above (and in section 14).
- Practical experimental skills (1 to 3) are developed through laboratory, computer-based and project work.
- Skills 4 and 5 are taught and developed through feedback on written reports and presentations made on the individual projects.
- Skill 6 is developed through tutorials and the individual supervised research projects.
- Skill 7 is taught and developed through tutorials and project work.
- Practical skills are assessed through the individual research projects.

Transferable Skills

Able to:

1. Communicate effectively through oral presentations, computer processing and presentations, written reports and scientific publications;
2. Apply statistical and modelling skills;
3. Management skills: decision processes, objective criteria, problem definition, project design and evaluation, risk management, teamwork and coordination;
4. Integrate and evaluate information from a variety of sources;
5. Transfer techniques and solutions from one discipline to another;
6. Use Information and Communications Technology;
7. Manage resources and time;
8. Learn independently with open-mindedness and critical enquiry;
9. Learn effectively for the purpose of continuing professional development

Teaching/learning methods and strategies

- Transferable skills are developed through the teaching and learning programme outlined above and in section 11.
- Skill 1 is taught through tutorials and individual project work and developed through feedback on reports and oral presentations.
- Skill 2 is taught through tutorials and developed, as appropriate, during the individual research project.
Skills 3 to 5 are developed through group tutorials and oral presentations.
Skill 6 is developed through computer-based exercises and individual learning.
Skill 7 is developed throughout the course within a framework of weekly tutorial deadlines and the individual research projects.
Although not explicitly taught, skills 8 and 9 are encouraged and developed throughout the course, which is structured and delivered in such a way as to promote this.
Although not assessed formally, skills 1 to 9 are however assessed through the written reports and the oral examinations.

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

Course Handbook

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

Streams
The course is divided into a number of alternative pathways, or ‘streams’ focussing on different aspects of biomedical science. Each student is a member of just one stream and most teaching elements (research projects, workshops, journal clubs etc.) will follow the scientific theme of the stream. Students choose their stream on application to the course. Several teaching elements cover all streams (e.g. grant writing exercise, statistics & bioinformatics workshops). All assessment procedures are common to all streams. For the academic year 2015-16 the streams available are:

- Biomedical Research (BMR)
- Personalised Healthcare (PH)
- Bacterial Pathogenesis and Infection (BPI)
- Respiratory and Cardiovascular Science (RCVS)
- Microbiome in Health and Disease (MHD)
- Epidemiology, Evolution and Control of Infectious Diseases (EECID)
- Anaesthetics, Pain Medicine and Intensive Care (APMIC)
- Molecular Basis of Human Disease (MBHD)
- Data Science (DS)

Year One

Term one:
All students will be required to attend an induction process during their two weeks, which will include registration; general orientation and guide to the South Kensington Campus; introduction to key members of the faculty; opportunity to meet with the faculty, postdoctoral scientists and postgraduate students; essential briefings on health and safety and computing. At this time, heads of research groups will present an overview of their activities in an informal ‘project fair’ format. This will give students an idea of the breadth of research available in the Division. Upon joining the course, confirmed students will be issued with a list of potential research projects and appropriate reading material. Project 1 allocations will be made in accordance with student preferences and in consultation with the Course organisers and the student will start project 1 during week 3.

Students gather as a class weekly to attend sessions that cover generic issues such as presentation, writing and computing skills, safety issues, academic peer review and information search and retrieval strategies. Students will be expected to attend the technical workshops offering training in advanced research techniques, which will be run through the year. Additionally, students are expected to attend Journal clubs to review and discuss relevant research papers. Students will be expected to present and discuss their work at group meetings in the laboratories where they undertake their projects and have regular meetings about progress.
Term Two:
Students will continue to work on their first project within the supervisor’s laboratory. The core programme will continue covering generic issues such as statistics, bioinformatics etc. Further technical workshops and journal clubs will be conducted. In the final weeks of project 1, students will submit a written project dissertation and will give a poster presentation of their research that will be assessed.

Term Three:
Students will submit choices and the second round of projects will be allocated according to preference and in consultation with the course organisers in week 24. Students start work on their second project in week 25. They will continue to meet weekly as a class to consider generic research issues, present research papers, attend technical workshops and discuss new research developments. During April, students will attend the grant writing exercise, initially as a class and subsequently in small collaborating groups. At the end of the scheduled period, individuals will write their own grant application, which will be submitted for assessment.

In week 47, students will submit a second written project dissertation in the form of a concise scientific paper and in week 47/48 students give an oral presentation of their research; both will be assessed. Prior to the MRes Examination Board meeting in late September, students will have their final viva voce examination with at least one external examiner and at least one internal examiner.

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

- One week induction programme for orientation, introduction to library and information technology and safety.
- MRes BMR Student Handbook, which includes descriptions of the course.
- Staff:student ratios for teaching of 1:1 (project supervision).
- A large community of academic staff, postdoctoral scientists and postgraduate research students working in molecular and cell science at the South Kensington and other campuses.
- Library and other learning resources and facilities at South Kensington.
- Dedicated computing facilities at South Kensington with 24 hr access.
- Weekly MRes staff – class interaction.
- Several seminar series covering many aspects of molecular and cell science ranging from the application of analytical chemistry to biological science to molecular biology and cell biology, which run weekly throughout the year.
- The course tutor based at South Kensington has overall responsibility for student welfare and guidance, to assist them with personal problems and advise on pastoral and academic issues. The Course Director and Course Organiser are also available for consultation.
- Where practical, students will be visited by College staff during their project.
- Student email and open personal access to tutorial 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.

19. Criteria for admission

The minimum qualification for admission is normally an Upper Second Class Honours degree in a Science-based subject from an UK academic institution or an equivalent overseas qualification. Applicants may visit South Kensington if possible for a site tour and/or interview. Offers made to students are initiated by the Course Director, Course Organiser or Admissions Tutor. Where an applicant has a lesser degree qualification but has at least 3 years relevant work experience, a special case for admission may be submitted to the Graduate School by the Course Director.
20. Processes used to select students

Students are selected on the basis of their academic qualifications, relevant industrial or other experience and academic references.

Students must indicate the stream(s) in which they are interested in the first line of their personal statement on the application form.

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 Masters’ Postgraduate Quality Committees 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 Postgraduate 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:**

After assessment of each element is complete, students are given prompt written feedback via email. The feedback consists of the literal grade for the element, plus examiners comments. The written feedback can be extensive since there are multiple sets of comments corresponding to the three assessed elements. At the end of the year, students are able to receive verbal feedback on their overall performance on the course, including the recommendations of the Board of Examiners. These processes are monitored through the student feedback processes (see (d) below) and through the course management committee and other College quality control procedures (e.g. biannual quality review).

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:**

Course organisers and staff meet with students on a weekly basis and request feedback from students both as a class and individually. Course organisers are always available to meet with students on a one to one basis to discuss areas of individual concern. Student feedback is also obtained via student representatives on the staff-student committee which meets once per term. External examiners request feedback from students in the final viva as to their experience on the course and report these views in the external examiners report. Each student is given the opportunity to complete an anonymous feedback questionnaire at the end of the year. The process is run within the e-learning environment (Blackboard) and results are collated and made available to the Course Organisers to inform changes to the next year of the course. Students are informed of the actions taken as a result of feedback at weekly core sessions and via email as appropriate.

e) **Mechanisms for monitoring the effectiveness of the personal tutoring system:**

The performance of the personal tutoring system is monitored via the mechanisms listed above in (d).

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:

- Postgraduate Certificate of in University Learning and Teaching (PG Cert ULT) qualification for all eligible staff.
- Attendance at Centre for Educational Development workshops and courses such as supervising research students, becoming a personal tutor, communicating knowledge, etc. for those not eligible for PG Cert ULT.

22. Regulation of Assessment

a) Assessment Rules and Degree Classification

The Pass Mark 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

The Pass Mark for all postgraduate taught course modules is 50%. Students must pass all elements in order to be awarded a degree. For the MRes Biomedical Research, these elements are: 1) project one, 2) grant writing exercise, 3) project two.

Each research project contributes 50% to the final mark. The grant-writing exercise is a pass or fail element and although does not contribute to the overall final mark, it is a requirement of the award that it is passed. All marks will be moderated by the External Examiners.

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, 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 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* and clinical 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.

For the MRes Biomedical Research, external examiners:

- may see and moderate the internal examiners marks for all assessed work;
- receive details of all taught material;
- *viva* students at the end of the course;
- attend the Board of Examiners;
- complete a report to the College.
- Determine whether students should be awarded a Distinction, Merit or Pass grade.

23. Indicators of Quality and Standards

Since the inception of the course in 2005, over 90% of students have consistently rated it every year as ‘good’ or ‘excellent’ in the end of year course evaluation survey. More than 85% of students have gone on to study for a PhD. The external examiners have been consistently complimentary about the organisation and student experiences of the course, as recorded in minutes of recent Exam Boards: ‘students clearly enjoyed the course and were particularly pleased that the research experience lived up to their expectations’, ‘the standard…was fantastic, and better than other MSc’s’, ‘organisation of the course was very good’, ‘there was high student satisfaction’.

24. Key sources

Other key sources of information about the programme can be found on the course website: [http://www1.imperial.ac.uk/medicine/teaching/postgraduate/mres_biomedical_research/](http://www1.imperial.ac.uk/medicine/teaching/postgraduate/mres_biomedical_research/)