

COURSE PROGRAMME SPECIFICATION

Programme Specification for the MSc in Molecular Medicine

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/molecularmedicine/>. 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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| 1. Awarding Institution: | Imperial College London |
| 2. Teaching Institution: | Imperial College London |
| 3. External Accreditation by Professional / Statutory Body: | Not applicable |
| 4. Name of Final Award (BEng / BSc / MEng etc): | MSc |
| 5. Programme Title (e.g. Biochemistry with Management): | Molecular Medicine |
| 6. Name of Department / Division: | Infectious Diseases/Medicine |
| 7. Name of Faculty: | Medicine |
| 8. UCAS Code (or other coding system if relevant): | Not applicable |
| 9. Relevant QAA Subject Benchmarking Group(s) and/or other external/internal reference points | Not applicable |
| 10. Level(s) of programme within the Framework for Higher Education Qualifications (FHEQ): | |

Master's (MSc, MRes)	Level 7
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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): | November 2009 |

14. Educational aims/objectives of the programme

The programme aims to:

- Provide postgraduate students with backgrounds in either basic science, medicine, dentistry or veterinary science with an advanced academic and laboratory research training in modern cellular and molecular medicine, with emphasis on the interface between the basic and clinical aspects of the subject.
- Produce postgraduates equipped to pursue careers in molecular medicine, in academia, in hospitals, in industry, the public sector and non-governmental organisations;
- Provide a solid foundation for those who intend to go on to study for a PhD;
- Develop understanding of processes at the molecular and cellular level;
- Provide a training in laboratory and research skills;
- Provide a supportive learning environment;

- Attract highly motivated students, 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.

At the end of the taught element students should have a good understanding of:

- The molecular and cellular mechanisms involved in the development and regulation of cells and tissues under normal and disease states
- Advanced molecular and cellular biology methodology
- Gene Expression and its role in disease
- Molecular Genetics and its application to study disease
- Practical techniques in molecular and cellular biology and medicine.

At the end of the seven months research component the students will have:

- Experienced a thorough training in the methods and ethos of laboratory research including:
 - The design of a good research project
 - Designing and planning of experiments
 - Trouble shooting for experimental problems
 - Data presentation, analysis and interpretation
 - Literature searching
 - Critical review
 - Preparation and presentation of work for publication (in the form of a written report)
 - A clear understanding of good laboratory practice, including safety.

15. Programme Learning Outcomes

1. Knowledge and Understanding

Knowledge and Understanding of:

- 1.1. Fundamental principles of molecular and cellular biology;
- 1.2. Modern technologies of molecular biology;
- 1.3. Molecular biology applied to investigation of disease, including infectious diseases, genetic diseases, cancer, haematology;
- 1.4. Practical research techniques, including essential molecular biology methodologies; Southern blotting, library screening, isolation of recombinant DNA, PCR and DNA sequencing technologies;
- 1.5. Detailed knowledge and understanding of the essential facts, concepts, principles and theories relevant to the student's chosen research project;
- 1.6. Management and communication skills, including problem definition, project design, decision processes, teamwork, written and oral reports, scientific publications.

Teaching/learning methods and strategies:

Acquisition of 1.1 to 1.4 is through a combination of lectures, seminars, tutorials and laboratory work, and coursework, (October to February).

Acquisition of 1.5 is through the full-time, individual, supervised research project (March to September).

Acquisition of 1.6 is through a combination of lectures, laboratory exercises, coursework, small group projects linked to workshops with group and individual presentations.

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 unseen written examinations (1.1-4, 1.6) and assessed coursework (1.1 - 4, 1.6) in the form of laboratory write-ups (1.1 - 4), essays (1.1 - 4), and the individual research project report and viva (1.5 - 6).

2. Skills and other Attributes

Intellectual Skills: able to

- 2.1. Understand the nature of disease in terms of molecular and cellular biology
- 2.2. Integrate and evaluate information from a variety of sources
- 2.3. Formulate and test hypotheses
- 2.4. Be creative in the solution of problems and in the development of hypotheses
- 2.5. Plan, conduct and write-up a programme of original research.

Teaching/learning methods and strategies

Intellectual skills are developed through the teaching and learning methods outlined above and in section 17.

Analysis and problem solving skills are further developed through the tutorials.

Experimental design and research skills are developed in lectures and course practical work in the course and subsequently in the individual research project. Individual formative feedback is given to students on all work produced including oral presentations. The Exams, held in February, provides important feedback on student progress.

Assessment of thinking skills is partly achieved through coursework, unseen written examinations and the individual research project but also in assessed practicals and course work

Practical Skills: able to

- 3.1. Plan and execute safely a series of experiments;
- 3.2. Use laboratory equipment to generate data;
- 3.3. Analyse experimental results and determine their strength and validity;
- 3.4. Prepare technical reports;
- 3.5. Give technical presentations;
- 3.6. Use the scientific literature effectively;
- 3.7. 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 17).

Practical experimental skills (3.1 to 3.3) are developed through laboratory practicals and project work.

Skills 3.4 and 3.5 are taught and developed through feedback on reports written and presentations made as part of coursework.

Skill 3.6 is developed through lectures, coursework reports and essays, and the individual supervised research project.

Skill 3.7 is taught and developed through coursework exercises and project work.

Practical skills are assessed through laboratory experiment write-up and the research project dissertation.

Transferable Skills: able to

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

4.9. 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 17.

Skill 4.1 is taught through coursework and developed through feedback on reports, essays and oral presentations. Skill 4.2 is taught through lectures and practical work and developed, as appropriate, during individual research project.

Skills 4.3 to 4.5 are developed through group project work. Skill 4.6 is developed through computer-based exercises, projects and other coursework activities and individual learning. Skill 4.7 is developed throughout the course within a framework of staged coursework deadlines and the split examination system.

Although not explicitly taught, skills 4.8 and 4.9 are encouraged and developed throughout the course, which is structured and delivered in such a way as to promote this.

Skill 4.1 is assessed through coursework, workshop presentations, written examinations and the oral examination. Skill 4.2 is assessed through coursework, written examinations and project work. Skills 4.3 to 4.5 are assessed in workshops. The other skills are not assessed formally.

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

MSc in Molecular Medicine Handbook and Course Standard Operating Procedure

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

Year One:

The programme is only offered as a full-time, one year course and leads to the MSc degree. The course is comprised of two parts, a taught component, which is given from October to February, and a research component that will be given over the remainder of the year, ~7 months.

The taught component will include lectures, laboratory practicals, tutorials and student presentations. Laboratory based practicals are held throughout the taught component.

All students attend a core induction week, followed by a module of core basics of molecular and cellular biology, together with molecular biology technologies, including molecular genetics, DNA sequence analysis and polymerase chain reaction (PCR). Gene regulation and cellular development, and signalling mechanisms are then covered.

This is followed by specific programmes centred on cancer, haematology and infectious diseases, molecular genetic diseases (diabetes, cystic fibrosis, muscular dystrophy, complex trait analysis and gene mapping), transgenic research and microarray analysis.

Practical sessions cover isolation and preparation of genomic DNA, Southern blotting, screening of bacteriophage libraries, plasmid cloning, restriction enzyme mapping, PCR and DNA sequencing, bioinformatic analysis of DNA sequence data, and protein expression and western blot analysis.

Tutorials and student presentations are held every 1 - 2 weeks.

There are three written examinations, one short answer question (SAQ) & paper critique paper, one essay paper and one practical data analysis paper. These are held in the last two weeks of February.

A full time laboratory based research project will be carried out, in one of the Departments associated with the MSc course, from the beginning of March until the end of September (approximately 7 months). The titles of the research projects, offered by prospective supervisors will be made available in December/January. On completion of the project a written report will be produced and submitted for an examination followed by a viva in September with an internal and external examiner.

The overall pass mark is 50%, and the written examinations and coursework element and the research project element contribute 50% and 50%, respectively.

In addition to the formal teaching sessions (approximately 20 lectures and/or two days of practicals per week), students are expected to undertake private study (approximately 20 - 25 hours per week) to supplement the lectures and practicals and to explore areas in greater depth. During the research component students are expected to work full-time in the laboratory and to undertake private study.

Assessment

In February, at the end of the taught component there are written examinations. These consist of:

- a) Paper 1 General Topics - Short Answer Questions & Paper Critique (3 hours)
- b) Paper 2 Specialised Topics – Essays (3 hours)
- c) Paper 3 Practical Data Analysis (3 hours - written paper testing knowledge of laboratory techniques, technical understanding and the ability to present and interpret data)

These examinations test both the breadth of knowledge of the candidate (Papers 1) and their ability to go into depth on some subjects (Paper 2) as well as their ability to understand laboratory techniques and to present and interpret data (Paper 3).

The coursework components consist of a Poster presentation (in January) and an oral Research presentation of their project (in July).

In September, students are examined on their research projects. This is on the basis of their written report and *viva voce*. The *viva voce* examines both the research project and thesis and is conducted by two examiners.

In order to obtain the MSc., it is necessary to pass each Element of the course: Element 1 – written examination Papers 1 – 3 and Coursework, and Element 2 – thesis and *viva voce* examination. Each Element is independent in that a failure in either Element requires the student to retake the failed Element, but not the Element they have passed. For each paper the pass mark is 50%. Candidates achieving an overall mark of between 50% and less than 60%, in both Elements, will be recommended for a Pass. Candidates achieving an overall mark of between 60% and less than 70%, in both Elements, will be recommended for a Pass with Merit. Candidates achieving an overall mark of 70% or greater in both Elements will be recommended for a Pass with Distinction. The overall mark is obtained with Elements 1 and 2 contributing 50% each. No mark of less than 40% will be accepted as a condoned failing mark for any component e.g. any of the written papers, thesis or *viva voce*. An overall grade of Pass, Merit or Distinction in the MSc. is awarded at the discretion of the examiners based on performance in both Elements.

ECTS Assignment

Element 1 – Written Examinations and Coursework	35 ECTS
Element 2 – Research Project and Viva	55 ECTS
Total	90 ECTS

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

- One week induction programme for orientation, introduction to library and computer facilities
- MSc Student Handbook, which includes lecture timetable and practical protocols
- In addition to the Course Director, who has overall responsibility for student welfare and guidance, all students are allocated personal tutors whose role is to assist them with personal problems and to advise on pastoral and academic issues.
- Small tutorial groups (4 - 6 students : 1 staff)
- A large community of postgraduate research students and postdoctoral research workers who work on molecular and cellular biology of disease at Hammersmith Hospital Campus.
- A comprehensive external speaker seminar programme at the Hammersmith Hospital Campus run by all the major departments of the Faculty of Medicine.
- Library and other learning resources and facilities at Hammersmith Hospital Campus, and also at the South Kensington Campus.
- Dedicated computing facilities at Hammersmith Hospital Campus.
- Safety lecture given in first week core programme.

- An MSc staff - student committee, 1 student representative/10 students on the course, which meets two times per year.
- Students conducting their research projects at an external site are assigned a member of Imperial College academic staff to oversee progress and advise on the project dissertation. 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.
- Access to College English Language Support Programme
- Feedback on coursework and examination performance given verbally to all students in individual meetings with the Course Director
- Opportunities for students to conduct their research projects at a wide range of internal laboratories at Imperial College, and possibly at external institutions and companies.
- Employer needs and opinions feed into the programme through frequent guest lecturers from industry and possible student placements in relevant industries and industry-based research projects.

19. Criteria for admission:

The minimum qualification for admission is normally a Lower Second Class Honours degree in a Science-based subject from an UK academic institution or an equivalent overseas qualification. Where an applicant has a lesser degree qualification but has at least three years work experience in biology, chemistry or a related discipline, a special cases for admission may be submitted to the Graduate School of Life Sciences and Medicine Postgraduate Quality Committee.

20. Processes used to select students:

All applications are reviewed by the Course Director and applicants are either selected or rejected, on the basis of their BSc degree result, the Institution at which they studied and their references. Candidates with 2nd or 1st class degrees from a Russell Group Universities are normally made a direct offer. All candidates are welcome to visit the Hammersmith Hospital Campus and discuss the course with the Course Director.

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:

- Questionnaire about the classes is completed by all students. These are seen and discussed by the Course Committee and Divisional Teaching Committee (See below)
- Individual feedback sessions with all students in May with the Course Director.
- Periodic staff appraisal and peer teaching observations
- Two-three yearly review of the course by an Imperial College London academic staff member from outside the Division with a report and grading to the Graduate School of Life Sciences and Medicine, Postgraduate Quality Committee (See below)
- MSc in Molecular Medicine Course Committee, with feedback from student representatives, with report to Divisional Teaching Committee (See below)
- External Examiner reports (See below)

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 Schools' 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.

Committees with responsibility for monitoring and evaluating quality and standards:

- MSc in Molecular Medicine Course Committee
- Board of Examiners – meets in September to consider awards
- Departmental Teaching Committees
- Divisional Postgraduate Teaching Committee
- Divisional Teaching Strategy Committee
- Graduate School of Life Sciences and Medicine, Postgraduate Quality Committee
- Imperial College London, Quality Assurance Advisory Committee (See below)
- Imperial College London, Senate (See below)

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 Advisory Committee (QAAC)** is the main forum for discussion of QA policy and the regulation of degree programmes at College level. QAAC 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. QAAC 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 **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.

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.

a) 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:

- Verbal feedback promptly given to students after their literature presentations;
- Discussion sessions on the laboratory practical sessions;
- Meetings with personal tutees to discuss progress;
- Meeting of individual students with course director to discuss exam performance, research project progress (in May);
- Course questionnaires and Staff-Student Liaison committee;
- External examiners and course committee

b) 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:

- MSc in Molecular Medicine Course Committee
- Meetings with personal tutees and Course Director
- Course questionnaire evaluation
- Meeting of individual students with course director to discuss exams performance, research project progress and career aims (in May);
- Viva with External Examiner
- Feedback meeting between External Examiners and Students held after the viva exams

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

- MSc in Molecular Medicine Course Committee
- Meetings with personal tutees
- Meeting of individual students with course director to discuss exams, performance, research project progress and career aims (in May each year)
- Course questionnaire evaluation
- Feedback meeting between External Examiners and Students held after the viva exams

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:

- Active research programme in molecular and cellular biology as applied to medical research;
- Staff appraisal scheme and institutional staff development courses;
- College Teaching Development Grant Scheme to fund the development of new teaching and appraisal methods;
- Updating professional and IT/computing developments.

22. Regulation of Assessment:

a) Assessment Rules and Degree Classification:

- Minimum pass mark is 50% for each module. No mark of less than 40% will be accepted as a condoned failing mark for any component e.g. one of the written papers.
- Assessment details are provided in the MSc Student Handbook.
- To qualify for the award of MSc students must complete all the course requirements and must achieve an overall pass mark in the combined examinations and coursework, Element 1, and in the research project and *viva voce*, Element 2.
- The weighting of marks contributing to the degree for the examinations and coursework element and the research project element is: 50:50.
- The written examination and coursework element contributes 50% of the total marks.
 - Paper 1 General Topics - Short Answer Questions & Paper Critique; 15%
 - Paper 2 Specialised Topics – Essays 15%
 - Paper 3 Practical Data Analysis 15%
 - Poster Presentation 2.5%
 - Research Presentation 2.5%

- The research project element contributes 50% of the total marks

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 undergraduate and 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,

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 will 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 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.

- Approve examination papers;
- Review coursework;
- See all examination scripts and research project dissertations;
- Viva students;
- Attend the Board of Examiners;
- Complete a report to the College.

23. Indicators of Quality and Standards:

- Favourable comments and feedback from students.
- Favourable comments by External Examiners.
- First destination data for MSc graduates, showing a high proportion find employment or further postgraduate research training in Molecular and Cellular Biology and related areas.
- Independent review of the quality of the educational provision in Medicine by the Quality Assurance Agency subject review process in 2000 achieving an excellent grading of 21 out of a maximum 24 points.

Curriculum Design Content and Organisation	= 3
Teaching Learning and Assessment	= 3
Student Support and Guidance	= 4
Student Progression and Achievement	= 4
Learning Resources	= 4
Quality Management and Enhancement	= 3

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

- MSc in Molecular Medicine Course handbook (available on course Blackboard web pages)
- Postgraduate Prospectus, Imperial College London (available on-line <http://www3.imperial.ac.uk/pgprospectus>)
- MSc in Molecular Medicine website (<http://www1.imperial.ac.uk/medicine/teaching/postgraduate/taughtcourses/molecularmedicine.html>)
- Imperial College Faculty of Medicine (<http://www1.imperial.ac.uk/medicine>)
- QAA Subject Review Report Imperial College of Science, Technology & Medicine (www.qaa.ac.uk).