Programme Title: Molecular and Genomic Medicine

Programme Specification (PG)

Awarding body / institution:	International Medical University / Queen Mary University of London
Teaching institution:	International Medical University / Queen Mary University of London
Name of final award and programme title:	Double MSc in Molecular Medicine (IMU) & MSc Genomic Medicine (QMUL)
Name of interim award(s):	PG Cert
Duration of study / period of registration:	2 years FT/ 4 years PT
QMUL programme code(s):	
QAA Benchmark Group:	
FHEQ Level of Award:	Level 7
Programme accredited by:	
Date Programme Specification approved:	28.11.18
Responsible School / Institute:	William Harvey Research Institute

Schools / Institutes which will also be involved in teaching part of the programme:
Barts Cancer Institute

Institution(s) other than QMUL that will provide some teaching for the programme:
UCL, International Medical University

Programme outline

The MSc in Molecular Medicine (IMU) & MSc Genomic Medicine (QMUL) is based on two established and running MSc courses. This programme is offered as a 2 years full time course (partially delivered as distance learning and partially on campus); programme is also offered as a 4 year part time (distance learning/on campus).

The area of molecular medicine and genomics research has transformed our understanding of disease biology and opened new avenues in drug discovery and patient treatment. Advances in technology and informatics are fuelling an exponential growth in genomics but at the same time have created an urgent need to train healthcare professionals and the broader biomedical sector in to this discipline. Genomics has strong potential to impact patient care but will require highly trained professionals to implement it both at the level of the pharmaceutical industry and the health care system.

This programme is modular in nature and will cover a wide range of disciplines associated with the subject from molecular basis of the diseases, immunology, infection through pharmacogenomics, the omics revolution, and the design of clinical trials. Modules are delivered over the period of 21h (aprox.) and students are expected to supplement the provided content with self-directed learning.

Students will carry out a research project under joint supervision as part of the joint dissertation module. Students will have the option to carry out their project at either QMUL or IMU. The former will require obtaining a visa.

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The language of instruction will be English throughout the programme.

Aims of the programme

The aim of the programme (MSc in Molecular & Genomic Medicine) is to expand the skills and knowledge of the students trained more broadly in molecular techniques and to cover in more depth, the field of genomics and its application to medicine. Moreover, the course aims to produce graduates with the knowledge and intellectual skills required to provide, develop and advance specialist scientific services around genomics within healthcare systems.
Students will gain a multi-disciplinary perspective in genomics applied to medical research to enhance their skills in this rapidly evolving field.
Furthermore, the programme aims to increase the pool of health care professionals trained in genomics to meet the growing demand in the emerging discipline of clinical genomicists.

What will you be expected to achieve?

Students are expected to achieve a solid theoretical foundation in the area of basic genetics and genomics in order to be able to critique: the study of disease genetics as well as how genomic information can be used to understand disease mechanisms and biology; A comprehensive analysis of the molecular and genetic approaches to the diagnosis of various diseases as well as tracking and managing conditions; the analysis of the regulatory, legal and ethical issues in genomic research and associated clinical applications.
In depth appraisal of the complexity of pharmacogenomics and other treatment options on individuals based on their genetic makeup, i.e. techniques to stratify patients at risk of adverse drug reactions as well as tailoring drug treatment to improve patient response.

Academic Content:	
A1	A solid theoretical foundation in the area of basic genetics and genomics to the participants in order to critique the study of disease genetics and how genomic information can be utilised to understand disease mechanisms and biology
A2	Comprehensive analysis of the techniques used to sequence either DNA or RNA using state-of –the-art highly parallel sequencing platforms. This will cover sequencing of targeted parts of the genome (e.g. exome sequencing) or whole gulatory genomes, the transcritome (mRNAs, micro RNAs, long non coding RNAs) as well as targeted regions of open chromatin and classes of regulatory elements.
A3	An introduction to the field of (i) metabolomics and (ii) proteomics and the state-of –the-art techniques used for high throughput measuring of comprehensive groups of metabolites and proteins in biological samples, respectively
A4	Comprehensive analysis of the application of genomics to rare genetic diseases including identification of mutations responsible for a condition and current approaches in using diagnostic tools based on genomics.
A5	Genomics in the context of common diseases
A6	Comprehensive analysis of the molecular and genetic approaches to the diagnosis and classification of tumors including the techniques used to obtain, prepare and store tumour samples for genomic analysis
A7	Comprehensive analysis of the molecular and genetic approaches to the diagnosis of infectious diseases as well as tracking and managing infections

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A 8	Critique of the complexity of pharmacogenomics and their effect of medication on individuals based on their genetic makeup, i.e. techniques to stratify patients at risk of adverse drug reactions as well as tailoring drug treatment to improve patient response.
A 9	Statistical and bioinformatics techniques to analyse genetic and genomic data including the use of publicly available databases and literature searches to critically assess and annotate findings of these analyses
A 10	Critical analysis of the regulatory, legal and ethical issues in genomic medicine and research (optional)
A 11	Approaches and issues surrounding the support of individuals who are affected by or are predisposed to a genetic condition. (optional)
A 12	Exploration of the impact of genomic technologies to the healthcare system including economic models to demonstrate the anticipated costs and benefits of new technological approaches (optional)
A 13	Approaches and issues surrounding the design of clinical trials - critical analysis of pre-clinical data

Disciplinary Skills - able to:	
B 1	Display an awareness of the scientific needs to support the development and understanding of the field of human genomics.
B 2	Demonstrate a thorough understanding of the strengths and weaknesses in utilizing specific genomic techniques in a clinical setting.
B 3	Interpret critically the research of others and develop the skills to formulate own research questions
B 4	Demonstrate initiative and originality in problem solving
B 5	Display a critical view to the potential ethical issues arising from the application of genomic research in patient care
B 6	Display a critical view to the design of early phase clinical trials
B 7	Demonstrate a thorough understanding of good clinical practice and international harmonisation in pre-clinical studies

Attributes:	
C 1	Demonstrate a comprehensive understanding of techniques applicable to their own research or advanced scholarship
C 2	Be able to evaluate and critique methodologies related to genomic medicine
C 3	Be able to make decisions in complex and unpredictable situations
C 4	Demonstrate initiative and personal responsibility
C 5	Demonstrate self-direction and originality in tackling and solving problems, and act autonomously in planning and implementing tasks at a professional or equivalent level

How will you learn?

This Double Award programme is offered via blended Distance learning and on-campus delivery.
Students will have the choice to undertake their joint Dissertation research project either at QMUL or IMU under remote joint

supervision.
Students will receive comprehensive study materials via virtual learning environment (e.g. QMPLUS):
- lecture capture material, seminar forums, message boards which requires student interaction to discuss and exchange ideas, share knowledge as well as reviewing lecture sessions.
The taught component of the course will provide clear and concise insights into key areas of molecular and genomic medicine. Students will receive more comprehensive study materials via virtual learning environment (QMPLUS) including lecture capture materials, seminar forums and message boards which requires student interaction to discuss and exchange ideas, share knowledge as well as reviewing lecture sessions.
One of the major strengths of this programme lies in the fact that the teaching staff will consist of top professionals working in the fields of molecular medicine and genomics. The exceptional expert "panel" of internal as well as external lecturers will be actively engaged with the course at all times.
The WHRI also provides a unique environment of international calibre research in cardiovascular genomics whereas acting as a host to Genomics England offers the possibility to engage experts in high throughput clinical genomics and access to data sets for training purposes.

How will you be assessed?

IMU modules are assessed through a variety of means including:
Molecular Medicine - (MM301)- Three case reports (90%) + Presentation (10%)
Molecular Basis of Diseases I - (MM307)- 2 Case studies
Molecular Basis of Diseases II - (MM308)- 2 Case studies
Immunology and Infection - (MM302)- Three case studies (60%) + Seminar (40%)
Research Methodology (MM304) - Proposal writing (70%) + Journal style writing (30%)

For all taught modules of the Genomic Medicine but WHRM992 & WHRM935, there will be an end of module assessment in the form of a written essay / practical and an end of the course exam that will take place at IMU premises. For WHRM992 & WHRM935 there is only an end of module assessment in the form of a written essay / practical.
For full Time students, the final examination for QMUL modules is undertaken only after all taught modules have been completed. For part-time students the examination is split over years 2 and 4.

Award of the double MSc will require the completion of a joint research project dissertation (60 credits) which will be assessed via a written thesis of ~20,000 words and an oral presentation of the project and its findings. For the latter, students will give a 20 minute presentation, followed by 20 minute Q & A.
(See appendix 1)

How is the programme structured?

Please specify the full time and part time programme diets (if applicable). The description should be sufficiently detailed to fully define the structure of the diet.

This Double Award programme comprises of modules from the two courses:

MSc Molecular Medicine (IMU) and MSc Genomic Medicine (QMUL).

Double Award Programme is offered as a Full Time (2 year distance learning / on campus) and Part-Time (4 year distance learning / on campus).

A. Full -Time programme:

(i) Taught modules

Students who are enrolled on the MSc Molecular Medicine at IMU and need to complete ALL the taught core modules plus 2 elective modules out of the three elective modules offered by the IMU programme (Laboratory Management, Stem Cell Technology and Therapeutics, Drug Discovery, Design and Development).
Students will undertake one QMUL module alongside their IMU study.

Students will then undertake the MSc Genomic Medicine programme via DL and undertake the following modules required for completion of the Double Award Degree:

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- 2 x 15 credit core modules (WHR7202 & WHR7206)

- 4 x 15 credit modules - WHR7204, WHR7205, WHR7207, WHR7211

- 2 x 15 credit module from a list of three electives (WHR7209, WHRM992, & WHRM935)

(ii) Dissertation

- a 60 credit joint research project in the field of genomic medicine. The dissertation project can be carried out at either QMUL or IMU and in either case will be under joint supervision.
Students who wish to complete the dissertation module at QMUL shall require a valid student visa.

B. Part-time version of the programme:

Students are expected to complete:

Year 1: (3 x IMU modules + 1 QMUL module):

- Molecular Medicine
- Molecular Basis of Diseases 1
- Immunology and Infection
- Omics' techniques and their application to genomic medicine

Year 2: (2 x IMU modules + 2 x QMUL modules):

- Molecular Basis of Diseases 2
- Research Methodology
- Bioinformatics, Interpretation, and Data Quality Assurance in Genome Analysis
- Ethical, legal and social issues in genomic medicine

Year 3: (2 x IMU (elective) modules + 3 x QMUL modules)

Year 4: (2 MGM modules + Dissertation)
(See Appendix 1)

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Molecular Medicine	IMU7201	3	7	Core	1	
Molecular Basis of Diseases 1	MM307	3	7	Core	1	

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Molecular Basis of Diseases 2	MM308	4	7	Core	1	
Immunology and Infection	MM302	2	7	Core	1	
Research Methodology	MM304	3	7	Core	1	
Laboratory Management	IMU	2	7	Elective	1	
Stem Cell Technology and Therapeutics	IMU	3	7	Elective	1	
Drug Discovery, Design and Development	IMU	3	7	Elective	1	
[Mar Start] - Omics' techniques and their application to genomic medicine. [Sep Start] - Bioinformatics, Interpretation, and Data Quality Assurance in Genome Analysis	WHR7202 WHR7206	15	7	Core	1	Semesters 1-3

Academic Year of Study FT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
[Sept Start] - Omics' techniques and their application to genomic medicine [Mar Start] - Bioinformatics, Interpretation, and Data Quality Assurance in Genome Analysis	WHR7202 WHR7206	15	7	Core	2	Semesters 1-3
Molecular pathology of cancer and application in cancer diagnosis, screening, and treatment	WHR7204	15	7	Compulsory	2	Semesters 1-3
Pharmacogenomics & stratified health-care	WHR7205	15	7	Compulsory	2	Semesters 1-3
Application of genomics in Infectious disease	WHR7211	15	7	Compulsory	2	Semesters 1-3
Economic models and human genomics	WHR7209	15	7	Elective	2	Semesters 1-3
Professional and Research skills	WHRM935	15	7	Elective	2	Semesters 1-3

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Dissertation	WHR7299	60	7	Core	2	Semesters 1-3

What are the entry requirements?

Entry Requirements

Candidates should have a degree or equivalent in an appropriate subject from an approved educational establishment/ professional qualifications or experience sufficient to satisfy the Head of Division and Course Director of the applicant's fitness to pursue the course of study.

Entry level guidelines for English Language: an IELTS score of ≥ 6.5 is required for this programme.

How do we listen to and act on your feedback?

There will be regular feedback sessions and online discussion board review between students and staff to address issues arising from delivering the programme.

The Staff-Student Liaison Committee provides a formal means of communication and discussion between schools/institutes and its students. The committee consists of student representatives from each year in the school/institute together with appropriate representation from staff within the school/institute. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. Staff-Student Liaison Committees meet regularly throughout the year. We anticipate that the distance learning students will engage in this process through an on-line mediated discussion forum, i.e. an interactive message board where students can discuss topics and formulate views, and by direct email.

Each school/institute operates a Learning and Teaching Committee, or equivalent, which advises the School/Institute Director of Taught Programmes on all matters relating to the delivery of taught programmes at school level including monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment before submission to Taught Programmes Board. Distance learning student views will be incorporated in the committee's work through student surveys.

All schools/institutes operate an Annual Programme Review of their taught postgraduate provision. APR is a continuous process of reflection and action planning which is owned by those responsible for programme delivery; the main document of reference for this process is the Taught Programmes Action Plan (TPAP) which is the summary of the school/institute's work throughout the year to monitor academic standards and to improve the student experience. Students' views are considered in this process through analysis of the NSS and module evaluations.

Distance-learning students are entitled to the same pastoral support as students on-site but via electronic / telephone means. Pastoral support can be accessed via the Programme Organiser and Course administrator within the Institute.

What academic support is available?

Participants will get access to extensive online induction material. There will be an induction day to review the programme details and expectations. Mechanisms for student support (academic, technical, administrative and pastoral) are all in place and information about this will be available online as part of the induction material.
The student group is expected to remain small due to clinical constraints and therefore a personalised approach to academic support is anticipated. The small group will also enable allocation of senior faculty including the Programme Director as personal tutors ensuring consistency of student experience and a commitment to personal contact.

Programme-specific rules and facts

A joint exit award may be issued due to academic failure/withdrawal of the programme. Students will need to successfully

complete: any three taught QMUL modules and IMU7201 Molecular Medicine (IMU)

Specific support for disabled students

Queen Mary has a central Disability and Dyslexia Service (DDS) that offers support for all students with disabilities, specific learning difficulties and mental health issues. The DDS supports all Queen Mary students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites.

Students can access advice, guidance and support in the following areas:
• Finding out if you have a specific learning difficulty like dyslexia
• Applying for funding through the Disabled Students' Allowance (DSA)
• Arranging DSA assessments of need
• Special arrangements in examinations
• Accessing loaned equipment (e.g. digital recorders)
• Specialist one-to-one "study skills" tuition
• Ensuring access to course materials in alternative formats (e.g. Braille)
• Providing educational support workers (e.g. note-takers, readers, library assistants)
• Mentoring support for students with mental health issues and conditions on the autistic spectrum.

Links with employers, placement opportunities and transferable skills

Students who are employed in a recognised training laboratory, will be offered the option to undertake their research dissertation project in that lab with designated mentors / supervisors from both the training laboratory and the Double Award MSc programme.

Programme Specification Approval

Person completing Programme Specification:	Prof Panos Deloukas
Person responsible for management of programme:	Prof Panos Deloukas & Prof Mark Caulfield
Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:	13.05.2022 (for Sept 2022)
Date Programme Specification approved by Taught Programmes Board:	28.11.18