Programme Title: Genomic Medicine

Programme Specification (PG)

Awarding body / institution:	Queen Mary University of London
Teaching institution:	Queen Mary University of London
Name of final award and programme title:	MSc Genomic Medicine PgDip Genomic Medicine PgCert Genomic Medicine
Name of interim award(s):	
Duration of study / period of registration:	1 year full time on site / 2 years part time by DL
QMUL programme code(s):	PSGMH
QAA Benchmark Group:	
FHEQ Level of Award:	Level 7
Programme accredited by:	QMUL
Date Programme Specification approved:	
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 / GOSH

Programme outline

The programme has a modular structure, and the learning delivered will provide the academic background and specialist knowledge and skills required for undertaking work and research in the area of genomics (e.g. routine diagnostic and research laboratories within the NHS).

Core Modules (i.e. have to take and pass the module in order to get the degree) – 15 credits each:
- WHR7201 - Fundamentals in Human Genetics and Genomics
- WHR7202 - Omics Techniques and their Application to Genomic Medicine
- WHR7206 - Bioinformatics, Interpretation, and Data Quality Assurance in Genome Analysis

45 credits from the following elective-core modules (i.e. have to take and pass 3 / 4 modules in order to get the degree):
Compulsory: (45 credits from the following):
- WHR7203 - Genomics of Common and Rare Diseases
- WHR7204 - Molecular pathology of cancer and application in cancer diagnosis, screening, and treatment
- WHR7205 - Pharmacogenomics and Stratified Healthcare

- WHR7211 - Application of Genomics in Infectious Disease

90 credits from the following elective modules:
Core: One of WHR7212, WHR7213 (either 30 or 60 credits)
Compulsory: (30 – 75 credits from the following):
- WHR7207 - Ethical, Legal and Social Issues in Genomic Medicine
- WHR7208 - Genetics and Genomics Counselling
- WHR7209 - Economic models and human genomics
- WHR7210 - Expanding the Content of the MSc in Genomic Medicine with Workplace-based Modules
- WHRM935 - Professional and Research Skills
- Any remaining elective-core

Aims of the programme

Advances in technology and informatics have fueled an exponential growth in genomics research which in turn has transformed our understanding of disease biology and opening new avenues in drug discovery and patient treatment.
This has created an urgent need to train staff across the NHS and researchers in 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.

The MSc programme in Genomic Medicine aims to:

1. Provide participants with a multi-disciplinary perspective in genomics applied to medical research to enhance their skills in this rapidly evolving field.
2. Increase the pool of health care professionals trained in genomics to meet the growing demand in the NHS for the emerging discipline of clinical genomicists

The overall aim of the programme is to produce graduates with the knowledge and intellectual skills required to provide, develop and advance specialist scientific services around genomics within healthcare systems. In this context the programme will take advantage of the location of Genomics England within WHRI to train course participants using high quality clinical genomic data and offer them the possibility to interact with international experts in this field.

Queen Mary University of London will award Master's degrees to Trainees who have demonstrated:
• a systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their academic discipline, field of study or area of professional practice
• a comprehensive understanding of techniques applicable to their own research or advanced scholarship
• originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline
• conceptual understanding that enables the student:
- to evaluate critically current research and advanced scholarship in the discipline
- to evaluate methodologies and develop critiques of them and, where appropriate, to propose new hypotheses.

Typically, holders of the qualification will be able to:

• deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences
• demonstrate self-direction and originality in tackling and solving problems, and act autonomously in planning and implementing tasks at a professional or equivalent level
• continue to advance their knowledge and understanding, and to develop new skills to a high level.

Graduates of the accredited pathway will have:
- proficiency in the application of genomics in Clinical Practice and Inter-professional Skills demonstrated by
- the ability to work with all sectors practising Genomic Medicine within the Healthcare Environment
- the ability to understand the structure of the NHS and the role Healthcare Scientists play
- the ability to manage the work place and interact with colleagues

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- being able to lead and demonstrate leadership skills
- being competent in diagnostic aspects of the Healthcare Scientist Role
- the ability to communicate genomic information to patients

What will you be expected to achieve?

We have developed a set of lectures tailored to the varied qualification and experience of entrants supplemented by online tutorials for standard informatics skills in order students acquire the necessary skills for analysis and interpretation of genomic data in a medical context. For example, students are first exposed to basic functions of a genome browser such as ENSEMBL, are then encouraged to use the online tutorials to familiarise themselves, and finally they attend a full day workshop with the help of the European Bioinformatics Institute to recap and learn in more depth how to access genomic information through ENSEMBL.

Academic Content:	
A 1	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
A 2	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.
A 3	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
A 4	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. Extension of the above to issues surrounding the application of genomics to infectious diseases.
A 5	Genomics in the context of common diseases
A 6	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
A 7	Comprehensive analysis of the molecular and genetic approaches to the diagnosis of infectious diseases as well as tracking and managing infections
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 genomics 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)

Disciplinary Skills - able to:

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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	Demonstrate counseling skills how to provide an appropriate support to individuals affected by a genetic condition or are predisposed to a genetic condition

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?

Following the success and expertise within WHRI in running postgraduate awards in distance-learning, we will be offering the PGCert/PGDip/MSc in Genomic Medicine as

- full time taught in house
- part time by distance learning

The curriculum and its assessment quality standards will be monitored to ensure students achieve the appropriate standard required for a QMUL award. For distance learning, students will have comprehensive study materials provided online, but will require access to the appropriate software to view lectures through the internet. With the recent infrastructure investment by QMUL, the new technologies (e.g. QMPlus, Eco360) which allows them to discuss and exchange ideas, share knowledge as well as to review the lecture sessions in their own time and at their own pace.

Teaching of students in this programme will be undertaken together with the postgraduate students attending the standard PGDip/MSc in Genomic Medicine. This will encourage the PGCert/PGDip/MSC students to learn with and interact with other biomedical scientists through online tools. Invited lecturers on the course include both geneticists and clinical scientists.

The WHRI 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. The taught component of the course will provide clear concise insights into key areas of genomic medicine. One of the major strengths of this programme lies in the fact that the teaching staff will consist of top professionals working in this field. Our exceptional expert "panel" of internal as well as external lecturers will be actively engaged with the course at all times.

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How will you be assessed?

For the taught modules there will be an end of module assessment in the form of a written essay and an end of course exam.

Module WHR7206 will have a practical assignment in addition to the above. The end of course exam will take place in the 3rd semester (will be coordinated with the standard PGDi / MSc in Genomic Medicine to occur at the same semester) and will cover all taught modules.

Award of an MSc will require either the completion of a research project which will be assessed via a dissertation (60 credits) or the completion of a literature based essay (30 credits) in combination with two additional optional modules (2 x 15 credits)

In assessing applicants for Accreditation of Prior and Experiential Learning (AP(E)L) we anticipate using the dedicated AP[E]L Panel to review potential Trainees on a case by case basis.

The case by case review would look at the following
• Study towards traditional and non-traditional qualifications,
• Masters in a biomedical discipline
• The applicants personal statement and portfolio of evidence of experience in specific specialism – looking for evidence of the following elements
• Professionalism
• Inter-professional learning
• Relevant research methods
• Relevant research projects

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.

The course is designed to have nine (with 60-credits project dissertation) or eleven (with 30-credits literature-based dissertation) modules of which eight and 10 respectively will be taught. The course will be delivered as full time, modules will be taught monthly in 3-day time blocks, over 1 year and distance learning over two years to facilitate training of professionals. The dissertation module will span 6 months for writing up a thesis. There will be two student intakes per year, in January and October.

The diet for Full-time students is given below - students do not need to take modules in a particular order

Modules WHR7201 and WHR7202 are run sequentially twice per academic year (September and January). January intake students can select any time combination e.g. WHR7201 in January and WHR7202 in September.

The start of the dissertation (WHR7212 or WHR7213) module is shifted by 3 months for January intake students.

The attached time-table (repeats on a rolling basis - actual dates may differ slightly based on availability and public holidays) serves as an example on how the programme is structured.

We anticipate distance-learning students of this programme to take a minimum of four taught modules (60 credits) in year 1 and the remaining in year 2 (all to be completed by the 3rd semester in order to undertake the end of course exam). Taught modules can be taken in any order and are stand alone. The dissertation project will span a minimum of 6 months for carrying out the research / literature search and writing up a report - dissertation projects will start at the beginning of the 2nd semester of year 2.

The modular nature of the course is designed to fit in with the needs of those students who are in full time employment. In order for study participants to achieve an MSc award all the modules (180 credits) have to be successfully completed.
For a Postgraduate Diploma, students must complete and pass all the taught modules (equivalent of 120 credits) whereas for a Postgraduate Certificate, students must complete and pass Modules WHR7201, WHR7202, WHR7206 and one of the elective-core modules (equivalent of 60 credits).

Students undertaking the programme on a part-time basis may select the taught modules in any order, but the dissertation module must be taken in the final year.

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Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Fundamentals in Human Genetics and Genomics	WHR7201	15	7	Core	1	Semester 1 or 2
Omics techniques and their application to genomic medicine	WHR7202	15	7	Core	1	Semester 1 or 2
Bioinformatics, interpretation, statistics and data quality assurance	WHR7206	15	7	Core	1	Semester 2
Genomics of common and rare inherited diseases (elective-core)	WHR7203	15	7	Elective	1	Semesters 1,2 or 3
Molecular pathology of cancer and application in cancer diagnosis, screening, and treatment (elective-core)	WHR7204	15	7	Elective	1	Semesters 1,2 or 3
Pharmacogenomics & stratified health-care (elective-core)	WHR7205	15	7	Elective	1	Semesters 1,2 or 3
Application of genomics in Infectious disease (elective-core)	WHR7211	15	7	Elective	1	Semesters 1,2 or 3
Ethical, legal and social issues in applied genomic	WHR7207	15	7	Elective	1	Semesters 1,2 or 3
Counselling skills for genomics	WHR7208	15	7	Elective	1	Semesters 1,2 or 3
Economic models and human genomics	WHR7209	15	7	Elective	1	Semesters 1,2 or 3
Professional and Research skills	WHRM935	15	7	Elective	1	Semesters 1,2 or 3
Expanding the content of the MSc in Genomic Medicine with workplace-based modules	WHR7210	15	7	Elective	1	Semesters 1,2 or 3
Dissertation	WHR7213	60	7	Core	1	Semester 3
Dissertation (literature based)	WHR7212	30	7	Core	1	Semester 3

What are the 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 these courses.

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How do we listen to and act on your feedback?

TThere 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

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 NHS 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 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 22)
Date Programme Specification approved by Taught Programmes Board:	