

## 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:	Master of Science (MSc)
Name of interim award(s):	Postgraduate Certificate (PG Cert)
Duration of study / period of registration:	12 months (FT); 24 months (PT)
Queen Mary programme code(s):	C1T3
QAA Benchmark Group:	N/A
FHEQ Level of Award:	Level 7
Programme accredited by:	N/A
Date Programme Specification approved:	
Responsible School / Institute:	School of Biological & Behavioural Sciences

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

Collaborative institution(s) / organisation(s) involved in delivering the programme:

### Programme outline

Research in ecology and evolution genetics is increasingly empowered by genomic data, but there is a shortage of personnel with both skills in bioinformatic analysis of genomic data handling as well as having knowledge of ecology and evolution. This programme is designed to bring biologists up to speed with essential bioinformatics skills. It provides the opportunity to combine these skills, with field-work skills and knowledge developed from a cutting edge research project.

The programme is achieved through a combination of blended learning techniques, involving on-line, face to face and field work activities, leading to an individual research project.

The course is taught by QMUL academics who are actively engaged in developing bioinformatics tools and applying them in areas such as genome sequencing, proteomics, evolution, ecology, psychology, cancer, diabetes and other diseases. We have an extensive network of academic and industrial collaborators around the UK and in Europe, who contribute to teaching, co-supervise projects and provide employment opportunities.

Programme highlights:

- New cross-disciplinary course.
- Delivered by experts in the development and application of genomics to ecology and evolution.

- Providing the skills and experience that employers and PhD supervisors need.
- An extended individual project thesis project tackling a real world genomic analysis challenge.
- Field trip skills to a tropical forest (Borneo, note, we reserve the rights to change field sites given unpredictable circumstances)
- Flexible modes of study: full time, part time, campus-based or online (excepting the field trip).

## Aims of the programme

The overarching aim of the programme is to provide a thorough grounding in cutting-edge research in Ecological and Evolutionary Genomics. It will address a major skills shortage in this area. Students will learn about research by practical application, rather than learning about the research process via formal teaching.

There is a combination of five compulsory taught modules teaching bioinformatics, statistics and coding, and a residential field course to Borneo (note, we reserve the rights to change field sites given unpredictable circumstances). The remainder of the programme is given over to a substantive research project, and the complete programme leads to the MSc qualification. Thus, it should provide a comprehensive preparation for students wishing to progress onto a research degree or into employment in a research-oriented environment.

This programme aims to:

- Address a skills shortage of bioinformaticians in bioinformatics and genomics; it is currently hard to find people trained in both areas.
- Prepare students for conducting research in ecological and evolutionary genomics, particularly through PhD research.
- Prepare students for employment in biotech companies
- Provide training in ecology and evolution for students from a computational background
- Provide training in bioinformatics for students from biological backgrounds.
- Produce graduates with the ability to undertake independent research projects at the interface of genomics and whole organism biology.

## What will you be expected to achieve?

You will develop good scientific principles alongside independent and innovative thought. You will be expected to achieve an advanced, inter-disciplinary understanding of techniques and methodologies applicable to the fields of ecological and evolutionary genomics, and an appreciation of the current research issues which are driving the science forward.

In particular, you should be able to demonstrate:

- skills in bioinformatics, statistics and coding.
- the ability to synthesize information with critical awareness in a manner that may be innovative, utilising existing knowledge or cutting-edge, contemporary processes from the forefront of the discipline
- a level of conceptual understanding that will allow you critically to evaluate evolutionary and ecological genomics research, advanced scholarship and methodologies, and to argue alternative approaches
- initiative and originality in problem solving, and be able to act autonomously in planning and implementing tasks at a professional or equivalent level

From a practical training perspective, you will:

- acquire technical expertise, and be able to perform tasks smoothly with precision and effectiveness;
- be able to adapt skills and design or develop new skills and/or techniques, for new applications that engage with user needs
- develop coding and bioinformatic skills
- develop field skills

Students taking the Postgraduate Certificate will achieve a substantial subset of the above skills through completion of four of the five compulsory modules, but will not complete an independent research project and will thus not have the experience of combining all of the above to produce a thesis.

Academic Content:	
A 1	Define the field of bioinformatics and related fields such as genomics, systems biology and software engineering, and understand how these relate to research in ecology and evolution
A 2	Demonstrate proficiency in existing bioinformatics databases and tools for a range of different data types and biological applications.
A 3	Demonstrate proficiency in key statistical and algorithmic underpinnings of common bioinformatics analyses.
A 4	Demonstrate proficiency in the key technical skills (e.g. software development or "coding") required to produce new bioinformatics resources.
A 5	Critically evaluate ecological and evolutionary theory
A 6	Synthesise and comprehend cutting edge technologies and how these contribute to the development of the field

Disciplinary Skills - able to:	
B 1	Demonstrate a critical awareness of current developments in genomics, and critically evaluate new developments as they arise
B 2	Devise solutions to data analysis problems using existing tools and databases.
B 3	Critically assess and evaluate methodology and experimental design
B 4	Conduct data-driven research by utilising existing bioinformatics tools or producing new tools, as appropriate

Attributes:	
C 1	Communicate relevant concepts, both orally and in writing, to academics and practitioners from within the ecological and evolutionary genomics community, and from other disciplines that rely on bioinformatics.
C 2	Demonstrate a range of personal and professional transferable skills in project design and management, report writing, software development, communication and presentation skills
C 3	To operate and conduct oneself in complex and unpredictable and/or specialized contexts
C 4	To exercise initiative and personal responsibility in professional practice

### How will you learn?

Five modules make up the taught element of the programme. Four of these will be taught in blocks of two weeks with a subsequent week long study break to use for independent learning and fulfilling the requirements of continuous assessment exercises. Most modules comprise blended teaching, involving, for example, on-line material and face-to-face activities including seminars, breakout discussion groups, workshops, and laboratory or computer-based practicals. Much of the theory gleaned from formal teaching during the modules will be placed in 'real-world' context, including presentations from practitioners and stakeholders, and practicing field skills. Practical skills in bioinformatics, statistics and coding will be learned from activities associated with extensive class and on-line activities associated with most modules. This training in practical skills will build towards the completion of a substantive research project which should coalesce theoretical, practical and transferable skills. A further module will be a residential field trip, where students will learn, in the field, about field surveying techniques and real-life

examples of conservation in action.

In addition, there will be a substantial research project. Alignment of that research project to the current work of funded researchers within the School or with an industrial or charitable partner will provide the most informative environment for students wishing to embark on the next step of a research career.

### How will you be assessed?

Taught component

- Module on Genome Bioinformatics (15 credits)
- Module of Coding for Scientists (15 credits)
- Module on Statistics for bioinformatics (15 credits),
- Module on Post genomics bioinformatics (15 credits)
- Field course in Biodiversity and Conservation (15 credits, Borneo)
- Literature Review in Conservation and Evolution (15 credits, 5000 word report)

Independent Research Project, (90 credits), comprising:

- Oral presentation - 10%
- Thesis (10,000 words) - 90%

The first four modules all involve a substantial individual practical assessment, e.g. to analyse a dataset and produce a report; produce a piece of software; etc. This will be carried out within the private study week, with individual feedback provided to the students during the following module.

The research project is assessed by the project thesis and an end of project presentation.

### How is the programme structured?

Please specify the structure of the programme diets for all variants of the programme (e.g. full-time, part-time - if applicable). The description should be sufficiently detailed to fully define the structure of the diet.

The taught element has six modules, each delivered as two weeks of taught material, and one week of self-directed learning leading to the completion of an exercise(s). The modules comprise:

1. A module on Genome Bioinformatics in Semester 1 presents the latest tools in bioinformatics.
2. A module on Coding for Scientists in Semester 1 develops the student's skills in coding
3. A module on Statistic for bioinformaticians in Semester 1 develops the student's skills in statistical analysis of data.
4. A module on Post genomics bioinformatics in Semester 1 that present approaches to study proteomic data.
5. A field trip module, to develop the student's skills in field work.
6. A literature review in conservation and evolution as preparation for the research project.

In the research project students are encouraged throughout to develop contacts and links within the research groups with whom they would like to conduct a research project. By the end of Semester A, students will have a good idea about their topic for research. The remainder of the academic year is given over to the substantive research

Project and its write up in a form as if it were to be submitted for publication. The aim of this project is to apply the technical and transferable skills gained during the taught modules to a pertinent research question involving the management and/or analysis of biological data.

Programme Title: MSc Ecological and Evolutionary Genomics

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Genome Bioinformatics	BIO721P	15	7	Compulsory	1	Semester 1
Coding for Scientists	BIO723P	15	7	Compulsory	1	Semester 1
Statistics for Bioinformaticians	BIO782P	15	7	Compulsory	1	Semester 1
Post-genomic Bioinformatics	BIO725P	15	7	Elective	1	Semester 1
Biodiversity and Conservation Field Course	BIO775P	15	7	Compulsory	1	Semester 2
Biodiversity Loss - Challenges and Solutions	BIO774P	15	7	Elective	1	Semester 1
Problems and Analysis in Biodiversity, Evolution & Conservation	BIO788P	15	7	Compulsory	1	Semester 2
Biodiversity and Conservation Research Project	BIO791P	90	7	Compulsory	1	Semesters 2 & 3

### What are the entry requirements?

All students will be admitted via SBBS

For the MSc programme, an upper second-class honours degree in a relevant subject such as Medicine, Biomedical Sciences, Biochemistry, Computer Sciences, Biology, Zoology, Genetics, Medical Genetics will be required. Preference will be given to candidates with a first-class degree.

This programme involves a compulsory overseas field course. Applicants for the programme from outside the UK should ensure that there are no residency or travel restrictions that would prevent them from attending this course.

Individuals with relevant professional qualifications or other relevant experience and qualifications will also be considered. English Language proficiency is required at the standard level for PGT S&E entry (IELTS 6.5, TOEFL 92, PTE Academic 62).

### How will the quality of the programme be managed and enhanced? How do we listen to and act on your feedback?

The Student-Staff Liaison Committee (SSLC) provides a formal means of communication and discussion between the School and its students. The committee consists of student representatives from each programme and each year in the school, together with appropriate representation from staff within the school. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. The Student-Staff Liaison Committee meet regularly throughout the year.

The School operates a Teaching and Learning Committee, chaired by the School's Director of Taught Programmes, which oversees and advises on all matters relating to the delivery of taught programmes at school level. This includes monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment, before submission to Taught Programmes Board. Student views are incorporated in this Committee's work in a number of ways, such as through consideration of items referred by the SSLC and by consideration of student surveys, including module evaluation questionnaires.

All schools operate an Annual Programme Review of their taught undergraduate and postgraduate provision. Students' views are

considered in this process through analysis of the results from the National Student Survey (NSS), module evaluations and other internal Queen Mary surveys.

### **What academic support is available?**

Academic and pastoral care will be provided by personal academic tutors and advisors in the SBBS, as is current policy with other MSc programmes. In the first instance, the module organiser is the port of call for any problems. But if that is unsuitable or does not resolve the problem, students are asked to contact the Post Graduate Taught Programme Director. Thereafter, for more serious or unresolved problems, students should refer to the Director of Learning and Teaching for School of Biological and Behavioural Sciences (SBBS) and/or the Head of SBBS. Some individual research projects will be closely aligned to PhD studentships or post-doctoral research projects, and in these cases, some academic support will be defrayed to staff and students in those positions.

### **Programme-specific rules and facts**

Students wishing to be awarded the PG Certificate in Ecological and Evolutionary Genomics must complete four 15 credit modules.

### **How inclusive is the programme for all students, including those with disabilities?**

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.

This programme involves an integral field-course during which students should expect to have to undertake physically demanding work in remote locations. Applicants with any disability that impacts upon their ability to undertake such activities should seek advice from the School before applying for this programme.

### **Links with employers, placement opportunities and transferable skills**

The Programme Director and module organisers have excellent links with individuals in both academic and industry who recruit genomicists in the UK and across Europe. These include contacts at the Sanger Institute, the European Bioinformatics Institute (EBI), GlaxoSmithKline, Philips, Nature Publishing Group, Unilever, CLCbio (a Qiagen Company) financial services companies, tech startups and various universities. These links are augmented by those of other colleagues, both within SBBS and in other parts of the College.

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## Programme Specification Approval

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**Person completing Programme Specification:**

Chris Bray

**Person responsible for management of programme:**

Conrad Bessant

**Date Programme Specification produced / amended by  
School / Institute Learning and Teaching Committee:**

4 Feb 2021

**Date Programme Specification approved by Taught  
Programmes Board:**