Programme Title: MSc Ecological and Evolutionary Genomics

Programme Specification

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)
QM Programme Code / UCAS 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 & Chemical Sciences

Schools which will also be involved in teaching part of the programme
- School of Biological & Chemical Sciences

Institution(s) other than Queen Mary that will provide some teaching for the programme

Programme Outline

Research in ecology and evolution is increasingly empowered by genomic data, but there is a shortage of personnel with both skills in bioinformatic analysis of genomic data and knowledge of ecology and evolution. This programme is designed to bring biologists up to speed with essential bioinformatics skills, and to bring computer scientists up to speed with ecology and evolution. It provides the opportunity to combine these skills and knowledge in a cutting edge research project. The programme is achieved through a combination of lectures, extensive guided practical sessions, a group genomic analysis project and 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.
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- An innovative group project, collaborating with peers to analyse a genomic data set.
- Providing the skills and experience that employers and PhD supervisors need.
- A six month individual thesis project tackling a real world genomic analysis challenge.
- Flexible modes of study: full time, part time, campus-based or online.

Aims of the Programme

- This programme aims to:
  - Address a skills shortage of bioinformaticians in ecology/evolution; it is currently hard to find people trained in both areas.
  - Prepare students for the prosecution of 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?

Student who successfully complete the MSc programme should be able to:

Academic Content:

| A1 | 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 |
| A2 | Demonstrate proficiency in existing bioinformatics databases and tools for a range of different data types and biological applications |
| A3 | Demonstrate proficiency in key statistical and algorithmic underpinnings of common bioinformatics analyses |
| A4 | Demonstrate proficiency in the key technical skills (e.g. software development or ‘coding’) required to produce new bioinformatics resources |
| A5 | Critically evaluate ecological and evolutionary theory |
| A6 | Synthesise and comprehend cutting edge technologies and how these contribute to the development of the field |

Disciplinary Skills - able to:

| B1 | Demonstrate a critical awareness of current developments in genomics, and critically evaluate new developments as they arise |
| B2 | Devise solutions to data analysis problems using existing tools and databases |
| B3 | Critically assess and evaluate methodology and experimental design |
| B4 | Conduct data-driven research by utilising existing bioinformatics tools or producing new tools, as appropriate |
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Attributes:

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>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.</td>
</tr>
<tr>
<td>C2</td>
<td>Demonstrate a range of personal and professional transferable skills in project design and management, team-working, report writing, software development, communication and presentation skills.</td>
</tr>
<tr>
<td>C3</td>
<td>To operate and conduct oneself in complex and unpredictable and/or specialized contexts.</td>
</tr>
<tr>
<td>C4</td>
<td>To exercise initiative and personal responsibility in professional practice.</td>
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</tbody>
</table>

How Will You Learn?

Traditional lectures are used impart key concepts and knowledge. These lectures are supported by online materials on QMPlus, including links to relevant resources and further reading. Extensive hands-on practical sessions cement the knowledge from the lectures and allow students to become proficient and confident in the use of bioinformatics tools introduced in the lectures. Individual support from teaching staff is available throughout these practical session. Practical coursework assignments are designed to allow students to further hone their skill through private study, with the completed coursework being assessed and detailed feedback returned to the student.

Substantially longer practical genomic analysis assignments form the focus of the group project module and the individual thesis project. These give students the opportunity to develop key transferable skills in team working, communication and research alongside while simultaneously improving their technical competence.

How Will You Be Assessed?

Continual assessment is used throughout the course, with the specific mode of assessment for each module selected according to the nature of the module content. Modules 1-4 will 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.

Assessment of the group project comprises four components:
1. The analysis for which each group receives a shared mark according to its implementation, design and robustness.
2. A technical report about the analysis, for which each group receives a shared mark.
3. A presentation in which each student is required to participate and is marked individually.
4. An assessment of each individual student’s contribution to the project, based on an individual reflective piece written by the student, and an analysis of their contributions to the analysis used by their group.

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

How is the Programme Structured?

The first five modules are intended to impart key knowledge and skills. These will each be taught over three weeks, with an intensive combination of lectures and computer-based practicals in the first two weeks, followed by a week of private study in which to complete a substantive piece of assessed work.

There then follows a group project in which the students work together in small teams (~4 people per team) for three weeks to design and implement a genomic analysis to match a specification provided. The aim of this exercise is to reinforce the students’ understanding of the technical concepts covered in the first five modules, and to gain valuable experience of working with other people on a complex technical project.

Finally, each student carries out an individual research project. 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.
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The MSc culminates in a public symposium at which each student delivers a presentation about what they achieved in their research project.

Academic Year of Study  1

<table>
<thead>
<tr>
<th>Module Title</th>
<th>Module Code</th>
<th>Credits</th>
<th>Level</th>
<th>Module Selection Status</th>
<th>Academic Year of Study</th>
<th>Semester</th>
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<tbody>
<tr>
<td>Genome Bioinformatics</td>
<td>BIO721P</td>
<td>15</td>
<td>7</td>
<td>Compulsory</td>
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<td>Semester 1</td>
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<td>Coding for Scientists</td>
<td>BIO723P</td>
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<td>Elective</td>
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<td>Semester 1</td>
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<td>Ecosystem Structure &amp; Function</td>
<td>BIO737P</td>
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<td>7</td>
<td>Elective</td>
<td>1</td>
<td>Semester 1</td>
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<tr>
<td>Statistics &amp; Bioinformatics</td>
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<td>7</td>
<td>Compulsory</td>
<td>1</td>
<td>Semester 1</td>
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<tr>
<td>Research Frontiers in Evolutionary Biology</td>
<td>BIO731P</td>
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<td>Semester 1</td>
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<tr>
<td>Post-genomic bioinformatics</td>
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<td>7</td>
<td>Elective</td>
<td>1</td>
<td>Semester 1</td>
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<tr>
<td>Ecological and Evolutionary Genomics Group Project</td>
<td>BIO733P</td>
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<td>7</td>
<td>Compulsory</td>
<td>1</td>
<td>Semester 2</td>
</tr>
<tr>
<td>Ecology and Evolutionary Biology Field Course</td>
<td>BIO792P</td>
<td>15</td>
<td>7</td>
<td>Compulsory</td>
<td>1</td>
<td>Semester 2</td>
</tr>
<tr>
<td>Ecology &amp; Evolutionary Genomics Research Project</td>
<td>BIO704P</td>
<td>90</td>
<td>7</td>
<td>Compulsory</td>
<td>1</td>
<td>Semester 2 &amp; 3</td>
</tr>
</tbody>
</table>

What Are the Entry Requirements?

Potential students are expected to have a minimum of a second class honours degree in a relevant subject such as biology, biochemistry, medicine, or genetics. Preference will be given to candidates with an upper second class or first class degree. 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 Do We Listen and Act on Your Feedback?

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.

Each school/institute operates a Learning and Teaching Committee, or equivalent, which advises the School/Institute Director of
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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. Student views are incorporated in the committee’s work in a number of ways, such as through student membership, or consideration of student surveys.

All schools/institutes operate an Annual Programme Review of their taught undergraduate and 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.

### Academic Support

The School runs a substantive induction programme specifically for its MSc intake each year.

Module organisers are the first point of academic contact for advice and support during the taught component.

Project supervisors are allocated once project topics have been decided upon.

The Programme Director acts as the coordinator of all programme activities, supported by staff of the SBCS Administrative Office.

If there is requirement for further advice or support, then one of the School’s Senior Academic Advisors or the Director of Taught Programmes may be consulted.

### Programme-specific Rules and Facts

Students wishing to be awarded the PG Certificate in EEG must complete the four modules listed as taking place in Semester 1.

### 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

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.
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[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 SBCS and in other parts of the College.

Programme Specification Approval

Person completing Programme Specification
Dr Richard Buggs

Person responsible for management of programme
Dr Axel Rossberg

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

Date Programme Specification approved by Taught Programmes Board

Queen Mary
University of London