THE UNIVERSITY OF EDINBURGH

PROGRAMME SPECIFICATION FOR
MSc/Diploma Quantitative Genetics and Genome Analysis

1) Awarding Institution: The University of Edinburgh
2) Teaching Institution: School of Biological Sciences
3) Programme accredited by: n/a
4) Final Award: MSc/Diploma
5) Programme Title: MSc/Diploma in Quantitative Genetics and Genome Analysis
6) UCAS Code: N/A
   Relevant QAA Subject Benchmarking Group(s): C400, D300
7) Postholder with overall responsibility for QA: Dr M Gallagher
8) Date of production/revision: August 2011
9) External Summary

Complex traits are determined by the combined action of several genes and the environment. They are characterised in quantitative terms using statistical methods and it is increasingly recognised that many common human diseases such as cardiovascular disease and cancer, as well as susceptibility to prevalent infections (in humans, domesticated & wild animals) can be so described as can most of the traits of greatest interest in evolutionary biology such as fitness, viability, and reproductive success.

The development of genomic technology in recent years has had an immense impact on all areas of genetics and evolutionary biology. Genetic mapping and genome sequencing programmes of human, mouse and other organisms have generated many markers for mapping genes influencing complex traits in human populations as well as those of wild animals and model organisms. These developments have led to a requirement for training young researchers working in the area of genome studies in population and statistical genetics, quantitative genetics and bioinformatics in an environment which exposes them to state-of-the-art science.

This programme is based in the internationally renowned Institute of Evolutionary Biology. It provides training in genetics and quantitative skills which are increasingly required by industry and research to exploit the explosion of information in genomics. Students gain the knowledge and skills required to apply quantitative genetics theory to practical problems in both the biomedical and animal-science industries, and to undertake research in evolutionary and quantitative genetics, population genetics and genome analysis.

Programme aims
• To provide postgraduate level education in population and quantitative genetics and in statistics
• To train students in statistical technologies used in quantitative genome analysis

1 The information contained in this Programme Specification should be used as a guide to the content of a degree programme and should not be interpreted as a contract.
• To prepare students for research by providing MSc projects in a world-class research environment in genome analysis

10) Educational aims of programme:

To deliver a comprehensive training in basic and applied aspects of quantitative genomics to students with backgrounds in biological or physical sciences.

By specifying no particular prior knowledge except exposure to and recognition of the importance of quantitative approaches in biology, we allow students with the broadest possible background who know they are interested in genomic analysis to enter. From basic quantitative concepts in genetics and statistics we build up to the latest statistical methodologies used in genome analysis to prepare the students for projects in one of the internationally recognised research groups that contribute to the course.

11) Programme outcomes:

11a) Knowledge and understanding

• A thorough understanding of general concepts in population and quantitative genetics and genomics
• In-depth knowledge of the specialist area chosen in Semester 2
• A solid grounding in the statistical methods required for quantitative biology

11b) Graduate attributes: Skills and abilities in Research and Enquiry

Through tutorials, assessed essay writing, and extensive computer based practical classwork, students gain essential skills for work in research and industry. These include:

• Interpretation of scientific papers
• Critical analysis and synthesis of scientific information
• Ability to conduct independent research
• Ability to place findings in context and suggest new research ideas
• Execution and writing up an independent research project
• Reporting of research data in formats suitable for publication
• Correct application of statistical methodologies and careful interpretation of results

11c) Graduate Attributes: Skills and abilities in Personal and Intellectual Autonomy

Critical and analytical thought is an essential element for a professional geneticist and is developed during the course through a high degree of independent working and instruction. By the end of the course students are able to:

• Assimilate information from different sources into a single thread
• Critically assess reports in the scientific literature
• Perform complex statistical analyses and summarise the results logically
• Become familiar with multiple approaches to the analysis of genomic data

11d) Graduate Attributes: Skills and abilities in Communication

Communication is an essential element of training for genetics in research and industry. Students acquire abilities in:

• Acquisition of knowledge from the scientific literature
• Accessing online information sources
• Scientific writing, in essays, short and long reports.
• Preparation of scientific posters
• Preparation of effective Powerpoint slides for oral presentations
• Delivery of oral presentations
• Responding to unrehearsed questions in oral presentation
11e) **Graduate Attributes: Skills and abilities in Personal Effectiveness**

The students develop as individuals and as members of a small class facing the same challenges. They gain confidence in and abilities in

- Project planning
- Time management
- Independent working
- Manage stress effectively
- Learning to interact positively with other group members in the environment of a research group

11f) **Technical/practical skills**

- Identification of appropriate statistical methods for the analysis of genetic data
- Application of quantitative genomics techniques through computer-based practicals
- General IT skills including data retrieval and the use of spreadsheets and other databases
- Computing skills and experience of a variety of software packages

12 **Programme structure and features**

**Entry Requirements**

Applications are welcomed from candidates with a strong interest in quantitative genetics and genomics who have a first degree in either:

Biological or Biomedical Sciences, Medicine, Agriculture or Animal Sciences, and who can show evidence of quantitative skills

or

Mathematics, Statistics or Physics, and who are intending to transfer into the biological sciences.

The minimum entry requirement is a 2.2 Honours degree or equivalent and the majority of students accepted on the course have at least a 2.1 or other additional experience.

Evidence of proficiency in English must be provided by non-native English speakers. Details of the English language qualifications that are currently accepted by the University of Edinburgh can be found here.

**Course structure**

Students take courses totalling 180 credits. All courses are SCQF Level 11 (Postgraduate)

**Taught stage (120 credits)**

Semester 1 (50 credits)

Compulsory courses:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Population and Quantitative Genetics (PGBI11001)</td>
<td>20</td>
</tr>
<tr>
<td>Genetic Interpretation (PGBI11002)</td>
<td>10</td>
</tr>
<tr>
<td>Statistics and Data Analysis (PGBI11003)</td>
<td>20</td>
</tr>
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Semester 2 (70 credits)

Compulsory courses:


<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Genome Analysis (PGBI11004)</td>
<td>20</td>
</tr>
<tr>
<td>QTL Detection and Genome Analysis (PGBI11036)</td>
<td>10</td>
</tr>
<tr>
<td>Mini Research Project (PGBI11007)</td>
<td>10</td>
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Option courses:
10 credits from:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Molecular Phylogenetics (PGBI11035)</td>
<td>10</td>
</tr>
<tr>
<td>Bioinformatics 2 (INFR11005)</td>
<td>10</td>
</tr>
</tbody>
</table>

20 credits from:

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evolutionary Genetics (PGBI11008)</td>
<td>20</td>
</tr>
<tr>
<td>Human Genetics (PGBI11009)</td>
<td>20</td>
</tr>
<tr>
<td>Principles of Genetic Improvement (PGBI11010)</td>
<td>20</td>
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Dissertation Stage (60 credits)

<table>
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<tr>
<th>Course</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Dissertation (PGBI11011)</td>
<td>60</td>
</tr>
</tbody>
</table>

**Progression requirements**

Students who gain >50% overall and >50% in at least 80 of the 120 credits in the final overall assessment of the taught stage at the end of May can proceed to the dissertation stage, and carry out a full-time research project from June – August.

Students who gain >40% overall and >40% in at least 80 of the 120 credits in the final overall assessment who do not qualify to proceed will be awarded the Diploma and leave in June.

**Assessment**

Assessment for the taught stage is by written examinations, in-course assignments and project work. The assessment split for the taught stage is as follows:

- a) written examination papers (open and closed-book) 53% of total*  
- b) in-course assessment 47% of total*

*50% written exams, 50% in-course work if PGBI11008 option is taken

Students who proceed to the dissertation stage carry out a full-time research project from June to August, which is assessed by a 15,000 word written dissertation.

**Modes of study**

Both part-time (2 year) and full-time (1-year) registration is available. A variety of teaching methods are used including lectures, tutorials, computer-based practicals and discussions of recent scientific papers. There is also a substantial research component, with a mini-project undertaken in Semester 2 and a full time 3-month research project carried out over the summer. Students receive individual supervision for the mini project and dissertation components of the course.
Exit awards
To be awarded the MSc, students must successfully complete both the taught and dissertation stages. Students may elect to exit at the end of the taught stage with the award of Diploma. Both the MSc and the Diploma may be awarded with Distinction.

Sustainability
We use electronic means of communication as much as possible and avoid printing emails.

Equality and diversity
The MSc QGGA attracts a diverse student population. The table below gives a breakdown of the gender and Home/EU/Overseas status of students on the programme for the last five years.

<table>
<thead>
<tr>
<th>Session</th>
<th>M %</th>
<th>F %</th>
<th>Home/EU %</th>
<th>Overseas %</th>
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<tbody>
<tr>
<td>2010/1</td>
<td>45</td>
<td>55</td>
<td>64</td>
<td>36</td>
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<tr>
<td>2009/1</td>
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<td>2007/8</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2006/7</td>
<td>33</td>
<td>67</td>
<td>87</td>
<td>13</td>
</tr>
</tbody>
</table>

Students come from all over the world to study on the programme. The following is the list of nationalities of students who have taken the MSc/Diploma:

- United Kingdom
- Ireland
- Italy
- Belgium
- Spain
- Germany
- Poland
- Greece
- France
- Portugal
- Hungary
- Canada
- China
- Malaysia
- Korea
- United States
- India
- Botswana
- Nigeria
- Iran
- Croatia
- Panama
- Taiwan
- Philippines
- New Zealand
- Bhutan
- Iceland
- Uruguay

13 Other Items
The MSc in Quantitative Genetics and Genome Analysis is one of six programmes offered by the School of Biological Sciences at the University of Edinburgh. Students will be encouraged to integrate themselves with the vibrant postgraduate student body (both MSc, MRes and PhD students) based in the King’s Buildings campus, and to make best use of the vibrant research community there.

The Programme Director of the MSc QGGA also adopts the role of Director of Studies to each student on the programme, providing them with both academic and pastoral guidance. Throughout a student’s time at the university the Director of Studies guides the student in choice of courses and provides general support.

The Degree Programme Tables (DPT) for the MSc QGGA programme can be found at:
http://www.drps.ed.ac.uk/index.php