



**QUEEN'S
UNIVERSITY
BELFAST**

SCHOOL OF
MEDICINE,
DENTISTRY AND
BIOMEDICAL
SCIENCES

JOIN THE OMICS REVOLUTION

MSc
**BIOINFORMATICS AND
COMPUTATIONAL GENOMICS**

The MSc Bioinformatics and Computational Genomics has been shortlisted for 'Postgraduate Course of the Year' in two categories, at the gradireland Higher Education Awards for three years running (2017–18, 2018–19 and 2019–20).



Summary Entrance Requirements

A 2.1 Honours degree or equivalent qualification acceptable to the University in a Natural Science subject, Mathematics, Computer Science, Physics, Statistics or a relevant medical subject (eg Genetics, Molecular Biology, Biomedical Sciences). The programme is open to graduates in computer science, life sciences, physics or statistics. A medical (MD) or dental (BDS) degree is also considered.

International Qualifications

For information on international qualification equivalents, please see: go.qub.ac.uk/YourCountry

English Language

Evidence of an IELTS* score of 6.5, with not less than 6.0 in any component, or an equivalent qualification acceptable to the University is required.

*Taken within the last 2 years.

For more information on English Language requirements for EEA and non-EEA nationals see: go.qub.ac.uk/EnglishLanguageReqs

Teaching

Morning/Afternoon

10–15 hours per week

We provide a range of teaching activities and learning facilities which enable our students to develop the key skills, experience and domain knowledge required by industry, academia or the public sector. This MSc provides a strong foundation for the development of further specialist bioinformatics and computational genomics skills. Weekly classes include lectures, tutorials, practicals, journal clubs, and e-learning. These are supported by self-directed study.

Assessment

Assessment for each taught module is based on 100 per cent coursework, the research project module is by dissertation. Students who pass all of the taught modules but who fail to achieve a mark of at least 50 per cent in the dissertation are eligible for the award of a PG Diploma. Students who pass between three and five taught modules are eligible for the award of a PG Certificate.

Contact Us

askmhls@qub.ac.uk

Further Information

www.qub.ac.uk

MSc BIOINFORMATICS AND COMPUTATIONAL GENOMICS

Overview

During the past decade there have been enormous advances in the development of molecular and biomedical technologies resulting in the rapid generation of patient-associated 'Big Data'. Medical and health research is now being driven by the analysis of such data, in order to understand the causes of disease and to identify the most appropriate patient treatments.

What's Involved?

Bioinformatics covers the application of mathematics, statistics and computing to answer clinical and biological questions, particularly how and why diseases develop and progress. Bioinformatics requires not only systematic and logical thinking, but also creativity and imagination; this combination can help us to uncover new biological and clinical insights that have the potential to impact on patient care.

In this course you'll develop your analytical skills to reveal complex patterns in clinical and "omics" data. You'll discover how these patterns translate to the real world, for example how and why certain groups of patients respond to specific treatments. You will build on your interpretative and communication skills and learn how to present your findings. By the end of the degree you'll be ready to work within a multidisciplinary team alongside other bioinformaticians, biologists and clinicians.

Content

Incorporating a diverse and challenging set of subjects, this MSc will enable students, with a previous background in computational or life sciences, to move across into an exciting new area of discovery, technology and applications. We provide a broad learning base and offer training in open-source programming languages and software commonly used in academia and industry.

Modules

Semester One

The MSc consists of an introductory short course (two weeks at the beginning of the first semester) in Cell Biology. This is followed by three taught modules:

Analysis of Gene Expression

This module will provide the practical molecular biological knowledge required to develop the most effective and useful computational tools for analysing gene expression data.

Genomics and Human Disease

This module explores rapidly advancing fields that are moving from specialised research areas into mainstream medicine, science, and public arenas. The principles of genomic medicine will be discussed alongside bioinformatics approaches for identifying 'causative genes' for human disease.

Scientific Programming and Statistical Computing

This module covers the fundamental elements of open source statistical frameworks commonly used by bioinformaticians, for example, R and Python. It also provides an introduction to the potential of parallel processing high performance computing in analysing large-scale datasets.

Semester Two

Applied Genomics

This module examines the practical challenges in generating and analysing different "omics" datasets. The module provides practical experience of dealing with such datasets using a range of relevant tools.

Biostatistical Informatics (Blended Learning)

This module focuses on the analysis of different types of clinical and "omics" data. It provides both theoretical and practical experience of applying a range of statistical tests in the R statistical programming language.

Systems Medicine and Network Biology (Half Module)

This module covers applications in multi-"omics" biomedical data analysis with the aims of illuminating disease mechanisms and developing new clinical tools. Students will gain knowledge across multiple areas including data integration, machine learning, complexity science and precision medicine.

Health and Biomedical informatics and the Exposome (Half Module)

The module will cover different aspects of health informatics including the basic structure of Electronic Health Records (EHRs). This module also includes an introduction to the concept of the exposome and the contribution of biomedical informatics to exposome research.

Semester Three

Research Project: Dissertation

Translational bioinformatics and technical development research projects are mainly based in either the Centre for Cancer Research and Cell Biology or the Centre for Experimental Medicine. You'll be working with supervisors who are actively conducting research into the causes and treatments of disease. There are also opportunities to work on research projects with our industrial partners. This will result in a dissertation of 15,000–20,000 words.

Why Queen's?

You'll be involved with our Centre for Cancer Research and Cell Biology, which works with partners around the world in developing cancer treatments and pioneering advances in patient care.

The Centre has an international reputation for successful dissemination and application of cutting edge research, knowledge transfer and the commercialisation of research ideas and innovations.

Careers

The rapid production of 'omics' data within medicine and the life sciences has meant that individuals with analytical experience in this field are highly sought after. Recent graduates have gone on to work in industry in companies such as Almac Diagnostics, Biokinetic Europe and Fios Genomics and some have gone onto further PHD level research.