

Faculty of Life Sciences
Programme Specification

MSc in Bioinformatics and Computational Biosciences

Academic Year:	2018/19
Degree Awarding Body:	University of Bradford
Partner(s), delivery organisation or support provider (if appropriate):	N/A
Final and interim award(s):	[Framework for Higher Education Qualifications (FHEQ) level 7] MSc in Bioinformatics and Computational Biosciences Postgraduate Diploma in Bioinformatics and Computational Biosciences Postgraduate Certificate in Bioinformatics and Computational Biosciences
Programme accredited by (if appropriate):	Not applicable
Programme duration:	12 months full-time
QAA Subject benchmark statement(s):	Currently QAA Biomedical Sciences Benchmark covers undergraduate courses.
Date of Senate Approval:	
Date last confirmed and/or minor modification approved by Faculty Board	

Introduction

This new research-led and applied technical skill-based Masters course is designed to enable life science graduates to develop and master the use of bioinformatics techniques to interrogate, evaluate and analyse large data sets acquired through a range of innovative laboratory techniques, such as new generation genomic sequencing, proteomic and metabolomic techniques. Currently many bioinformaticians have a background in computer science or information technology. This Masters programme is unique as it seeks to develop bioinformatics skills in graduates from the life-sciences and to exploit their foundation in biological knowledge to transform the application and evaluation of bioinformatics in biological research and healthcare settings. The emphasis is on developing sufficient knowledge and understanding of the nature of 'Omics' data sets to evaluate and critically interpret the results of data analysis, to formulate appropriate bioinformatics research questions and to analyse bioinformatics databases using a range of bioinformatics and statistical techniques, including programming and scripting via command line and the Galaxy interface. The critically important issues of the ethical use of individual genomic and other patient data for use in research and healthcare applications and how aspects of equality and inclusion are integral to the practice of bioinformatics will form a core strand of the programme.

The content of this programme is strongly research-led and technology-based, in line with University and Faculty strategies and the majority of academic staff who will teach on the programme are active researchers who publish in high quality, international scientific journals and have long-standing expertise in the learning and teaching field gained from delivery at postgraduate and PhD levels. Further sessions will be contributed by scientists currently working within healthcare genomics. This is a rapidly developing and new field of research and teaching, it has developed from the interests, research needs and expertise of academic staff in the Faculty, in particular the Centre for Skin Sciences, a leading research centre at the University of Bradford with a longstanding international reputation. Consequently, the programme will provide opportunities for students to experience current biomedical and bioinformatics techniques and to study alongside established research teams.

The programme is designed to build from formal (tutor-led) learning approaches, which provide a good grounding in the core bioinformatics topics to student-led study for individual and group projects. Teaching and learning methods will include lectures, seminars, tutorials, laboratory sessions, technology-based workshops and group-based projects to develop and refine Bioinformatics and Computational Biosciences skills in a collaborative environment. The programme emphasises the importance of the group collaborative environment through various activities. These include, for example, group work and problem-solving in Principles of Bioinformatics and Advanced Bioinformatics; peer review sessions; journal club activities in Personal & Professional Development and Task-Based Learning exercises in 'Omics Techniques in Biology and Healthcare' modules. The use of professional bioinformatic on-line networking and discussion forums will be fully integrated throughout the course in order to equip students with the skills required to work in the bioinformatics field after completion. The individual, substantial research project will use real-life data from a variety of sources, such as open-source genomic databases and experimental data from current researchers. This project will begin to develop during the second semester and continue throughout semester 3. The assessment of this project will be via production of a report, poster, presentation and a viva-voce examination, skills of critical importance to those looking to pursue research.

As well as developing key knowledge and skills specific to bioinformatics, the programme will enhance autonomous learning and develop transferable skills and knowledge in areas such as scientific communication, critical review and analytical thinking, complex problem solving and reflective practice. After completion, successful graduates should find that their high levels of expertise in these important areas, combined with their advanced communication and transferable skills, are in great demand.

The aims and outcome statements have been referenced to the Quality Assurance Agency (QAA's) Master's Degree Characteristics Statement (2015) and the UK Quality Code for Higher Education: the Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies (2014) (FHEQ).

This should also ensure that the course is aligned with European-wide guidance, particularly the Framework for Qualifications of the European Higher Education Area (QF-EHEA).

Programme Aims

The programme is intended to:

- Deliver a flexible programme of postgraduate study in Bioinformatics and Computational Biosciences to students from diverse cultural and educational backgrounds;
- Enable students to develop a systematic understanding and critical awareness of current issues within Bioinformatics and Computational Biosciences and 'Omics';
- Enable students to demonstrate competence in the design and execution of bioinformatics research and the interpretation of scientific data;
- Enable students to evaluate the advantages, limitations and applications of a range of biomedical and bioinformatics techniques;
- Provide learning opportunities to enable critical thinking to develop autonomous and lifelong learning;
- Develop and enhance students' abilities in a range of personal and key transferable skills;
- Enhance skills associated with the communication of scientific data;
- Develop an understanding of the ethical and governance considerations that arise when working with data such as the genomic data of individuals.

Programme Learning Outcomes

To be eligible for the award of **Postgraduate Certificate** at FHEQ level 7, students will be able to:

- LO1 Demonstrate a systematic understanding of current genomic technologies and 'Omics' techniques, and be able to discuss their interpretation and application in key areas of biosciences and healthcare.

- LO2 Demonstrate knowledge of how ethical and governance frameworks apply to the use of patient data in healthcare 'Omics' applications.
- LO3 Demonstrate knowledge of principles of bioinformatics techniques and the Galaxy interface.
- LO4 Demonstrate the ability to use IT skills to gather, synthesise and appropriately apply information.

Additionally, to be eligible for the award of **Postgraduate Diploma** at FHEQ level 7, students will be able to:

- LO5 Critically evaluate and appraise experimental design and the application of bioinformatic techniques.
- LO6 Demonstrate the ability to formulate research questions, analyse, interpret, and evaluate biomedical data using a range of statistical and bioinformatics techniques and be able to communicate the findings effectively.
- LO7 Demonstrate application of values, ethical thinking, equality awareness and inclusive practice in Bioinformatics and Computational Biosciences.
- LO8 Effectively use reflective practice and complex problem-solving to inform, shape or change their practice, or that of others within Bioinformatics and Computational Biosciences.

Additionally, to be eligible for the award of **Degree of Master** at FHEQ level 7, students will be able to:

- LO9 Demonstrate self-direction and originality in designing, undertaking and reporting a project that contributes to or extends the body of knowledge for Bioinformatics and Computational Biosciences.

Curriculum

The MSc in Bioinformatics and Computational Biosciences programme consists of 120 taught Credits (60 credits in each of Semesters 1 & 2) and a substantial 60 credit individual research project (Semester 3).

Postgraduate Certificate

Students will be eligible to exit with the award of Postgraduate Certificate in Bioinformatics and Computational Biosciences if they have successfully completed 60 credits including the modules *Principles of Bioinformatics* and *'Omics' Techniques in Biology and Healthcare* and achieved the award learning outcomes.

FHEQ Level	Module Title	Type (Core/Option/Elective)	Credits	Semester	Module Code
7	Principles of Bioinformatics	Core	20	1	BIS7017-B
7	'Omics' techniques in Biology and Healthcare	Core	20	1	BIS7019-B
7	Personal & Professional Development	Core	20	1&2	BIS7012-B
7	Research & Analytical Methods	Core	20	1&2	BIS7006-B
7	Experimental Design	Core	20	2	BIS7007-B
7	Advanced Bioinformatics	Core	20	2	BIS7018-B

Postgraduate Diploma

Students will be eligible to exit with the award of Postgraduate Diploma in Bioinformatics and Computational Biosciences if they have successfully completed at least 120 credits including the modules *Principles of Bioinformatics* and *'Omics' Techniques in Biology and Healthcare* and *Advanced Bioinformatics* and achieved the award learning outcomes.

FHEQ Level	Module Title	Type (Core/option/elective)	Credits	Semester	Module Code
7	Principles of Bioinformatics	Core	20	1	BIS7017-B
7	'Omics' techniques in Biology and Healthcare	Core	20	1	BIS7019-B
7	Personal & Professional Development	Core	20	1&2	BIS7012-B
7	Research & Analytical Methods	Core	20	1&2	BIS7006-B
7	Experimental Design	Core	20	2	BIS7007-B
7	Advanced Bioinformatics	Core	20	2	BIS7018-B

Degree of Master

Students will be eligible for the award of Degree of Master in Bioinformatics and Computational Biosciences if they have successfully completed at least 180 credits and achieved the award learning outcomes.

FHEQ Level	Module Title	Type	Credits	Semester (s)	Module Code
7	Principles of Bioinformatics	Core	20	1	BIS7017-B
7	'Omics' techniques in Biology and Healthcare	Core	20	1	BIS7019-B
7	Personal & Professional Development	Core	20	1&2	BIS7012-B
7	Research & Analytical Methods	Core	20	1&2	BIS7006-B
7	Experimental Design	Core	20	2	BIS7007-B
7	Advanced Bioinformatics	Core	20	2	BIS7018-B
7	Research Project	Core	60	3	BIS7005-E

Learning and Teaching Strategy

The learning and teaching strategy employed in this programme takes into consideration the learning outcomes for the programme, the nature of the topics studied and the need for students to demonstrate significant autonomy in their learning. Directed study, involving reading appropriate texts and the preparation of assessed work, is used to fully address the majority of learning outcomes. This will help students appreciate that understanding in much of these subject areas is moving rapidly.

The delivery of the programme is planned to enable students to take increasing responsibility for their own learning as they progress through the programme. Formal lectures, workshops and learning activities will facilitate students' acquisition of knowledge, understanding and basic bioinformatic skills (LO1–4). As the course progresses, the emphasis will move towards self-directed research and skill-development and evaluation of related scientific literature and experimental approaches (LO5–8); students will be supported in these by staff in the semester 2 modules and by the supervisors for their research project. These aspects further develop the research-informed nature of the curriculum. Students will be expected to critically evaluate scientific data (LO 4–8) and to design appropriate experimental approaches to test specific scientific hypotheses (LO 6, 8 & 9). The research project module provides a major opportunity for students to gain and demonstrate competence in the execution of experimental work and autonomy in data handling and critical interpretation in a research context (LO 9).

Students' ability to deal with complex issues and to solve problems will be enhanced by effective reflective practice (LO 8). Key transferable skills are embedded in a number of modules but are consolidated in the *Personal and Professional Development* module. Students will also be able to practice and demonstrate their communication skills in many parts of the course (LO1, 6, 9) and gain familiarity with a range of aspects relating to working in bioinformatics as part of a group and enhancing their understanding of work-related issues (LO 2, 4, 5 & 8).

Assessment Strategy

The assessment strategy for this programme is designed to allow students to demonstrate achievement of the learning outcomes of an individual module

appropriate to the level of study. At level 7 as well as a systematic understanding and critical awareness of current topics and techniques, students are expected to demonstrate well developed skills of analysis, synthesis and criticism and to demonstrate self-direction and originality in dealing with complex problems.

These aspects will be assessed by a variety of strategies, including written/computer-based tests, report writing, case studies, group work, essays, a portfolio of bioinformatics techniques and outcomes, oral presentations, a poster presentation and the final scientific paper from the individual project report. Many aspects will be assessed both formatively and summatively to assist students in their learning.

Assessment Regulations

This Programme conforms to the standard University Regulations which are available at the following link:

<http://www.bradford.ac.uk/agpo/ordinances-and-regulations/>

Admission Requirements

The University welcomes applications from all potential students and the most important aspect in the decision to offer a place is our assessment of a candidate's potential to benefit from their studies and of their ability to succeed on this particular programme. Consideration of applications will be based on a combination of formal academic qualifications and other relevant experience.

The standard entry requirements for the programme are as follows:

- A Degree of Bachelor of an approved university or of the Council for National Academic Awards or of any other approved degree-awarding body in any aspect of the Biological Sciences or Biosciences or related Life Sciences courses. A medical degree would also be appropriate. Minimum classification: Class 2, Division 2 or equivalent
- English requirement of:
GCSE Grade C (or 4) or
IELTS 6.0 with a minimum score of 5.5 in each sub-unit.

Applications are welcome from students with non-standard qualifications or mature students (those over 21 years of age on entry) with significant relevant experience.

Recognition of Prior Learning

If applicants have prior certificated learning or professional experience which may be equivalent to parts of this programme, the University has procedures to evaluate and recognise this learning in order to provide applicants with exemptions from specified modules or parts of the programme.

Minor Modification Schedule

Version Number	Brief description of Modification	Date of Approval (Faculty Board)
1		