UNIVERSITY of BRADFORD

Faculty of Life Sciences

MSc Bioinformatics Programme Specification

Academic Year:	2022/23
Degree Awarding Body:	University of Bradford
Final and interim award(s):	[Framework for Higher Education Qualifications (FHEQ) level 7]

Master of Science

Postgraduate Diploma

Postgraduate Certificate |
| Programme duration: | 1 year full time |
| Date last confirmed and/or minor modification approved by Faculty Board | March 2022 |

Please note: This programme specification has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but changes may occur given the interval between publishing and commencement of teaching. Any change which impacts the terms and conditions of an applicant's offer will be communicated to them. Upon commencement of the programme, students will receive further detail about their course and any minor changes will be discussed and/or communicated at this point.

Introduction

Bioinformatics is the study of biological systems using mathematical and statistical analysis with the aid of computer science. New and emerging informatics techniques are increasingly being used to process large data sets, obtained across the spectrum of Omics techniques (including genomic, proteomic, transcriptomic, metabolomic etc.), to determine trends and patterns in scientific information.

The MSc Bioinformatics programme at Bradford has been designed to equip students with the scientific knowledge and the practical skills necessary to enter the employment market in a number of specialist areas of Bioscience, both in the public and the private sectors, and in environments aimed at improving human health across the world in the 21st century. Bioinformaticians are currently in high demand in employment industries allied to hospitals, universities, healthcare and diagnostics laboratories, as well as those affiliated to government and other institutions.

The Bioinformatics programme at Bradford combines the theoretical knowledge in molecular biology with a practical training in advanced experimental techniques to provide a sound understanding of the commonly used data acquisition methods in a broad range of

investigative scenarios. A detailed training in data acquisition is also coupled to modules that are designed to provide a specialised training in the principles of bioinformatics before going on to study some of the advanced systems that are frequently used in large-scale data mining and processing, including programming and scripting via command line and the Galaxy interface.

An important feature of the programme is the opportunity to gain practical experience in a wide range of experimental techniques in a progressive and cumulative manner throughout the academic year. The practical training is delivered alongside the theoretical content to provide the contextual relevance to the specific laboratory sessions and workshops. Both the taught and the practical elements of the course are delivered in an environment of current hypotheses rather than certainty, and thus highlight the nature of the natural variation encountered in new empirical data generated in a broad range of scenarios in different international settings.

A key component of the programme is the research project. The start of the research project is prefaced with a generic training period that incorporates a range of key transferrable skills such as literature searching, health and safety training and project planning. The research project itself offers an extended period of specialist training in research methods and experimental design. This is coupled with training in the use of appropriate statistical methods to enable a detailed analysis of the research data and is followed by guidance on the interpretation and contextualisation of the experimental findings.

Programme Aims

The programme is intended to:

- Develop a systematic understanding of knowledge and critical awareness of selected topics that are of current and future importance to national and international healthcare issues.

- Enhance a conceptual understanding that enables students to critically evaluate current research and advanced scholarship in bioinformatics.

- Develop an understanding of the applications of research techniques to different areas of Bioinformatics research that aims to improve health and wellbeing.

- Enable self-direction and originality in tackling and solving problems, and in planning and implementing tasks at a professional or equivalent level.

- Enable critical evaluation of methodologies and, where appropriate, to propose new hypotheses.

- Develop communication of ideas and experimental results, together with appropriate conclusions, to specialist and non-specialist audiences to advance understanding and effective management of existing and future challenges worldwide.

- Advance knowledge and understanding, along with new and transferable skills, requiring the exercise of initiative, personal responsibility and decision-making in complex and unpredictable situations relevant to employment.

Programme Learning Outcomes

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

1. 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.

2. Demonstrate a comprehensive and systematic understanding of the interdisciplinary nature of the approaches required in advancing medical knowledge and understanding of the processes and biological mechanisms.

3. Demonstrate a comprehensive understanding of core experimental competencies relevant to bioinformatics, including the fundamental principles of bioinformatics and the Galaxy interface.

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

4. Use detailed literature searching methods and strategies to critically evaluate and critique existing experimental methods currently in use for the investigation of relevant areas of bioinformatics.

5. Demonstrate an understanding of the importance of ethical and practical issues relating to laboratory investigations of living systems in a responsible, safe and ethical manner to ensure that professional judgement is exercised in complex and unpredictable situations.

6. Demonstrate application of professional standards of Health and Safety Policies, Good Laboratory Practice and Control of Substances Hazardous to Health to ensure competency at using equipment, experimental methods and procedures appropriate to Bioinformatics.

7. Prepare, process and interpret data, using advanced qualitative and quantitative techniques, statistical programmes, spreadsheets and programmes for presenting data visually.

8. Communicate effectively to specialists and non-specialists.

9. Plan, design and undertake a significant research project autonomously, which may involve primary or secondary data (for example from a survey database).

10. Report the findings in an interim project report or a scientific publication.

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

11. Suggest new hypotheses to explore new and novel lines of inquiry at a high scholarly level.

12. Demonstrate self-direction, originality and capability in executing new investigations in the form of a substantial research project based on experimental knowledge and

skills relevant to bioinformatics and communicate the findings of a final Project Report, Dissertation or scientific publication.

Curriculum

FHEQ Level	Module Title	Type	Credits	Semester	Module Code
7	'Omics' Techniques in Biology and Healthcare	Core	20	1	BIS7019-B
7	Principles of Bioinformatics	Core	20	1	BIS7017-B
7	Practical Skills in Research	Core	20	1	LIS7018-B
7	Research Project Preparation and Plan	Core	20	2	BIS7022-B
7	Advanced Bioinformatics	Core	20	2	BIS7018-B
7	Practical Molecular Biology	Core	20	2	BIS7027-B
7	Research Project	Core	60	3	BIS7026-E

Students will be eligible to exit with the award of Postgraduate Certificate if they have successfully completed 60 credits and achieved the award learning outcomes.

Students will be eligible to exit with the award of Postgraduate Diploma if they have successfully completed at least 120 credits and achieved the award learning outcomes.

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

Learning and Teaching Strategy

A wide variety of teaching methods, appropriate to the learning outcomes of the individual modules, are employed throughout the programme, and are supported by formative assessment where possible. The teaching methods are designed to encourage students to take increasing responsibility for their own learning as they progress through the course. In this way students are expected to develop the key attributes needed for life-long learning and continued professional development. Students are also supported by a designated Personal Academic Tutor.

The programme content is taught using conventional teaching methods that include lectures, seminars, tutorials, laboratory classes, workshops and a research project. In addition, independent self-directed or problem-based learning may include interactive research case studies, peer and collaborative sessions, reflective practice and portfolio building. These may be supplemented with interactions with science professionals and tasks that are either work-based or linked to other placements.

Assessment Strategy

Assessments use a combination of unseen written examinations and a wide range of coursework elements such as laboratory reports, essays, online and computer-based assessments, data interpretation and analysis. This is also supplemented with assessment of communication skills in oral and poster communications during peer-reviewed and collaborative sessions. Together, these strategies are designed to evaluate a broad range of skills including the abilities to:

- Access and evaluate bioscience information from a variety of sources and comprehend biological phenomena at different organisational levels (from molecules through to organism systems).

- Communicate the underlying principles and methodologies, both orally and in writing, in a way that is organised and topical, and recognises the limits of the current state of knowledge.

- Demonstrate appropriate practical techniques and skills relevant to the biosciences; including data collection, analysis and interpretation of those data, and testing of hypotheses in a context that can be used to suggest new lines of future investigation.

- Execute and present an independent piece of hypothesis-driven work within a supported framework in which qualities such as time management, problem solving, and independence are evident.

These skills and abilities are assessed in a subject-specific manner to establish an understanding of the key concepts necessary to devise and evaluate suitable and relevant experimental methods for the investigation of relevant areas of bioinformatics. For example, the overarching programme design requires the successful completion of the key assessments associated with the core modules (e.g., LIS7018-B and BIS7022-B) that are designed to prepare students for an increasing level of autonomy and independence required to demonstrate the application of advanced research skills during the Research Project (BIS7026-E) and to demonstrate the achievement of skills described in PLO7 to PLO12 to develop independent researchers for the future.

Reassessment of any failed components of assessment will be carried out using a format that is similar to that of the original assessment. If, however, this is not possible, an alternative format may be used to examine the same Learning Outcomes e.g. items of assessment that need to be undertaken on an individual basis rather than as group work.

Assessment Regulations

This Programme conforms to the standard University Postgraduate Assessment Regulations which are available at https://www.bradford.ac.uk/regulations.

Admission Requirements

We take into consideration a number of factors when assessing your application. It's not just about your grades; we take the time to understand your personal circumstances and make decisions based on your potential to thrive at university and beyond. 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:

Normally, you would be expected to have gained an Honours degree in an appropriate biological sciences discipline with a minimum of a 2:2 or a similar qualification.

For students from outside of the UK/EU you will be required to meet the current visa and entry requirements for study in the UK, and if your first language is not English you must also satisfy the University that you meet the International English Language Testing Service (IELTS) overall band of 6.0 with a minimum of 5.5 in all elements.

Applications are welcome from students with non-standard qualifications with significant relevant experience.

We are continually reviewing and developing our practices and policies to make the University more inclusive, but if you are disabled, we may need to make some adjustments to make sure that you are not disadvantaged. We would advise you to contact the Programme Leader before you apply to discuss these.

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	Updated to incorporate January start	December 2020
2	Specification reformatted and made accessible	February 2021
3	Optional modules replaced with new core module BIS7027-B	June 2021
4	Annual changes for 2021 academic year	June 2021
5	Annual changes for 2022 academic year	March 2022