The University Of Sheffield.

Programme Specification

A statement of the knowledge, understanding and skills that underpin a taught programme of study leading to an award from The University of Sheffield

Programme Details

1. Programme title	Genetics
2. Programme code	MBBU20
3. QAA FHEQ level	Level 7 (MBiolSci)
4. Faculty	Science
5. Department	School of Biosciences
6. Other departments providing credit bearing modules for the programme	None
7. Accrediting Professional or Statutory Body	Advanced Accreditation from the Royal Society of Biology
8. Date of production/revision	September 2021, September 2023

Awards	Type of award	Duration
9. Final award	MBiolSci	4 years
10. Intermediate awards	BSc	3 years

Programme Codes

11. JACS code(s) *Select between one and three codes from the HESA website.*	C400		
12. HECoS code(s) *Select between one and three codes from the HECoS vocabulary.*	100259		

Programme Delivery

13. Mode of study	Full-time
14. Mode of delivery	in Sheffield

15. Background to the programme and subject area

Genetics is central to the whole of modern biology and to many aspects of current life. Articles in the press regularly feature issues such as the human genome project, human genetic disorders, gene testing, gene therapy, cloning, genetic fingerprinting, genetic engineering, transgenic animals and GM crops. Large parts of the biotechnology industry depend upon the application of genetic research, and much of what we eat is already the result of the use of genetic principles in selective breeding programmes. All these applications of genetics depend upon fundamental research, which is often carried out using relatively simple "model" organisms. For example, genetic studies on cell growth in yeast have led to fundamental insights into cell growth and cancer in humans. Our programmes in Genetics are designed to give both a sound understanding of the fundamental science and an appreciation of its wider significance.

Students graduating after three years with a BSc in Genetics are equipped with a wide range of skills, both subject-specific and generic. These provide a sound basis for a wide variety of careers in the molecular biosciences, and many graduates go on to research careers in industry or universities, often after obtaining a PhD qualification. Our graduates are also well qualified to enter non-research careers, such as teaching or management.

The first three years of the MBiolSci degree are identical to the BSc programme. The MBiolSci programme includes a fourth year of study, which provides further training specifically for students who are considering a career in research. This enhanced research element was an important factor in the award of Advanced Accreditation to the MBiolSci degree by the Society of Biology in 2015.

External reviews of The Department of Molecular Biology and Biotechnology in 2008 and 2013 recognised our excellence in teaching, building on a maximum score of 24 out of 24 in the national Teaching Quality Audit Subject Review in 1999. We also have an international reputation for research; in 2014, in a joint submission with other bioscience departments in Sheffield, we were ranked first in the national Research Excellence Framework for Subjects Allied to Medicine, and fifth for Biological Sciences. This means that students are exposed to a stimulating learning environment, in which the experience of staff as researchers contributes directly to their ability to teach the latest developments in the field. The School's accommodation has been refurbished to a very high standard at a cost of more than £23M.

Further information about the School, our staff, programmes and admissions may be found on the web at: http://www.shef.ac.uk/mbb/index.html

16. Programme aims

MBiolSci Genetics aims to:	
A1	provide teaching in the molecular biosciences that is informed and inspired by the research and scholarship of the staff, and is stimulating, useful and enjoyable to students and encourages academic excellence.
A2	provide a broad understanding of the molecular biosciences together with more detailed and critical knowledge in selected areas.
A3	equip graduates with well-developed practical, analytical, communication, IT and problem-solving skills.

A4	provide all students with the opportunity to carry out laboratory-based project work, to develop their practical skills and to allow them to assess their ability and interest in laboratory work.
A5	provide a stimulating educational experience that prepares students for future employment and is orientated towards a professional career in the molecular biosciences.
A6	encourage students to become informed citizens and understand the place of the molecular biosciences in society.
A7	provide a broad understanding of Genetics together with more detailed and critical knowledge in selected areas of the subject.
A8	provide a broad understanding of the chemistry that underpins the study of molecular biosciences.
The MBiolSci extends and enhances the BSc, aiming to:	
A9	provide an extended laboratory-based research project in a university or industrial environment.
A10	provide additional training in research skills and the scientific cycle.

17. Programme learning outcomes

Knowledge and understanding On successful completion of the programme, students will be able to:		
		Links to Aim(s)
K1	demonstrate a broad-based knowledge and understanding of the core facts, concepts, and terminology across the molecular biosciences.	A1-8
K2	demonstrate detailed and critical knowledge (including of the most recent advances) in selected areas relevant to Genetics.	A1-8
K3	demonstrate a practical understanding of the nature of scientific knowledge and its development in the light of continuing scientific advances.	A1-8
In addition, students achieving the award of MBiolSci should be able to:		
K4	demonstrate knowledge of recent research developments gained for example through attendance at departmental seminars and critical analysis of the literature.	A1-8
Skills and other attributes On successful completion of the programme, students will be able to:		
S1	investigate scientific questions by formulating hypotheses and designing experiments to test them effectively, including appropriate controls and drawing on an understanding of research ethics.	A1-8
S2	competently and safely use relevant laboratory equipment; master, with appropriate training, new experimental techniques; demonstrate a theoretical knowledge of how some more advanced methods would be used; and keep accurate experimental records.	A1-8
S3	analyse and critically evaluate experimental data, including the use of appropriate statistical methods.	A1-8

S4	present scientific ideas in oral, written, numerical, graphical and visual presentations, to a specialist or a lay audience.	A1-8
S5	search for, critically evaluate, and reference appropriate primary and secondary scientific literature relevant to Genetics.	A1-8
S6	plan and manage their own work, including managing their own time and using a range of resources (including lectures, textbooks, websites and the scientific literature) appropriately.	A1-8
S7	work effectively and flexibly with a range of colleagues in a collaborative and reflective manner, making good use of feedback.	A1-8
S8	consider scientific knowledge as it relates to wider society and apply it creatively to a range of problems.	A1-8
S9	reflect on and articulate their own skills and interests and relate these to their career aspirations (including motivation for and interest in postgraduate study).	A1-8
S10	develop and use appropriate IT skills in analysing data, accessing information and preparing all types of presentations.	A1-8
In addition, students achieving the award of MBiolSci will have acquired:		
S11	carry out and report extended independent practical and literary project work to a professional standard.	A9-10

18. Learning and teaching methods

1. Lectures

Students in the molecular biosciences must acquire and critically understand a substantial body of knowledge (**K1, K2, K3**). Much of this is conveyed through lectures, with lecture-based modules of 10 or 20 credits usually comprising lectures, respectively, associated with 1-2 data analysis sessions at levels 1 and 2 (see 'Practical classes' below). Level 1 lectures are focussed on the development of a broad knowledge of the molecular biosciences. This continues at Level 2, but students also acquire progressively more detailed and critical knowledge during Levels 2 and 3. MBiolSci students acquire additional advanced, research-led knowledge at Level 4 through attending departmental research seminars and a 'journal club' (**K4**). Students at all Levels are expected to supplement each lecture with directed independent study (**S5, S6**; see below). All lecture-based modules include optional questions designed to allow students to assess the development of their knowledge and understanding (**S6**).

2. Practical classes

At Levels 1 and 2, students take practical modules to the value of 30 credits each year. These involve two 3-hour laboratory sessions each week. In addition, a 3-hour data analysis session each week is associated either with a practical module or with one of the lecture-based modules. The laboratory sessions develop students' knowledge of equipment and methods (**K1**), and their skills in laboratory work (**S2**), data analysis (**S3, S10**), experimental design (**K3**, **S1**) and the preparation of reports (**S4, S10**). Laboratory work is typically carried out in pairs or small groups (**S7**). The data analysis sessions associated with practical and lecture-based modules provide further development of skills through a combination of instruction, discussion and practice (**K1**, **K3, S1, S3**; also **S5, S10** at Level 2). Laboratory and data analysis sessions are assessed, and feedback is provided on each session (**S7**).

At Level 3, students take a 10-credit data handling module, which develops data interpretation skills using a format similar to that of the data analysis sessions at Levels 1 and 2 (**K2, K3, S1, S3, S5, S10**).

3. Project work

At Level 3, each student carries out a 30-credit practical project supervised by a member of staff. Students select their preferred options from a list of potential topics and are then allocated one of their choices. A wide range of projects is offered, reflecting diverse career options, and including: laboratory work in one of the research groups in the School, or the School of Medicine; analysis of complex data sets gathered from large-scale research projects; clinical diagnostics; development and delivery of science lessons in a local school; or creation and evaluation of a portfolio on a biological topic of ethical and political significance. (**K1**, **K2, K3, S1-10**).

Students following the MBiolSci programme carry out a more extensive, laboratory-based research project at Level 4, either in one of the research groups in the School or in industry. Both types of project allow more advanced and extensive understanding of research work (**K4**) and development of the relevant skills (**S11**).

4. Literature reviews
At Level 3, each student takes a 10-credit module involving a search for scientific literature relevant to a specified topic (**K1**, **K2, K3, S5, S10**) and the preparation of a critical review (**S4**, **S5**, **S6, S10**). Students select several topics from a list of titles offered by potential supervisors and are then allocated one of their choices. This exercise builds on skills in literature searching introduced in tutorials at Levels 1 and 2, and skills in the reading and understanding of scientific literature introduced in a practical module at Level 2 and particularly in the Level 3 data handling module.

Students following the MBiolSci programme use the same skills at Level 4 in the preparation of an advanced literature review relevant to the topic of the extended research project (**S11)**.

5. Tutorials
Small-group tutorials at Levels 1 and 2 develop students' ability to seek out subject-related information and present it orally or in handwritten or word-processed reports (**K1**, **K2, K3, S4**, **S5**, **S6, S8, S10**). Oral and written feedback is provided by tutors. Work prepared for some tutorials is assessed (**S6**) and contributes to the marks for practical modules. Personal development tutorials help students prepare for life after graduation including reflection on how their skills and interests relate to career aspirations (**S9**).

6. Independent study
In all modules and at all Levels, students are expected to carry out substantial amounts of independent study (**S5, S6, S9, S10**). This includes directed reading, problem solving, and the completion of self-assessment questions.

19. Assessment and feedback methods

Opportunities to demonstrate achievement of the learning outcomes are provided through the following assessment methods:

1. Formal examinations
Lecture-based modules are assessed by formal examinations (2 hours for 10-credit and 20-credit modules at Level 3 and Level 2, respectively; and an exam in each semester (1 hour Autumn, 1.5 hour, Spring) for 20-credit modules at Level 1). Formal examinations at all Levels provide effective tests of knowledge (**K1**, **K2, S5**) and problem-solving skills (**K3, S1**, **S3**). Examination papers at Levels 2 and 3 test students' critical understanding by challenging them to evaluate their knowledge and synthesise answers that reflect the specific ways in which questions have been framed (**S4, S10**). Multiple-choice examinations are used at Level 1. Level 2 examinations combine compulsory, short-answer questions with a choice of essays, and Level 3 examinations provide a choice of essays, with some modules combining compulsory short answer questions with a choice of essays.

Formal examinations also contribute to the assessment of practical at Levels 1 and 2 (**K1, K3, S1, S3, S10**), where they provide 40-50% of the overall assessment. The 30-credit skills module at Level 2 is assessed via short-answer examination for the 30-credit practical module.

The data handling module at Level 3 is assessed in two formal examinations, one of compulsory data handling questions (**K2, S1, S3, S5, S10**) and the other comprising a choice of synoptic essay questions (**K3, S4, S8**).

2. Continuous assessment
100% of the overall assessment of the L1 practical module is based upon laboratory records, answers to questions. evidence of professional development, formal laboratory reports, and written tutorial work (**K1, K2, K3, S1, S2, S3, S4**, **S5, S8, S9, S10**). Up to 50% (but typically 0-20%) of the overall assessment in each lecture-based module comes from data analysis sessions and other coursework. Some laboratory and data analysis sessions are assessed, and feedback is given (**S7).**

3. Project assessment
Assessment of projects is based upon the student's performance in the practical work and upon oral and written reports (**K1, K3, S1-S10**). Literature reviews are assessed entirely on the basis of the report (**K1**, **K2, K3, S1**, **S3, S4, S5, S6, S10**).

4. Level 4 research skills assessment
For students following the MBiolSci programme, attainment of the learning outcomes of the extended laboratory project and advanced literature review at Level 4 is assessed according to their approach to professional standards (K4, S11). Assessment of the advanced, research-led knowledge acquired from departmental research seminars and appreciation of the key steps of the scientific cycle (K4).

Feedback
Formative individual written and oral feedback will be provided in L1 and L2 tutorial exercises, and in L3 and L4 field course reports, dissertations and projects. Oral individual and group feedback will be provided in practicals and staff will be available in lecture modules for students to ask questions and receive feedback.

20. Programme structure and student development

Programme Structure

The programmes are modular and offered as full-time study only. Students register for modules to a total of 120 credits in each year of study.

Level 1
Modules to the value of 100 credits are core (compulsory), comprising four 20-credit lecture-based modules and one 30-credit core skills module. In addition, students may choose 20 credits from the School of Biosciences. At the end of Level 1, students are free to transfer to any other undergraduate degree programme within the School.

Level 2
Modules to the value of 90 credits are core (compulsory), comprising three 20-credit lecture-based modules and one 30-credit practical module. In addition, students choose one of two approved (optional) 20-credit lecture-based modules, and also choose between a 10-credit enterprise module, a 10-credit module on the history and philosophy of molecular bioscience, and any other 10-credit module offered within the University. At the end of Level 2, students are free to transfer to any one of a small number of related degree programmes within the School.

Level 3
Core modules comprise the 30-credit project, 10-credit literature review and 10-credit data handling module. Seven approved, 10-credit, lecture-based modules must be chosen, six from a degree-specific list, and one from all those offered in the School.

Level 4 (MBiolSci programme only).
Core modules comprise an 80-credit laboratory project, a 20-credit literature review and a 20-credit module on the scientific cycle two 10-credit modules in research-related skills. Students may carry out the laboratory project in industry if they are successful in the competitive application procedure for one of the participating companies.

For the BSc, final degree classifications are based on aggregate marks of 33% for Level 2 and 67% for Level 3.

For the BSc programme a pass must be achieved in the Research Project module, MBB380, for an accredited degree to be awarded.

Progression to Levels 3 and 4 of the MBiolSci programme is normally subject to a minimum overall mean grade of at least 64.5 at Level 2. MBiolSci students who fail to achieve this score will normally transfer to the BSc programme. Students on the BSc programme may transfer at the end of L3 Semester 1 to the MBiolSci if they have achieved a mark of at least 59.5 at both Level 2 and in the Autumn of Level 3.

Programme Development

Level 1
This Level is designed to provide a broad theoretical and practical grounding in the molecular biosciences. By the end of this year, students will have:

- knowledge of relevant concepts, principles, equipment and methodologies;
- the ability to evaluate and interpret relevant data, both qualitative and quantitative;
- the ability to use a variety of methods to communicate relevant information cogently and analytically;
- the study skills to undertake further training at Level 2.

Level 2
This Level is designed to allow students to develop a more advanced appreciation of specific areas of the molecular biosciences. By the end of this year, students will have:

- deeper and more critical knowledge and understanding in specific areas;
- more advanced laboratory skills and knowledge of complex research equipment;
- the ability to identify and use primary and secondary literature relevant to a specific topic;
- more advanced skills in data interpretation and analysis;
- more advanced communication skills;
- the study skills to undertake further training at Level 3.

Level 3
This Level is designed to allow students to carry out critical, in-depth study of selected areas of the molecular biosciences relevant to genetics, and to carry out practical project work, usually as a member of a group. By the end of this year, students will have:

- deep and critical knowledge and understanding of the latest developments in selected areas;
- skills in the planning, execution, evaluation and reporting of a practical project;
- well-developed skills in interpreting, evaluating and explaining relevant primary literature;
- well-developed communication skills;
- the study skills to undertake further training and life-long learning.

Level 4 (MBiolSci only)
This Level is designed to provide further training specifically for students who intend to pursue a career in research. By the end of this year, students will have:

- understanding of some of the latest developments through research seminars and participation in a ‘journal club’;
- experience of an extended, individual laboratory project as a member of an active research group;
- a comprehensive understanding of the literature, approaches and techniques relevant to the project;
- a practical understanding of the role of creativity, originality and judgement in the execution of laboratory research;
- the knowledge, skills and attributes necessary to undertake a career in research.

Detailed information about the structure of programmes, regulations concerning assessment and progression and descriptions of individual modules are published in the University Calendar available online at http://www.sheffield.ac.uk/calendar/.

21. Criteria for admission to the programme

Detailed information regarding admission to programmes is available from the University's On-Line Prospectus at http://www.shef.ac.uk/courses/.

This is likely to be updated/aligned with the development of the Biologies Teaching Partnership.

22. Reference points

The learning outcomes have been developed to reflect the following points of reference:

Subject Benchmark Statements
https://www.qaa.ac.uk/quality-code/subject-benchmark-statements

Framework for Higher Education Qualifications (2014)
https://www.qaa.ac.uk/docs/qaa/quality-code/qualifications-frameworks.pdf

University Vision and Strategic Plan
https://www.sheffield.ac.uk/vision

Learned Society recommendations
https://www.rsb.org.uk/images/RSB_Subject_Specific_Learning_Outcomes.pdf
https://www.rsb.org.uk/images/Appendix_1_RSB_Additional_Subject_Specific_Guidance__Biochemistry.pdf

23. Additional information

None

This specification represents a concise statement about the main features of the programme and should be considered alongside other sources of information provided by the teaching department(s) and the University. In addition to programme specific information, further information about studying at The University of Sheffield can be accessed via our Student Services web site at http://www.shef.ac.uk/ssid.