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

1	**Programme Title**	Molecular Biology and Biotechnology
2	**Programme Code**	MBBT12 / BIST07
3	**JACS Code / HECoS Code**	C710 / 100354
4	**Level of Study**	Postgraduate
5a	**Final Qualification**	Master of Science (MSc)
5b	**QAA FHEQ Level**	M – Framework Level 7
6a	**Intermediate Qualification(s)**	Postgraduate Diploma (PGDip), Postgraduate Certificate (PGCert)
6b	**QAA FHEQ Level**	M – Framework Level 7
7	**Teaching Institution** (if not Sheffield)	Not applicable
8	**Faculty**	Science
9	**Department**	School of Biosciences
10	**Other Departments providing credit bearing modules for the programme**	Department of Chemical and Biological Engineering (CBE)
11	**Mode(s) of Attendance**	Full time
12	**Duration of the Programme**	Calendar Year
13	**Accrediting Professional or Statutory Body**	Not applicable
14	**Date of production/revision**	January 2016, February 2022

15. Background to the programme and subject area

Molecular Biology is central to the whole of modern biology, and includes many aspects that are of relevance to the biotechnology industry. Biotechnology is a rapidly developing area that is heavily dependent upon molecular approaches, and there is significant demand in academic, industrial and health service laboratories for scientists with molecular biology laboratory skills combined with a strong knowledge base in biochemical engineering. Our MSc programme in Molecular Biology and Biotechnology is designed to provide a research-focussed training for students who are typically aiming to go on to study for a PhD, with a view to a career in molecular bioscience.

In the governmental review of higher education in the UK, the School of Biosciences was awarded top scores for both research and teaching: in the 2014 Research Excellence Framework (REF 2014) the University of Sheffield was placed 5th nationally for research in biological sciences and 1st nationally for research in Subjects Allied to Medicine, and was awarded Silver in the last Teaching Excellence Framework (TEF). 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. In 2006, the School's accommodation was completely refurbished to a very high standard at a cost of more than £23M.

Further information about the programme may be found at:
https://www.sheffield.ac.uk/postgraduate/taught/courses/2022/molecular-biology-and-biotechnology-msc

16. Programme aims

All degree programmes offered by the School of Biosciences have the following general aims consonant with the University of Sheffield's Mission.

1. to 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;

2. to equip graduates with well-developed practical, analytical, communication, IT and problem-solving skills;

3. to 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;

4. to provide a stimulating educational experience that prepares students for future employment and is orientated towards a professional career in the molecular biosciences;

5. to assess students over a range of skills and identify and encourage academic excellence;

6. to give students the opportunity to obtain feedback on their progress;

7. to provide a supportive environment for students;

8. to engender in students a desire for continuing professional development;

9. to encourage students to become informed citizens and understand the place of the molecular biosciences in society.

10. to provide detailed and critical knowledge in selected areas of molecular biology and biotechnology, including experience of relevant laboratory techniques;

11. to provide more comprehensive knowledge and deep understanding of molecular biology and biotechnology;

12. to provide additional training in research skills suitable as preparation for study at PhD level or employment in laboratory-based research;

13. to provide an extended laboratory-based research project in a relevant research area.

17. Programme learning outcomes

Knowledge and understanding: by the end of the programme, students achieving the award of MSc will have acquired:	
K1	detailed and critical knowledge, including knowledge of the most recent advances in selected areas relevant to molecular biology and biotechnology;
K2	practical understanding of the nature of scientific knowledge, and of techniques and tools for searching the scientific literature;
K3	familiarity with relevant laboratory equipment and molecular methods, including knowledge of safe working practices;
K4	knowledge of numerical, graphical, statistical and other methods for analysing experimental data;
K5	familiarity with a range of presentation techniques;
K6	an understanding of ethical issues, the relevance of public understanding of science and the responsibilities of the researcher;
K7	experience of an individual research project on a relevant topic;
K8	detailed knowledge of the topic studied in the research project;
K9	an understanding of whether or not they have the ability, motivation and interest to pursue further training for a PhD or employment in laboratory-based research.

Skills and other attributes: by the end of the programme, students achieving the award of MSc will have acquired:	
S1	the ability to plan and manage their own learning, including time management skills and the ability to learn effectively from a range of resources, including lectures, textbooks, websites and the scientific literature;
S2	competence in the use of relevant laboratory equipment and the ability to master, with appropriate training, new experimental techniques;
S3	the ability to analyse and critically evaluate experimental data;
S4	the ability to formulate hypotheses and design experiments to test these hypotheses effectively, including the design of appropriate controls;

S5	skills in oral, written, numerical, graphical and visual presentations, such that essential aspects of molecular biology and biotechnology can be effectively conveyed;
S6	skills in searching for primary and secondary scientific literature relevant to a specific topic;
S7	the ability to read and critically understand primary and secondary scientific literature relevant to molecular biology and biotechnology;
S8	the ability to work effectively as a member of a team;
S9	the ability to organise and manage an independent, laboratory-based research project to a professional standard.

18. Teaching, learning and assessment

Development of the learning outcomes is promoted through the following teaching and learning methods:

Students on this programme will have a good degree from a relevant area and, as such, will be expected to be relatively sophisticated learners.

1. Lectures and research seminars
Much of the detailed factual knowledge is conveyed through two lecture-based modules (15 credits each) that students must choose (K1) and a core (compulsory) 30-credit module introducing the principles of biochemical engineering (K1). Additional advanced, research-led knowledge comes from a 15-credit core module involving attendance at departmental research seminars and a 'journal club' (K1). Students are expected to supplement each lecture with directed independent study (see below; S1, S7). Lecture-based modules include optional questions designed to allow students to assess the development of their knowledge and understanding (programme aim 6).

2. Practical classes
All students take a 15-credit practical module, which is designed to give training and practice in basic molecular bioscience techniques, to prepare students for their individual research project. This module involves extensive laboratory work to develop students' knowledge of equipment and methods (K2-K4) and their skills in laboratory work (S2), data analysis (S3), experimental design (S4) and the preparation of reports (S5). Data analysis sessions associated with the practical module provide further development of skills through a combination of instruction, discussion and practice (K4, S3, S4).

3. Research project
Each MSc student carries out a 60-credit, laboratory-based research project supervised by a member of staff (K7-K9, S8-S9).

4. Literature review
All students take a 15-credit literature review module, involving a search for scientific literature relevant to the topic of the individual research project (K2, S6, S7) and the preparation of a critical review (K5, S5).

5. Tutorials
Small-group meetings associated with most modules, particularly the 'journal club' sessions, provide opportunities for discussion and informal presentations (K5, S5). One-to-one meetings provide opportunities to discuss progress, particularly in the individual research project (K2-K9, S3-S5, S8, S9).

6. Independent study
In all modules, students are expected to carry out substantial amounts of independent study (S1). This includes directed reading, self-directed reading, problem solving, and the completion of self-assessment questions (K1, K2, K8, S1, S3-S7, S9).

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, largely essay-based examinations (usually contributing 66% of the grade) and coursework essays (usually 34%). Formal examinations provide effective tests of knowledge and also 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 (K1, S1, S5, S7). Formal

examinations are also used to test problem-solving skills (S3-S5).

2. Continuous assessment
Assessment of the practical module is based upon experimental competence (25%; K3, S2) and laboratory reports (75%; K4, K5, S3-S5). Assessment of Advanced Research Topics is assessed on the basis of a series of brief reports (75%) and a 'journal club' presentation (25%) (K1, K2, K4-K6, S1, S3, S5-S7). The literature review is assessed entirely on the basis of the report (K1, K2, K4-K6, S1, S3-S7).

3. Project assessment
Assessment of the research project is based upon the student's performance in the practical work (20%), a *viva voce* exam (10%), a poster (5%), an oral presentation (5%) and a written report (60%) (K1-K9, S1-S9).

19. Reference points

The learning outcomes and programme content have been developed with reference to existing PGT (QAA FHEQ Level 7) provision within the School of Biosciences. In agreement with the University's Learning and Teaching Strategy, the programme has been designed to benefit from our excellent research-led teaching, and the programme-level approach ensures that students will develop broad skills which cut across individual modules and result in the development of deeper knowledge and understanding. In accordance with the vision set out in The Sheffield Masters' Graduate, the programme is designed to allow students to deepen their discipline-based knowledge while at the same time gaining the confidence to apply this knowledge within local, national, and international contexts, and to encourage creative and strategic problem-solving skills which transcend the component disciplines.

20. Programme structure and regulations

The programme is modular and offered as full-time study only.

To complete the MSc programme successfully, a student must carry out a 60-credit, individual research project on a relevant topic.

To be permitted to take the individual research project, a student must first take other modules to the value of 120 credits. Successful completion of all these 120 credits by a student who did not complete the project would make the student eligible to graduate with the award of PGDip, while the award of at least 60 out of the 120 credits would make a student eligible to graduate with the award of PGCert.

Of the initial 120 credits, modules to the value of 90 credits are core (compulsory), comprising a 30-credit practical skills unit, a 15-credit literature review, a 30-credit introduction to the principles of biochemical engineering, and a 15-credit module on advanced research topics. In addition, students choose two 15-credit, lecture-based modules from a choice of five offered.

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

21. Student development over the course of study

The programme is designed to prepare graduates for work in a research laboratory, and typically for further training in a PhD programme. A key feature of the programme is the 60-credit individual research project, carried out on an appropriate topic, which provides an experience similar to the first year of PhD study.

As preparation for the research project, students study a range of modules to the value of 120 credits. These include theory-based units as well as training in laboratory experimental techniques, data analysis, literature searching and analysis, and presentation methods.

22. Criteria for admission to the programme

Candidates will normally have a good (Upper Second Class or better) degree in a relevant area of molecular bioscience. In addition, international students where English is not their first language or who have not been taught in English will also have an IELTS mean of 6.5 (with a minimum of 6.0 in all 4 components).

23. Additional information

Further information about the School, our staff, programmes and admissions may be found on the web at: https://www.sheffield.ac.uk/biosciences
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.