



Programme Specification (PG)

Awarding body / institution:	Queen Mary University of London
Teaching institution:	Queen Mary University of London
Name of final award and programme title:	MSc Biotechnology and Synthetic Biology
Name of interim award(s):	
Duration of study / period of registration:	12 months
Queen Mary programme code(s):	PMSF-QMBIOL1/PSBSB
QAA Benchmark Group:	Biomedical Science and Biomedical Sciences; Biosciences
FHEQ Level of Award:	Level 7
Programme accredited by:	N/A
Date Programme Specification approved:	30 Nov 2023
Responsible School / Institute:	School of Biological and Behavioural Sciences

Schools / Institutes which will also be involved in teaching part of the programme:

Collaborative institution(s) / organisation(s) involved in delivering the programme:

Programme outline

The MSc Biotechnology and Synthetic Biology programme at Queen Mary University of London offers an advanced level of understanding of biotechnology and synthetic biology. It provides opportunities for students to develop their critical analysis and problem-solving skills, as well as their ability to evaluate and apply knowledge in a professional context. The programme is designed to equip students with the skills and knowledge needed to succeed in the biotechnology and synthetic biology industries at a master's level. Students will learn through a combination of lectures, seminars, workshops and practical work, with opportunities to engage in independent research projects. The programme is situated within a research-intensive environment, with a focus on cutting-edge research and real-world applications. Students will be expected to engage with the latest research findings and to evaluate their implications for the field. The programme provides students with access to world-class facilities, including state-of-the-art laboratories, advanced computing resources, and a wide range of scientific equipment. Students will have the opportunity to work with these resources, gaining valuable hands-on experience in the process. Overall, the MSc Biotechnology and Synthetic Biology programme at Queen Mary University of London is an excellent choice for students looking to build a career in this exciting and rapidly evolving field at a master's level.

Aims of the programme

The key aim of the programme is to equip students for a research career in biotechnology, synthetic biology or a related biological or engineering discipline. The laboratory or dissertation based research project sits at the core of the programme, and will give students the necessary skills and attributes of a research scientist and will be an excellent preparation for a PhD or to enter the research industry. The students will acquire new skills and develop knowledge of the theoretical background of biotechnology and synthetic biology, they will apply these key concepts to support the development of their research projects.

The programme will:

- i.) Provide comprehensive preparation for students intending to pursue further research degrees or seek employment in research-oriented environments in industry or academia. This bridges the gap between the didactic approach of typical undergraduate degrees and research degrees, ensuring a smooth transition.
- (ii.) Emphasize experiential learning, enabling students to acquire practical skills at the postgraduate level, which are highly valued for professional growth and development.
- (iii.) Cultivate a broad knowledge base in the relevant fields of study while developing essential transferable skills such as effective communication, data analysis, programming, teamwork, problem-solving, and time and task management.
- (iv.) Encourage the early-stage exploration of curiosity-driven basic and applied scientific research, fostering an open-minded and creative mindset while maintaining a balanced approach.
- (v.) Promote scientific awareness regarding the significance of multidisciplinary and interdisciplinary research in the fields of biotechnology and synthetic biology.
- (vi.) Nurture the development of early-stage entrepreneurial skills in alignment with a broader understanding of the economic, ethical, and social factors that drive industrially-focused research.

The students will:

- (i) Immerse themselves in a research environment and receive supervision from an academic member of the team, collaborating closely to meticulously design and conduct experiments while ensuring adherence to proper protocols and guidelines.
- (ii) Strengthen their proficiency in experimental techniques, theoretical knowledge, and analytical skills, enabling them to adeptly adapt and apply methodologies to solve unfamiliar problems encountered during their research endeavors.
- (iii) Enhance their organizational and time-management skills, effectively managing research tasks and deadlines. Additionally, they will refine their ability to articulate and convey research findings and scientific concepts both orally and in written form, ensuring clear and effective communication.

What will you be expected to achieve?

Through this programme, students will develop logical-thinking skills, critical analysis and problem-solving skills while gaining the ability to evaluate and apply knowledge in professional research laboratories. Designed to prepare students for success in the biotechnology and synthetic biology industries at a master's level, the programme combines lectures, seminars, and practical work, including independent research projects. The programme takes place in a research-intensive environment, emphasising cutting-edge laboratory practicals. Students who successfully complete the programme will have demonstrated that they can confidently and professionally apply their knowledge within either the biotechnology or synthetic biology fields, equally applicable to industrial or academic research. This includes achievement of the specific learning outcomes listed below.

Academic Content:

A 1	Display an advanced understanding of the fundamental background of biotechnology and synthetic biology.
A 2	Show an ability to solve problems associated with either basic or applied biotechnology/synthetic biology approaches.
A 3	Demonstrate an ability to perform independent biotechnology/synthetic biology research displayed throughout the programme.
A 4	Critically evaluate biotechnology/synthetic biology-related journal articles, reports, and popular media articles.

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A 5	Demonstrate broad awareness and understanding of the ethics and regulatory processes with commercial biotechnology exploitation.
A 6	Apply all taught research skills in forming a biotechnology/synthetic biology idea or concept for application.
A 7	Demonstrate a critical awareness and systematic evaluation of scientific method appropriate in biotechnology research.
A 8	Leverage a range of methods to investigate and resolve issues pertaining to environmental biotechnology, energy, health and medicine, food and agriculture, and industrial biotechnology and medicine, food and agriculture and industrial biotechnology.

Disciplinary Skills - able to:	
B 1	Plan, design and execute hypothesis or problem-driven experiments to address research questions within the biotechnology and synthetic biology research fields.
B 2	Make a significant contribution to a research project in the chosen field of biotechnology or synthetic biology.
B 3	Develop competency in practical skills expected of a postgraduate level student.
B 4	Perform model-based analysis and visualisation using appropriate software.
B 5	Show team working skills to approach a engineering biology problem.
B 6	Display advanced oral presentations skills commensurate with a postgraduate student.
B 7	Develop deeper-thinking skills by exploring problems using evidence and literature to formulate scientific ideas.

Attributes:	
C 1	Assess and critically analyse current knowledge involves thoroughly evaluating scientific claims by examining primary literature and commenting on the sufficiency of the methods employed and the data presented.
C 2	Acquire new knowledge and extend understanding through investigation of unfamiliar problems.
C 3	Communicate results of hypothesis-driven research clearly by both written report and oral presentation.
C 4	Manage time, prioritise workloads and work to deadlines as a transferable key skill to help students with career goals and continuing education.
C 5	Work independently and build capacity for independent learning in a new range of ways.
C 6	Assess the relevance, importance and reliability of the ideas of others and successfully assess the quality of various information sources and use information constructively and critically.
C 7	Participate constructively as a member of a group/team, respect the opinions of others and act inclusively as responsible learners.
C 8	Identify information needs and devise strategies for the retrieval and selection of relevant information from a wide range of sources.

How will you learn?

Much of your learning will take place as part of your contribution to a research team.

Progress in the research project is monitored by your project supervisor through regular meetings as well as through inspection of your laboratory book. You also need to submit dissertation drafts and will receive feedback on this.

This course will provide knowledge with a focus on practical experience of modern techniques in Biotechnology and Synthetic Biology areas. These include: DNA assembly; microbial pathway expression; cell-free systems; protein production; spectroscopic measurements; structural biology; computational modeling; statistical data analysis; as well as other techniques used by students studying in biotechnology and synthetic biology.

You will be encouraged to attend the School seminar series and the Protein & Gene Club.

How will you be assessed?

The programme is designed to incorporate a broad range of assessments including written reports, in-class assessments, problem-solving questions, oral and graphical presentations, poster presentations, statistics assignments, lab reports, science communication pieces, vivas, literature reviews and dissertation for the research project.

How is the programme structured?

Please specify the structure of the programme diets for all variants of the programme (e.g. full-time, part-time - if applicable). The description should be sufficiently detailed to fully define the structure of the diet.

Students require a total of 180 credits to graduate with a MSc degree.

Compulsory modules (taught component)

Unix and Analysis of Large Genomic Datasets (15 credits) – term A

Principles of Engineering Biology (15 credits) – term A

Industrial Biotechnology (15 credits) – term B

Responsible Innovation and Commercialisation (15 credits) – term B

Genome Editing in Biotechnology and Synthetic Biology (15 credits) – term A

Proteins and Biocatalysts in Biotechnology (15 credits) – term A

The key focus of the MSc is a Research Project (90 credits), which is supported by prior compulsory modules. The aim of this project is to apply the technical and transferable skills gained during the taught modules to a pertinent research question involving the management and/or analysis of biotechnology or synthetic biology data. The students will conduct the project within one of the research labs in the Biochemistry department at SBBS. The project will start in March and end in August. After completion of the bench work, students are required to:

(i) present the results of their project at a symposium (10 min + 5 min questions)

(ii) submit a dissertation consisting of a comprehensive description and discussion of the work undertaken during the project.

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Principles of Synthetic Biology	BIO751P	15	7	Compulsory	1	Semester 1
Industrial Biotechnology	BIO752P	15	7	Compulsory	1	Semester 2
Unix and Analysis of Large Genomic Datasets	BIO726P	15	7	Compulsory	1	Semester 1
Genome Editing in Biotechnology and Synthetic Biology	BIO753P	15	7	Compulsory	1	Semester 1
Responsible Innovation and Commercialisation	BIO754P	15	7	Compulsory	1	Semester 2
Proteins and Biocatalysts	BIO755P	15	7	Compulsory	1	Semester 1
Research Project in Industrial Biotechnology and Synthetic Biology	BIO750P	90	7	Core	1	Semesters 2 & 3

What are the entry requirements?

1. BSc in Biomedical Sciences; Biochemistry or related. Graduated with an Upper Second Class degree or equivalent.
2. An international qualification of similar standing to the above.

In addition, international students must normally have an English language qualification at a level that meets the university guidelines for admission of international students (e.g.IELTS)

How will the quality of the programme be managed and enhanced? How do we listen to and act on your feedback?

The Student-Staff Liaison Committee (SBBS) provides a formal means of communication and discussion between the School and its students. The committee consists of student representatives from each programme and each year in the school, together with appropriate representation from staff within the School. It is designed to respond to the needs of students, and act as a forum for discussing programme and module developments. The Student-Staff Liaison Committee meet regularly throughout the year.

For this MSc degree the programme organiser will seek verbal and written feedback on the programme from students at the end of each semester from the whole student body. One or two student will be elected as part of the student staff liaison committee for the totality of the MSc programmes. They will seek feedback from their peers and discuss it during the 2 dedicated meetings yearly.

The School operates a School Education Committee, chaired by the School's Director of Education which oversees and advises on all matters relating to the delivery of taught programmes at school level. This includes monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment, before submission to Taught Programmes Board. Student views are incorporated in this Committee's work in a number of ways, such as through consideration of items referred by the SSLC and by consideration of student surveys, including module evaluation questionnaires.

All schools operate an Annual Programme Review of their taught undergraduate and postgraduate provision. Students' views are considered in this process through analysis of the results from the Postgraduate Taught Experience Survey (PTES), module evaluations and other internal Queen Mary surveys.

What academic support is available?

Each student will have a primary project supervisor and a second academic advisor.

Other forms of academic support:

Induction Programme:

This includes briefing from the Programme director on matters relating to the requirements of the programme and conduct of research in the laboratories as well as a series of briefings, demonstrations and visits aimed at ensuring that students are aware of the range of facilities for the support of study and research in the School.

Research Project Supervisor:

Students on this programme have a research project supervisor who is a member of academic staff based in the School, and is the primary source of guidance on all matters relating to the experimental project component of the degree programme.

Director of Postgraduate taught programmes:

Available to discuss any issues related to the programme which cannot be resolved by the the programme director

Access to teaching staff:

On an individual basis, for matters relating to individual specific academic problems.

Queen Mary Student Guide and a range of other on-line documentation, published by the College Registry.

MSc programme details will be available on QMplus.

Extensive Library and IT facilities:

This includes the main library, a subject librarian, the Student PC Service and the Computing Services Help Desk.

IT Training Short Courses:

A range of short courses covering common software applications, operated by Computing Services.

On-line module documentation on QMplus.

Support classes (mathematics) and drop-in sessions (chemistry, biology, physics and mathematics) operated by the Learning Development Unit (LDU).

English Language & Study Skills Programme:

This includes pre-sessional and in-sessional classes in English language training for international students, and in-sessional Study Skills programme.

Staff-Student Liaison Committee(s):

For discussion of, and feedback on, all matters relating to academic programmes and departmental teaching activities.

Other support services/development opportunities:

SBBS Student Support Officers are available for meetings via an online booking system.

Advice & Counselling Service (for general advice, welfare information and counselling service).

College Residences Office (for support in finding accommodation).

Learning Support Service for Students with Disabilities/Learning Difficulties.

Language Learning Unit (for introductory courses in various modern European languages).

Student Support Centre of the Queen Mary Student Union.

Careers Service.

Programme-specific rules and facts

None

How inclusive is the programme for all students, including those with disabilities?

Queen Mary has a central Disability and Dyslexia Service (DDS) that offers support for all students with disabilities, specific learning difficulties and mental health issues. The DDS supports all Queen Mary students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites.

QMUL operates a universal design for learning to ensure that all materials are created with an understanding of a variety of learning styles and learning challenges.

Multiple assessment formats will ensure that all skills are evaluated and allow all students the opportunity to demonstrate their ability. This is particularly beneficial for neurodivergent students. The use of spoken and visual assessments will reduce the negative impact of generative software.

Students can access advice, guidance and support in the following areas:

- Applying for funding through the Disabled Students Allowance (DSA)
- Arranging DSA assessments of need
- Special arrangements in examinations
- Accessing loaned equipment (e.g. digital recorders)
- Specialist one-to-one study skills tuition
- Ensuring access to course materials in alternative formats (e.g. Braille)
- Providing educational support workers (e.g. note-takers, readers, library assistants)
- Mentoring support for students with mental health issues and conditions on the autistic spectrum.

Links with employers, placement opportunities and transferable skills

This programme provides a comprehensive preparation for students wishing to progress onto a research degree, bridging the gap between the lecture-dominated programme of a typical undergraduate BSc degree and the research intensive PhD degree. Graduates often proceed on to a PhD programme, although the MSc qualification can also be a real asset for careers in teaching or industry.

Graduates of biotechnology and synthetic biology degree courses are highly recognised by employers as having good subject-specific and transferable skills: including skills in literacy, numeracy, application of logic, problem solving, communication, IT and computation, independent and team working, and time management.

Opportunities for employment outside the field of Biotechnology and Synthetic Biology would include careers in the following areas: finance; commerce; economics; civil service; law; journalism; publishing; healthcare; technical sales; information technology.

Programme Specification Approval

Person completing Programme Specification:

Simon Moore

Person responsible for management of programme:

Simon Moore

Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:

SEC SBBS - 12th July 2023

Date Programme Specification approved by Taught Programmes Board:

30 Nov 2023