School of Life and Medical Sciences

Title of Programme: **MSc Biotechnology**

Programme Code: HHMBIO

**Programme Specification**

This programme specification is relevant to students entering:
23 September 2019

Associate Dean of School (Academic Quality Assurance):
Stefanie Schmeer

Signature

A programme specification is a collection of key information about a programme of study (or course). It identifies the aims and learning outcomes of the programme, lists the modules that make up each stage (or year) of the programme, and the teaching, learning and assessment methods used by teaching staff. It also describes the structure of the programme, its progression requirements and any programme-specific regulations. This information is therefore useful to potential students to help them choose the right programme of study, to current students on the programme, and to staff teaching and administering the programme.

<table>
<thead>
<tr>
<th>Date</th>
<th>Section</th>
<th>Amendment</th>
</tr>
</thead>
<tbody>
<tr>
<td>27/03/18</td>
<td>1 A</td>
<td>Deleted the sentence that “there is an option to take agricultural biotechnology as an alternative to industrial biotechnology” from the paragraph titled Programme Rationale. Also deleted the word agricultural biotechnology from the last line in the same paragraph.</td>
</tr>
</tbody>
</table>

If you have any queries regarding the changes please email AQO@herts.ac.uk
Programme Specification  MSc Biotechnology

This programme specification (PS) is designed for prospective students, enrolled students, academic staff and potential employers. It provides a concise summary of the main features of the programme and the intended learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the teaching, learning and assessment methods, learning outcomes and content for each module can be found in Definitive Module Documents (DMDs) and Module Guides.

Section 1

A. Programme Rationale
The programme is designed to provide a postgraduate education in Biotechnology for graduates in the Biosciences or Biological Chemistry. A strong practical foundation is provided in the first semester with the study of modules that concentrate on the basic principles and techniques used in modern molecular biology investigations, and on aspects of cellular molecular biology and development. In the second semester there is a progression to problem-based learning (PBL) to develop an in-depth understanding of the application of molecular biological approaches to the production of industrial and medicinal proteins. Students will also learn how to apply and design industrial and environmental biotechnology processes, such as process kinetics and design, reactor design and oxygen transfer, sterilization kinetics and the application of biotechnology processes for the bioremediation of contaminated sites. During the final semester, the research project may include aspects of fermentation biotechnology, genetic manipulation and protein engineering, bioinformatics, microbial physiology, or environmental microbiology.

The use of problem based learning approaches is a key feature of the programme and will promote development of investigative skills, the ability to work in a group and confidence in the investigation of new research areas.

B. Educational Aims of the Programme
The programme has been devised in accordance with the University's graduate attributes of programmes of study as set out in UPR TL03.

Additionally this programme aims to:
- engender a continuing and independent approach to learning, encouraging initiative and self-discipline such that students will be able to comprehend, contribute to, and apply advances in biotechnology;
- build and improve on students' cognitive skills, including the ability to think logically and independently; to be reflective and critical of scientific hypotheses, to analyse, synthesise and be creative;
- enable students to develop a systematic understanding of knowledge and a critical awareness of associated issues, some of which are at the forefront of biotechnology;
• provide a framework for the acquisition of a comprehensive understanding of molecular biology and biotechnology techniques applicable to research, equivalent advanced scholarship and commercial situations;

• develop an ability to apply the techniques described above and an understanding of how the results may be used to inform judgements, and develop and advance ideas;

• provide opportunities for the continuing development of transferable skills including communication, mathematical analysis, use of information technology, problem solving both as part of a team and as an individual.

C. Intended Learning Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills and other attributes in the following areas. The programme outcomes are referenced the Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies (2014), and relate to the typical student. Additionally, the SEEC Credit Level Descriptors for Further and Higher Education (2016) have been used as a guiding framework for curriculum design.

Knowledge and Understanding:

A1 gene expression to the phenotype of an organism via an understanding of gene and protein structure and function, developmental biology and the influence of the environment on gene expression

A2 the methodologies of gene mapping, recombinant DNA technology and introductory bioinformatics and apply them to the investigation and deconstruction of biological systems.

A3 the nature and application of biopharmaceuticals and understand the molecular mechanisms underlying protein engineering, production and purification thus enabling the design of such processes.

A4 the unit operations constituting biotechnological processes thus enabling their optimization and development.

Teaching/learning methods & strategies:

Acquisition of A1 and A2 is through a combination of lectures, laboratory classes, tutorials and guided reading in Core Molecular Biology and Genes, Proteins and Development. These outcomes will also be reinforced and developed in the problem-based learning (PBL) exercises in semester B.

A3 is achieved through the lecture programme, and problem-based learning (PBL) exercises in Molecular Biotechnology.

A4 and A5 are achieved through the lecture programme, and problem-based learning (PBL) exercises in Industrial Biotechnology.

Assessment:

Knowledge and understanding are assessed through a combination of unseen tests (A1- A5), data interpretation exercises (A3, A4, A5), oral presentations (A1, A2), laboratory records (A1, A2), viva voce examinations (A3, A4, A5), PBL assignments (A3, A4, A5), bioinformatics exercise (A2).

Throughout, the learner is encouraged to undertake independent study both to supplement and consolidate what is being taught/learnt and to broaden their individual knowledge and understanding of the subject.
A5 the principles of molecular biology and microbial physiology and their application to the analysis and design of large-scale processes for the manufacture of microbial and cellular products.

<table>
<thead>
<tr>
<th>Intellectual skills:</th>
<th>Teaching/learning methods &amp; strategies</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful students will typically be able to:</td>
<td></td>
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<tr>
<td>B1 apply molecular and physiological methods in fundamental research and industry/agriculture.</td>
<td>Acquisition of B1 is through the laboratory classes, the project, Research Methods and in the PBL exercises.</td>
<td>Intellectual skills are assessed through laboratory reports, synoptic summary, viva voce examinations, the project and PBL assignments.</td>
</tr>
<tr>
<td>B2 demonstrate a critical approach in enquiry and hypothesis testing and critically evaluate scientific literature and experimental data.</td>
<td>Acquisition of B2 is through Research Methods, the Project, PBL exercises and in Genes, Proteins and Development.</td>
<td></td>
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<tr>
<td></td>
<td>Throughout, the learner is encouraged to develop intellectual skills further by independent study</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Practical skills:</th>
<th>Teaching/learning methods &amp; strategies</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 design, execute, analyse, interpret and report investigations (practical and theoretical) of molecular biology and industrial/agricultural biotechnology problems and critically evaluate the contribution made to current knowledge and propose avenues for future study.</td>
<td>Acquisition of C1 is through laboratory classes, PBL exercises, Research Methods and the Project.</td>
<td>Practical skills are assessed through laboratory reports, viva voce examinations, PBL assignments, the project proposal and project.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transferable skills:</th>
<th>Teaching/learning methods &amp; strategies</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1 effectively communicate analyses of case studies in both the written and spoken word and defend the findings of their work.</td>
<td>Transferable skills are developed throughout the programme: Acquisition of D1 is achieved in the PBL modules and the Project.</td>
<td>Transferable skills are assessed through laboratory reports (D1, D4, D5); viva voce examinations (D1 and D2); seminars (D1) PBL reports (D1, D3, D4, D5) and the project (D1, D2, D4, D5).</td>
</tr>
<tr>
<td>D2 demonstrate self-direction and originality in tackling and solving problems and act autonomously in planning and executing tasks.</td>
<td>Acquisition of D2 is through the Project, PBL and the supporting mentoring programme operated in Semester A.</td>
<td></td>
</tr>
<tr>
<td>D3 work effectively both as an individual and as part of a team and reflect on the learning experience.</td>
<td>Acquisition of D3 is achieved through the PBL modules</td>
<td></td>
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<tr>
<td></td>
<td>Acquisition of D4 and D5 is achieved in the PBL exercises, bioinformatics practicals in Core</td>
<td></td>
</tr>
</tbody>
</table>
D4 demonstrate numeracy and manipulate, analyse and present data.

D5 apply appropriate information technology to the recovery, analysis and reporting of data.

**Programme Structures, Features, Levels, Modules, and Credits**

The programme is offered in full-time mode (Semester A intake, 3 semesters (ABC)); and leads to the award of an MSc in Biotechnology. Entry is normally at level 7.

**Professional and Statutory Regulatory Bodies**
None

**Work-Based Learning, including Sandwich Programmes**
Not Applicable

**Programme Structure**
The programme structure and progression information below (Table 1a and 1b) is provided for the award. Any interim awards are identified in Table 1b. The Programme Learning Outcomes detailed above are developed and assessed through the constituent modules. Table 2 identifies where each learning outcome is assessed.

**Table 1a Outline Programme Structure**

*Mode of study* Full Time

*Entry point* Semester A

<table>
<thead>
<tr>
<th>Compulsory Modules</th>
<th>Module Title</th>
<th>Module Code</th>
<th>Credit Points</th>
<th>Language of Delivery</th>
<th>% Examination</th>
<th>% Coursework</th>
<th>% Practical</th>
<th>Semesters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cellular Molecular Biology</td>
<td>7LMS0089</td>
<td>30</td>
<td>English</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Core Genetics and Protein Biology</td>
<td>7LMS0093</td>
<td>30</td>
<td>English</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>A</td>
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<tr>
<td></td>
<td>Molecular Biotechnology</td>
<td>7LMS0091</td>
<td>30</td>
<td>English</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>Biosciences Research Methods for Masters</td>
<td>7LMS0095</td>
<td>15</td>
<td>English</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>ABC</td>
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<tr>
<td></td>
<td>Project – Mol Biology, Biotechnology, Pharmacology</td>
<td>7LMS0096</td>
<td>45</td>
<td>English</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>Industrial Biotechnology</td>
<td>7LMS0088</td>
<td>30</td>
<td>English</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>B</td>
</tr>
</tbody>
</table>

The award of an MSc requires 180 credit points passed at level 7. Although the modules are assessed by coursework, this will also include some in course tests.
Table 1b Final and interim awards available

The programme provides the following final and interim awards:

<table>
<thead>
<tr>
<th>Final Award</th>
<th>Award Title</th>
<th>Minimum requirements</th>
<th>Available at end of (normally):</th>
<th>Programme Learning Outcomes developed (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masters</td>
<td>Biotechnology</td>
<td>180 credit points including at least 150 at level 7</td>
<td>3 Semesters</td>
<td>All programme learning outcomes (see Table 2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interim Award</th>
<th>Award Title</th>
<th>Minimum requirements</th>
<th>Available at end of Level</th>
<th>Programme Learning Outcomes developed (see above)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postgraduate Diploma</td>
<td>Biotechnology</td>
<td>120 credit points, including at least 90 at level 7</td>
<td>2, 3 Semesters</td>
<td>A1, A2, A3, A4, B1, B2, C1, D1, D2, D3, D4, D5</td>
</tr>
<tr>
<td>Postgraduate Certificate</td>
<td></td>
<td>60 credit points, including at least 45 at level 7</td>
<td>1-2 Semesters</td>
<td>For untitled awards: See UPR AS11, section 13: <a href="http://sitem.herts.ac.uk/secreg/upr/AS11.htm">http://sitem.herts.ac.uk/secreg/upr/AS11.htm</a></td>
</tr>
</tbody>
</table>

Masters and Diploma awards can be made "with Distinction" or "with Commendation" where criteria as described in [UPR AS14](http://sitem.herts.ac.uk/secreg/upr/AS14.htm), Section D and the students' handbook are met.

Programme-specific assessment regulations

The programme is compliant with the University's academic regulations (in particular, [UPR AS11](http://sitem.herts.ac.uk/secreg/upr/AS11.htm), [UPR AS12](http://sitem.herts.ac.uk/secreg/upr/AS12.htm) / [UPR AS13](http://sitem.herts.ac.uk/secreg/upr/AS13.htm) (delete as applicable) and [UPR AS14](http://sitem.herts.ac.uk/secreg/upr/AS14.htm)) with the exception of those listed below, which have been specifically approved by the University:

- None

Further points of clarification and interpretation relevant to this specific programme are given below:

- In order to pass any constituent module of the programme, attendance of at least 85% of the classes specified in the module is normally required. Failure to attend the required proportion of classes will normally result in the award of grade of FREN.

E. Management of Programme & Support for student learning

Management

The programme is managed and administered through:

- Dean of School
- Associate Deans (Academic Quality Assurance and Education)
- A Programme Leader who is responsible for the day to day management of the programme and admissions
- A designated Programme Administrator to deal with day to day administration associated with the programme
• Module Co-ordinators who are responsible for individual modules
• A Programme Committee with the following membership: Programme Leader (chair), a Programme Administrator, Module Co-ordinators, School Learning Information Services Consultant, lecturing staff who have a substantial input into the programme, and student representatives.

Support
Students are supported by:
• An induction period at the beginning of the academic session
• An extensive Learning Resources Centre, incorporating a library and computer centre
• A Programme Leader to give academic advice
• Personal tutors to provide pastoral and academic support
• A mentor to support the acquisition of study skills and report writing
• Project tutors
• Module guides providing module information and study guidance
• On-line module information provided via the University’s managed learning environment “StudyNet”, a University-wide system for study support
• A student handbook
• Comprehensive feedback on assessed assignments
• Student representatives on the Programme Committee
• An English Language Teaching Centre
• A substantial Student Centre that provides advice on issues such as finance, University regulations, legal matters etc
• An Accommodation Office
• An Overseas Student Orientation course
• A Mathematics Drop-in Centre
• A Disabled Student Co-ordinator
• An Equal Opportunities Officer
• The Students’ Union
• Careers, Enterprise and Employment Service

F. Other sources of information

In addition to this Programme Specification, the University publishes guidance to registered students on the programme and its constituent modules:
• A Programme (or Student) Handbook;
• A Definitive Module Document (DMD) for each constituent module;
• A Module Guide for each constituent module.
• University of Hertfordshire Course website: http://www.herts.ac.uk/courses/
• Information on Programme and Module External Examiners http://www.studyset1.herts.ac.uk/ptl/common/studentcentre.nsf/Teaching+Documents/184A221E5EECA6B780257A5C00250BA9?OpenDocument

The Ask Herts website provides information on a wide range of resources and services available at the University of Hertfordshire including academic support, accommodation, fees, funding, visas, wellbeing services and student societies.

As a condition of registration, all students of the University of Hertfordshire are required to comply with the University’s rules, regulations and procedures. These are published in a series of documents called ‘University Policies and Regulations’ (UPRs). The University requires that all students consult these documents which are available on-line, on the UPR web site, at: http://www.herts.ac.uk/secreg/upr/. In particular, UPR SA07 ‘Regulations and Advice for Students’ Particular Attention - Index’ provides information on the UPRs that contain the academic regulations of particular relevance for undergraduate and taught postgraduate students.
In accordance with section 4(5) of the Higher Education and Research Act 2017 (HERA), the UK Office for Students (OfS) has registered the University of Hertfordshire in the register of English higher education providers. The Register can be viewed at: https://www.officeforstudents.org.uk/advice-and-guidance/the-register/the-ofs-register/. Furthermore, the OfS has judged that the University of Hertfordshire delivers consistently outstanding teaching, learning and outcomes for its students. It is of the highest quality found in the UK. Consequently, the University received a Gold award in the 2018 Teaching Excellence and Student Outcomes (TEF) exercise. This award was made in June 2018 and is valid for up to 3 years. The TEF panel’s report and conclusions can be accessed at: https://www.officeforstudents.org.uk/advice-and-guidance/teaching/tef-outcomes/#/provider/10007147

G. Entry requirements

The normal entry requirements for the programme are:

i. a first or second class Honours Degree in Biosciences or Biological Chemistry with a final classification grade of a minimum of 60%; or
ii. a professional qualification accepted as equivalent to the above; or
iii. a qualification in veterinary science, medicine or dentistry or
iv. a first or second class Honours Degree in disciplines other than those described above but where the applicant, in the opinion of the Programme Leader, would benefit from, and succeed on, the programme; or
v. successful completion of the International Pre-Masters (IPM) programme at the University or at Hertfordshire International College (HIC).

In addition, all international students are required to demonstrate an English Language capability of IELTS 6.5 (with no less than 6.0 in any band) or equivalent qualification.

Non-Standard Entry
Applicants not within the categories described above, but who can demonstrate by other means, as specified below, that they can succeed on the programme will be considered on an individual basis.

i. at least 5 years experience working full-time in the biotechnology industry

Applicants will be interviewed in order to establish their suitability based upon the criteria

The applicant will be rated on a 5 point scale for their ability to demonstrate:

1. an advanced knowledge in the field of Molecular Biology and Biotechnology and how this has been developed during employment.
2. critical awareness of current issues in Molecular Biology and Biotechnology, in particular the impact of these on recent developments in the discipline.
3. practical experience in a range of laboratory techniques relevant to the biosciences.

The programme is subject to the University's Principles, Policies and Regulations for the Admission of Students to Undergraduate and Taught Postgraduate Programmes (in UPR SA03), along with associated procedures. These will take account of University policy and guidelines for assessing accredited prior certificated learning (APCL) and accredited prior experiential learning (APEL).

If you would like this information in an alternative format please contact:
Amy Grogan, Student Administrator: a.grogan@herts.ac.uk

If you wish to receive a copy of the latest Programme Annual Monitoring and Evaluation Report (AMER) and/or the External Examiner’s Report for the programme, please email a request to aqo@herts.ac.uk
**MSc Biotechnology**

**Table 2: Development of Intended Programme Learning Outcomes in the Constituent Modules**

This map identifies where the programme learning outcomes are assessed in the constituent modules. It provides (i) an aid to academic staff in understanding how individual modules contribute to the programme aims (ii) a checklist for quality control purposes and (iii) a means to help students monitor their own learning, personal and professional development as the programme progresses.

<table>
<thead>
<tr>
<th>Module Title</th>
<th>Module Code</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>B1</th>
<th>B2</th>
<th>C1</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>D5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellular Molecular Biology</td>
<td>7LMS0089</td>
<td>x</td>
<td>x</td>
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<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
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<td>Core Genetics and Protein Biology</td>
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<td>x</td>
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<tr>
<td>Industrial Biotechnology</td>
<td>7LMS0088</td>
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</table>
KEY TO PROGRAMME LEARNING OUTCOMES

Knowledge and Understanding
A1. relate gene expression to the phenotype of an organism via an understanding of gene and protein structure and function, developmental biology and the influence of the environment on gene expression
A2. critically evaluate the methodologies of gene mapping, recombinant DNA technology and introductory bioinformatics and apply them to the investigation and deconstruction of biological systems.
A3. appreciate the nature and application of biopharmaceuticals and understand the molecular mechanisms underlying protein engineering, production and purification thus enabling the design of such processes.
A4. develop an in-depth quantitative understanding of the unit operations constituting biotechnological processes thus enabling their optimization and development.
A5. apply the principles of molecular biology and microbial physiology to the analysis and design of large-scale processes for the manufacture of microbial and cellular products.

Practical Skills
C1. design, execute, interpret and report investigations (practical and theoretical) of molecular biology problems and molecular genetics of disease, critically evaluate the contribution made to current knowledge and propose avenues for future study.

Intellectual Skills
B1. apply molecular and physiological methods in fundamental research and industry
B2. critically evaluate scientific literature and experimental data.

Transferable Skills
D1. effectively communicate analyses of case studies in both the written and spoken word and defend the findings of their work.
D2. demonstrate self-direction and originality in tackling and solving problems and act autonomously in planning and executing tasks.
D3. contribute effectively to the functioning of a group and reflect on the learning experience
D4. demonstrate numeracy and manipulate, analyse and present data.
D5. apply appropriate information technology to the recovery, analysis and reporting of data.
Section 2

Programme management

Relevant QAA subject benchmarking statements
None

Type of programme
Taught postgraduate

Date of validation/last periodic review
February 14

Date of production/last revision of PS
May 2018

Relevant to level/cohort
Level 7 entering September 2019

Administrative School
School of Life and Medical Sciences

Table 3 Course structure

<table>
<thead>
<tr>
<th>Course code</th>
<th>Course description</th>
<th>JACS / HECOS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHMBIOB</td>
<td>MSc Biotechnology</td>
<td>J700 / 100134</td>
</tr>
</tbody>
</table>