

**BSc Biotechnology (with Industrial Training) UCAS code: J700**

Awarding Institution:	University of Reading
Teaching Institution:	University of Reading
Relevant QAA subject benchmarking group(s):	Agriculture, Forestry, Agricultural Sciences, Food Sciences and Consumer Sciences, and Biosciences
Faculty of Life Sciences	Programme length: 4 years
For students entering Part 1 in Autumn 2006	Date of specification: April 2009
Programme Director: Dr D Charalampopoulos	
Programme Adviser: Dr D Charalampopoulos	
Board of Studies: Undergraduate Programmes in the Department of Food Biosciences	

**Summary of programme aims**

The programme aims to provide a degree-level education from which graduates can enter a career in the biotechnology-based industries (or other areas of applied biology or processing) as scientists or technologists in production, research and development and to develop their capacity to undertake research into problems relating to the biotechnological products. The testable learning outcomes will be the ability to:

- integrate the scientific disciplines relevant to biotechnology
- apply and communicate scientific knowledge to meet the needs of industry and the consumer for the production and marketing of safe and quality biotechnology products.

**Transferable skills**

The University's Strategy for Teaching and Learning has identified a number of generic transferable skills which all students are expected to have developed by the end of their degree programme. In following this programme, students will have had the opportunity to enhance their skills relating to career management, communication (both written and oral), information handling, numeracy, problem-solving, team working and use of information technology.

**Programme content**

The profile which follows states which modules must be taken (the core Biotechnology modules) and, for Part 2 and 3, lists of modules from which the student must make a selection (the optional modules). For the optional modules, students are free to select any module that is not a compulsory module so as to make 120 credits in each Part.

**Part 1 (2006-2007 three terms)**

*Compulsory modules (120 credits):*

<i>Mod Code</i>	<i>Module Title</i>	<i>Credits</i>	<i>Level</i>
AM1P11	Introductory Microbiology	10	C
BI1BA1	The Living Cell	10	C
BI1BB2	Biochemistry and Metabolism	10	C
BI1BC2	Genes and Chromosomes	10	C
FB1EPH	Physical Aspects of Biological Systems	20	C
FB1GFB	Topics in Food and Biotechnology	20	C
FB1EM1	Mathematics and Computing for Life Sciences	20	C
CH1FC1	Fundamental Concepts in Chemistry 1	10	C
10 credits from the following modules (depending on entry qualifications):			
CH1FC2	Fundamental Concepts in Chemistry 2	10	C
CH1O1	Introduction to Organic Chemistry	10	C

**Part 2 (2007-2008 three terms)**

*Compulsory modules (100 credits):*

<i>Mod Code</i>	<i>Module Title</i>	<i>Credits</i>	<i>Level</i>
AM2C31	Molecular Biology and Bioinformatics	10	I
AM2M32	Physiology and genetics of Bacteria	10	I
AM2C39	Regulation of Gene Expression	10	I
FB2BBE	Biochemistry and Enzymology	10	I
FB2BPP	Protein Purification and Proteomics	10	I
PM2MP2	Dosage form design	10	I
FB2UOP	Unit Operations	10	I
FB2BIP	Bioprocessing Practicals	10	I
FB2EPR	Process Engineering Principles	20	I

*Optional modules (20 credits):*

<i>Mod Code</i>	<i>Module Title</i>	<i>Credits</i>	<i>Level</i>
AP1EM1	Introduction to Marketing	10	C
AP1SB1	Introduction to Management	10	C
LA1XX1	Institution Wide Language Programme	20	C/I/H
<i>(Plus additional modules subject to timetabling)</i>			

**Industrial Training Placement Year (2008-2009)**

<i>Mod Code</i>	<i>Module Title</i>	<i>Credits</i>	<i>Level</i>
FB2PY	Placement Year	120	I

### Part 3 (2009-2010 three terms)

#### Compulsory modules (100 credits):

Mod Code	Module Title	Credits	Level
FB2BBE	Biochemistry and Enzymology	10	I
FB3BGE	Molecular Techniques in Microbiology & Biotechnology	10	H
FB3BPD	Bioprocess Design	20	H
FB3EB2	Bioprocess Systems (Economic Manufacturing)	10	H
FB3PFB	Individual Research Project	40	H
FB3PP2	Process Biotechnology	10	H

#### Optional modules (20 credits):

Mod Code	Module Title	Credits	Level
BI3EH8	Plant Biotechnology for Postharvest Quality	10	H
FB2OE	Oenology	10	I
LA1XX1	Language at a Higher Level than previously studied	20	I/H
MM270	Practice of Entrepreneurship	20	I

*(Plus additional modules subject to timetabling)*

### Industrial Training

Students are required to undertake a period of industrial training between Parts 2 and 3. The placement takes 44 weeks and may be split into two 22 week periods at two different establishments. Performance in the training will be assessed. In addition students are encouraged to seek relevant industrial training during the Summer vacation between Parts 1 and 2.

### Progression requirements

- To gain a threshold performance at Part 1 and qualify for the CertHE a student shall normally be required to achieve an overall average of 40% over 120 credits taken in Part 1, where all the credits are at C level or above, and a mark of at least 30% in individual modules amounting to not less than 100 credits. In order to progress from Part 1 to Part 2, a student shall normally be required to achieve a threshold performance at Part 1, and have no module mark below 30%.
- To gain a threshold performance at Part 2 and qualify for the DipHE a student shall normally be required to achieve an overall average of 40% over 120 credits taken in Part 2, and a mark of at least 30% in individual modules amounting to not less than 100 credits. In order to progress from Part 2 to Part 3, a student shall normally be required to achieve a threshold performance at Part 2.
- To pass the Industrial Training Year students must achieve a mark of 40%. Students who fail the Industrial Training Year will be required to transfer to the 3 year Programme.
- To obtain the degree at the end of Part 3, students must obtain an overall average of 40%. The final degree assessment is based on the following weightings:

*For students registered for a 4 year programme:*

Part 2 Modules	23 %
Industry Year	10%
Part 3 Modules	67 %

### **Summary of teaching and assessment**

As indicated above, teaching is organised into modules – each module will consist of lectures, practicals, or a combination of these. Students are assessed on each module, usually by a formal examination, although modules consisting only of practicals (or similar coursework) may not have a formal examination. All coursework is assessed and the assessment contributes towards the modular marks. The Part 3 project is an individual study requiring the submission of formal report for assessment. The industrial training is assessed by using formal reports from the employer and the student's tutor and the assessment of a report submitted by the student.

### **Admission requirements**

Entrants to this programme are normally required to have obtained:

GCSE: Grade C or better in Mathematics and English in GCSE; and achieved

Advanced Level (AS and A2):

- A core science at A2 level with either a core or related science subject at AS level (where 'Core Science' is defined as: mathematics, chemistry, physics and biology, and 'Related Science' is defined as: food technology, environmental science and human biology)
- A UCAS Tariff of 260 with 80 obtained in at least one core science

International Baccalaureate: 30 points

Irish Leaving Certificate: BBBBC

Admissions Tutor: **Dr R A Frazier**

### **Support for students and their learning**

University support for students and their learning falls into two categories. Learning support includes IT Services, which has several hundred computers and the University Library, which across its three sites holds over a million volumes, subscribes to around 4,000 current periodicals, has a range of electronic sources of information and houses the Student Access to Independent Learning (S@IL) computer-based teaching and learning facilities. There are language laboratory facilities both for those students studying on a language degree and for those taking modules offered by the Institution-wide Language Programme. Student guidance and welfare support is provided by Personal Tutors, the Careers Advisory Service, the University's Special Needs Advisor, Study Advisors, Hall Wardens and the Students' Union.

### **Career prospects**

In recent years, demand for biotechnologists has increased through the many developments in the industrial application and exploitation of biochemical processes, like the manufacture and use of enzymes, medical diagnostic reagents and therapeutic agents, and agricultural applications. Biological waste treatment is becoming increasingly important as legislative requirements become more stringent. Graduates are capable in assisting the industry in all of these issues and have a role in production, technical sales and research and development. In addition to the career opportunities in the biotechnological industries, the academic training our graduates receive equips them for positions in other industries, commerce and Government service.

### **Opportunities for study abroad or for placements**

There are no formal arrangements for study abroad. Industrial training attachments have sometimes been found in other countries including the United States of America and Australia.

## Educational aims of the programme

The Biotechnology programme aims to:

- Provide a programme of education which will enable its graduates to enter a career in the biotechnology-based industries as scientists or technologists in production and research and development.
- Provide a broadly based scientific and technological education whose graduates can also enter a career in other areas of applied biology or processing.
- Provide a course containing integrated periods of industrial training allowing students to experience and apply the skills developed during the course.
- Provide undergraduates with opportunities to develop their inter-personal and communication skills.

## Programme Outcomes

### *Knowledge and Understanding*

<p><b>A. Knowledge and understanding of:</b></p> <ol style="list-style-type: none"> <li>1. the fundamental concepts and techniques used in the production of bioproducts from living organisms,</li> <li>2. bioprocessing and bioengineering,</li> <li>3. the criteria used to select, specify and establish an overall process design and operating schedule for bioprocesses,</li> <li>4. the technical and economic criteria used to choose the necessary equipment for bioprocessing.</li> </ol>	→	<p><b>Teaching/learning methods and strategies</b> Lectures and practical classes provide the basic knowledge. A variety of coursework gives opportunities for extending knowledge and techniques. Individual and group projects reinforce techniques and give experience of practical applications. The industrial training year provides a major opportunity for most students to enhance their knowledge of some or all of topics 1 - 4.</p> <p><i>Assessment</i> Most knowledge is tested through a combination of coursework and unseen formal examinations. Project work, reports, oral presentations and computer-based exercises also contribute to the final assessment. Where appropriate, the industrial training assessment is also used.</p>
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### *Skills and other attributes*

<p><b>B. Intellectual skills – able to:</b></p> <ol style="list-style-type: none"> <li>1. analyse and solve problems,</li> <li>2. critically evaluate scientific literature,</li> <li>3. assess problems and design experiments to test hypotheses,</li> <li>4. apply knowledge to new problems,</li> <li>5. plan, conduct and report on an individual research project.</li> </ol>	→	<p><b>Teaching/learning methods and strategies</b> Topics 1 and 2 are essential components of the programme and are embedded in many parts of the programme. Topics 3 and 4 are introduced in Part 2 course-work. Topics 3, 4 and 5 are fully developed during the individual research project in Part 3 of the programme. The industrial training year provides a major opportunity for most students to enhance their skills relating to some or all of topics 1 - 5.</p> <p><i>Assessment</i> Coursework is structured to assess topics 1, 2, 3 and 4. Topics 3, 4 and 5 are assessed as components of the individual research project. Where appropriate, the industrial training assessment is also used.</p>
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**C. Practical skills – able to:**

1. quantitatively evaluate the performance of bioprocessing equipment,
2. perform chemical, physical and microbiological laboratory tests to assess the quality bioproducts,
3. establish, screen and sub-clone from, a gene library,
4. produce and isolate an enzyme,
5. participate in, and help develop, research and product development programmes relating to bioproducts,
6. monitor and evaluate process operation,
7. establish, evaluate and operate control procedures for safe process operation.

**Teaching/learning methods and strategies**

All topics are introduced by lectures but are developed fully by appropriate laboratory exercises during all Parts of the programme. The industrial training year provides a major opportunity for most students to enhance their skills relating to some or all of topics 1 - 7.

*Assessment*

All topics will be assessed by coursework. Where appropriate, the industrial training assessment is also used.

**D. Transferable skills – able to:**

1. work as an individual, in a small group or as part of a larger team,
2. prepare reports and make presentations that effectively present the results of investigations carried out,
3. critically assess and present data using appropriate statistical techniques,
4. make effective use of information technology,
5. consider and manage career choice.

**Teaching/learning methods and strategies**

The development of transferable skills is integrated into many parts of the programme. Students are required to work both as individuals and as part of groups. Career skills (topic 5) are introduced in a Part 1 module and reinforced by the industrial training year. The industrial training year provides a major opportunity for most students to enhance their skills relating to some or all of topics 1 - 5.

*Assessment*

All topics are assessed both by coursework within the modules and in formal examinations. Where appropriate, the industrial training assessment is also used.

*Please note:*

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably expect to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in module and programme handbooks.