BSc Biotechnology (with Industrial Training) UCAS code: J700

Awarding Institution: The University of Reading
Teaching Institution: The University of Reading
Relevant QAA subject benchmarking group(s): Agriculture, Forestry, Agricultural Sciences, Food Sciences and Consumer Sciences, **and** Biological Sciences
Faculty of Life Sciences
Programme length: 4 years
For students entering Part 1 in Autumn 2002
Date of specification: May 2004
Programme Director: Dr R A Rastall
Programme Adviser: Dr R A Rastall
Board of Studies: Undergraduate Programmes in the School 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 (three terms)
Compulsory modules

Mod Code	*Module Title*	*Credits*	*Level*
AM1M11	Microbiology 1	10	C
AM1M12	Microbiology 2	10	C
BI1C10	Cell Biology and Biochemistry	10	C
BI1C11	Genetics and Molecular Biology	10	C
CH1C	Foundation Chemistry	20	C
FB1EPH	Physical Aspects of Biological Systems	20	C
FB1GSB	Science in Biotechnology	20	C
FM1EM1	Mathematics and Computing for Life Sciences	20	C

Part 2 (three terms)

Compulsory modules

Mod Code	*Module Title*	*Credits*	*Level*
FB2BBE	Biochemistry and Enzymology	10	I
FB2EM2	Mathematical Tools	20	I
FB2EBP	Bioprocess Engineering	20	I
AM2C31	Molecular Biology	10	I
FB2EDP	Down Stream Processing	10	I
FB2MP1	Microbial Physiology 1	10	I
FB2BFP	Fermentation Processes	10	I
FB2BAE	Applied Enzymology and Food Biotechnology	10	I

Optional modules (20 credits):

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

Industrial Training Placement Year

Mod Code	*Module Title*		
FB2PY	Placement Year	120	I

Part 3 (three terms)

Compulsory modules

Mod Code	*Module Title*	*Credits*	*Level*
FB3BGE	Practical Introduction to Genetic Engineering	10	H
FB3BPD	Bioprocess Design	10	H
FB3BR	Bioreactors	10	H
FB3EBC	Biochemical Engineering	10	H
FB3EBS	Bioprocess Systems	10	H
FB3MP2	Microbial Physiology 2	10	H
FB3PBT	Individual Research Project	40	H

Optional modules (20 credits):

Mod Code	*Module Title*	*Credits*	*Level*
	Institution Wide Language Programme	20	C/I/H
AP1EM1	Introduction to Marketing	10	C
AP1SB1	Introduction to Management	10	C
	(Plus additional modules to be notified later)		

Industrial Training

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

Progression requirements

- To proceed from **Part 1 to Part 2**, students must obtain an overall average of 40% plus a minimum of 30% in each module.
- To proceed from **Part 2 to Part 3**, students must achieve an overall average of 40% over 120 credits taken in Part 2 and achieve a mark of at least 30% in individual modules amounting to not less than 100 credits taken in Part 2.
- 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:

Part 2 Modules	23 %
Part 3 Modules	67 %
Industrial Training	10 %

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. For the 4-year programmes, 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 240 with 80 obtained in at least one core science

International Baccalaureat:
Irish Leaving Certificate:

Admissions Tutor: Dr M Gordon

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

The School participates in a number of exchange programmes under the EU Socrates scheme which includes the opportunity to take industrial training in another European country. Students have, as a result, been to a number of countries including Germany, France, Spain and Italy. Although not common, industrial training attachments have also been arranged 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

A. Knowledge and understanding of:	**Teaching/learning methods and strategies**
1. the fundamental concepts and techniques used in the production of bioproducts from living organisms, 2. bioprocessing and bioengineering, 3. the criteria used to select, specify and establish an overall process design and operating schedule for bioprocesses, 4. the technical and economic criteria used to choose the necessary equipment for bioprocessing.	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. *Assessment* 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.

Skills and other attributes

B. Intellectual skills – able to:
1. analyse and solve problems,
2. critically evaluate scientific literature,
3. assess problems and design experiments to test hypotheses,
4. apply knowledge to new problems,
5. plan, conduct and report on an individual research project.

Teaching/learning methods and strategies
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.

Assessment
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.

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.