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**	Biochemical Engineering with Industrial Management
2	**Programme Code**	CPET37
3	**JACS Code**	H831 (2/3), N200 (1/3)
4	**Level of Study**	Postgraduate
5a	**Final Qualification**	Master of Science in Engineering (MSc(Eng))
5b	**QAA FHEQ Level**	Masters - 7
6a	**Intermediate Qualification(s)**	Postgraduate Certificate (PGCert), Postgraduate Diploma (PGDip)
6b	**QAA FHEQ Level**	Masters - 7
7	**Teaching Institution** (if not Sheffield)	Not Applicable
8	**Faculty**	Engineering
9	**Department**	Chemical and Biological Engineering
10	**Other Departments involved in teaching the programme**	Mechanical Engineering
11	**Mode(s) of Attendance**	Full-time
12	**Duration of the Programme**	1 year
13	**Accrediting Professional or Statutory Body**	Not applicable
14	**Date of production/revision**	March 2019

15. Background to the programme and subject area

The Department of Chemical and Biological Engineering at Sheffield houses a unique bio-engineering centre with world-class capabilities. We have a core team of inherently multidisciplinary academic staff with primary research interests and expertise in biochemical engineering. This Master's programme harnesses this combined knowledge to provide a uniquely multidisciplinary learning experience relevant to the emerging discipline of biological engineering and careers in industrial biotechnology, biosimilars and biopharmaceutical manufacturing.

The emerging industrial biotechnology, established biopharmaceutical industry and internationally expanding biosimilars industries provides the opportunity to educate postgraduates with the skills in biochemical engineering and industrial management skills to advance these markets. This course is forward thinking with respect to the emerging industrial biotechnology where the impact maybe in the decade timescale, through to the expanding biosimilars industries (prevalent in India, China and Brazil) through to the established biopharmaceutical industry of the UK, Europe and USA.

16. Programme aims

The University's Mission is to provide students from a wide variety of educational and social backgrounds with high-quality education in a research-led environment using staff working at the frontiers of academic enquiry. The Department of Chemical and Biological Engineering implements this through its strong commitment to both teaching and research. It also aims to engender in its students a commitment to future self-learning and social responsibility.

The specific aims of the MSc in Biochemical Engineering with Industrial Management programme are to:

1. Provide access to an engineering degree to students from a range of academic and social backgrounds;
2. Provide an appreciation of industrial management and its application in the commercial setting;
3. Prepare students for a professional career in industry, education, public and commercial sectors;

4. Develop interpersonal skills appropriate to a professional person;
5. Encourage students to think for themselves, work effectively on their own initiative, and develop a social awareness;
6. Provide experience in conducting extended individual projects;
7. Develop the students' ability to make technical decisions;
8. Provide students with an education through a firm understanding and practical knowledge in biochemical engineering.

17. Programme learning outcomes

Knowledge and understanding:	
K1	Knowledge of the principles and practice of biochemical engineering in the industrial biotechnology and biopharmaceutical industries.
K2	Understanding of core aspects of industrial management in business.
K3	Understand strategy design and development, techniques and frameworks for crafting strategic options, competitive challenges of a global market environment, implementation of strategy and change.
K4	Professional and ethical responsibilities including the regulatory framework and the global and social context of biochemical engineering.
K5	Introduction to entrepreneurship and its application to in the industrial biotechnology and biopharmaceutical industries.
K6	Understand the operational practice of bio-processing and integrated unit operations.

Skills and other attributes:	
S1	Hands-on experience of facility and process design for either the industrial biotechnology and biopharmaceutical industries.
S2	Hands-on experience of the creation of a process design and business plan.
S3	Assimilate data from a wide range of sources, extract that which is pertinent to an unfamiliar problem, and apply this to a particular problem.
S4	Produce solutions to problems through the application of biological and engineering knowledge and understanding.

Practical Skills – students will be able to:	
P1	make use of relevant test and measurement equipment in experimental laboratory based research work.
P2	undertake practical testing of scientific hypotheses in the laboratory or through simulation, with technical analysis and critical evaluation of results.
P3	apply bioprocess design techniques taking account of industrial and commercial constraints.
P4	effectively manage their time in the context of research project.

18. Teaching, learning and assessment

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

Lecturing – formal teaching to larger audiences for dissemination of broader concepts and outcomes.

Group learning – smaller groups where group participation and question and answer sessions are preferred.

Practical classes – students undertake laboratory experiments and computing to gain practical skills.

Individual tuition – one on one learning especially required for personal tuition and for the dissertation.

Site visits – experience actual biopharmaceutical manufacturing facilities and talk to staff involved in this industry sector.

Independent learning – learn how to complement formal teaching using finding, assessing and using data and knowledge to build skills that will assist the student long after the completion of this course.

Opportunities to demonstrate achievement of the learning outcomes are provided through the following assessment methods:

Written examinations – unseen examinations.

Coursework submission – designed to test knowledge and communication skills; these include technical design studies, critical reviews and extended analytical essays.

Oral presentations – The research projects and some taught modules include an oral presentation.

Individual project reports – these include intermediate and final individual enquiry dissertations and the research project, in addition to design project reports.

19. Reference points

The learning outcomes have been developed to reflect the following points of reference:

Subject Benchmark Statements
http://www.qaa.ac.uk/assuring-standards-and-quality/the-quality-code/subject-benchmark-statements

Framework for Higher Education Qualifications
http://www.qaa.ac.uk/publications

University Strategic Plan
https://www.sheffield.ac.uk/ourplan/

Learning and Teaching Strategy (2016-2021)
https://www.sheffield.ac.uk/staff/learning-teaching/our-approach/strategy2016-21

'Academic Standards – Engineering', Subject Benchmark Statement, Quality Assurance Agency for Higher Education, 2015 (as far as this pertains to postgraduate masters' programmes).

Informed feedback from external industrial referees on research project design and assessment.

In assessing students' achievement of the learning outcomes, the level of performance, e.g. the extent of knowledge and depth of understanding, will be compliant with guidance given in the above references.

20. Programme structure and regulations

Students studying for the award of Masters are required to take modules to the value of 180 credits, comprising, four core biochemical engineering 15-credit modules, totalling 60 credits, three management modules to the value of 45 credits, a choice of one optional module worth 15 credits in biochemical engineering, and a 60-credit supervised dissertation. The credits will be divided evenly between both semesters. Postgraduate taught modules offered are usually 15 credits, which is nominally equivalent to 150 hours of work by a student. Of this between 30 and 40 hours are usually contact time and the remainder directed/private study. Credits are accumulated by obtaining a mark of at least 50 in the assessment for the module.

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.sheffield.ac.uk/calendar.

21. Student development over the course of study

The student will gain a practical understanding of biochemical engineering and its application to industrial biotechnology and biopharmaceutical industries.

The student will also gain an understanding of elements of business management including marketing management, strategic management, business management and innovation management.

They will display levels of creativity, originality and judgement expected of Masters degree graduates and, upon successful completion of the programme, will have developed and demonstrated achievement of the overall programme outcomes outlined in Section 17 and met the aims given in section 16.

22. Criteria for admission to the programme

Detailed information regarding admission to programmes is available from the University's On-Line Prospectus at http://www.sheffield.ac.uk/study/.

Students will need an upper second class honours degree (2:1) in a relevant discipline, or equivalent qualifications and experience. Applicants with a 2:2 (or equivalent) can apply and will be considered on merit.

Relevant qualifications include a BEng in chemical engineering, biological engineering, biomedical engineering, or bioengineering or a BSc in chemistry, biochemistry, biotechnology, cell biology or biomaterial science. We do welcome applicants from other bioscience and engineering backgrounds.

International student must also have a suitable language qualification, such as IELTS.

23. Additional information

Please see programme regulations for breakdown of modules.

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.