PROGRAMME SPECIFICATION

Programme Code: S110100AX

Programme Title:
Chemical Engineering

Awarding Institution:
Queen's University Belfast

Teaching Institution:
School of Chemical Engineering

Programme Accredited By:
Institution of Chemical Engineers

Final Award:
BEng

UCAS Code:
H800

QAA Benchmarking Group:
Engineering (Hons)

Educational Aims of Programme
Main Educational Outcomes
Engineering is a profession directed towards the skilled application of a distinctive body of knowledge and understanding based on mathematics, science and technology, integrated with business and management, which is acquired through education and professional formation in a particular engineering discipline. The engineer should be able to exercise original thought, have good professional judgement and be able to take responsibility for the direction of important tasks. This undergraduate programme for chemical engineering students fosters and inculcates the following knowledge and understanding, abilities and qualities of mind.

Knowledge and Understanding
Graduating chemical engineering students should demonstrate knowledge and understanding of essential facts, concepts, principles and theories within chemical engineering and knowledge and understanding of the constraints within which their engineering judgement will have to be exercised. Chemical engineering graduates should have a sound grasp of chemistry, physics and mathematics and of the technological base of chemical engineering. It is desirable that chemical engineering students have some knowledge and understanding of business and management techniques integrated into their engineering studies.

Because of the professional context of engineering, graduating chemical engineering students should also have an understanding of their professional and ethical responsibilities, the broad education necessary to understand the impact of engineering solutions in a global societal context, and a knowledge of contemporary issues.

Intellectual Abilities
Chemical engineers need to be creative and innovative in solving problems, and in designing systems and processes. To do this they need to apply the appropriate mathematical tools. Graduating chemical engineers need to have the necessary intellectual abilities, and be able to apply these abilities in a professional context. They should be able to:

- solve engineering problems, often on the basis of limited and possibly contradictory information;
- analyse and interpret data and, when necessary, design experiments to gain new data;
- design a system or process to meet a need;
- evaluate designs, processes and products, and make improvements;
- maintain a sound theoretical approach in enabling the introduction of new and advancing technology to enhance current practice.

Practical Skills
Graduates will have demonstrated practical chemical engineering skills, particularly concerning laboratory work and the use of chemical engineering software. They should be able to:
- use a wide variety of tools, techniques and equipment, including chemical engineering software;
- use laboratory and workshop equipment to generate valuable data;
- develop, promote and apply safe systems of work.

Key/Transferable Skills
Graduating engineers should have transferable skills that would be of value in other occupations and will be life enriching. These skills include the ability to:
- communicate effectively with colleagues and others using both written and oral methods;
- use IT effectively;
- manage resources and time;
- work in a multi-disciplinary team;
- undertake lifelong learning, particularly for continuing personal development.

Criteria for Admission (Subject Specific Requirements) to Programme

The minimum entry requirement is normally **BBC** at A-Level or equivalent if entry is from UCAS into level 1, to include Maths and one other physical science/

Equivalent offers made for appropriate AS Levels or other relevant qualifications.

Note: - Relevant Science: A/S-Level in a relevant science subject Grade B (Chemistry, Physics, Computer Science, Biology, Technology, Geography) acceptable for Stage 1 if offered with A-Level Mathematics.

International candidates require, at least a British Council IELTS qualification scored at a standard of 6.5. TOEFL scores are accepted with thresholds of: 577 (paper); 233 (computer).

NB For current general University requirements go to http//www.qub.ac.uk/ado

Additional Relevant Information

A parallel sandwich course is available leading to the additional qualification of a City & Guilds Senior Award at Licentiateship level.

The degree has been accredited by the Institution of Chemical Engineers and endorsed by the Engineering Council (UK). Graduates from the course will need a period of Further Learning (Matching Section) after graduation, in order to meet the academic requirements for Chartered Engineer status. This further learning can be achieved in a combination of ways - full or part-time in HE, distance learning or work-based learning.

The programme is subject to the University General Regulations, which can be found at:

http://www.qub.ac.uk/directorates/AcademicStudentAffairs/AcademicAffairs/

For Further Information refer to
The School website: http://www.ch.qub.ac.uk/education.html
Director of Education: Dr Nick Fletcher
School of Chemistry and Chemical Engineering
Queen's University, Belfast BT7 1NN
N Ireland
Tel: +44 28 9097 5418
Email: candce@qub.ac.uk

Programme Structure, Levels, Modules and Credits
Module assessments have the following characteristics:

- Assessment criteria are linked to learning outcomes for each module.
- A wide range of assessment methods is used.

Stage 1

Students must take 120 CATS points. All modules are compulsory.

	Status	Code	Title	Pre-Requisites	CATS	STATUS
	Compulsory	CHM1011	Basic Chemistry 1		20	LIVE
	Compulsory	CHE1001	Chemical Engioneering1(i)		20	LIVE
	Compulsory	CHE1010	Physical Theory		10	LIVE
	Compulsory	CHE1006	Chemical Engineering1(ii)	A-level Maths	10	LIVE
	Compulsory	CHE1002	Chemical Process Principles 1 (i)		20	LIVE
	Compulsory	CHE1003	Chemical Process Principles 1 (ii)		20	LIVE
	Compulsory	FOE1006	Electrical Engineering 1		10	LIVE
	Compulsory	FOE1002	Further Mathematics 1		10	LIVE

Stage 2

Students must take 120 CATS points. All modules are compulsory.

	Status	Code	Title	Pre-Requisites	CATS	STATUS
	Compulsory	CHE2002	Introduction to reaction engineering	None	10	LIVE
	Compulsory	CHE2003	Process Heat Transfer 2	None	10	LIVE
	Compulsory	CHE2009	Thermodynamics 2	None	10	LIVE
	Compulsory	CHE2014	Fluid and Particle Mechanics 2	None	10	LIVE
	Compulsory	CHE2018	Computer Aided Design & Simulation 2	None	10	LIVE
	Compulsory	CHE2007	Safety and Design Codes 2	None	10	LIVE
	Compulsory	CHE2012	Design 2	None	10	LIVE
	Compulsory	CHE2013	Mass Transfer (1) 2	None	10	LIVE
	Compulsory	MEE2005	Professional Studies 2	None	10	LIVE
	Compulsory	CHE2011	Process Control 2	None	20	LIVE
	Compulsory	CHE2021	Oil and Energy	None	10	LIVE

Stage 3

Students must take 120 CATS points. All modules are compulsory.

Students must pass CHE3013

	Status	Code	Title	Pre-Requisites	CATS	STATUS
	Compulsory	CHE3001	Reaction Engineering 3	None	10	LIVE
	Compulsory	CHE3004	Transport Phenomena 3	None	10	LIVE
	Compulsory	CHE3013	Design Project 3(i)	CHE2012	30	LIVE
	Compulsory	CHE3002	Management and Administration 3	None	10	LIVE
	Compulsory	CHE3008	Biochemical Engineering 3	None	10	LIVE
	Compulsory	CHE3010	Loss Prevention 3	None	10	LIVE
	Compulsory	CHE3020	Heat and Mass Transfer 3	None	20	LIVE
	Optional	CHE3012	Research Project	None	20	LIVE
	Optional	CHE3014	Design Project 3(ii)	CHE3013	20	LIVE

Students taking a sandwich placement should be enrolled on CHE3021.

Awards, Credits and Progression of Learning Outcomes

Examinations / Assessment

The program is governed by general university regulations. All students are required to undertake 120 CATS points of modules per year. The overall pass mark for all modules is 40 % but students will be allowed to pass on a 35% theory mark so long as their overall mark is greater than 40%. Coursework and project work will be assessed according to defined conceptual equivalents in line with those stated within QUB assessment policies.

Module assessments have the following characteristics:

- Assessment criteria linked to learning outcomes for each module.
- Overall ratio of coursework: unseen examinations 40 : 60.
- Assessment is carried out at the end of each semester.
- Supplementary examination held in August/September for Level 1.

Assessment methods include:

i. unseen written examinations
ii. laboratory/workshops
iii. coursework - designs, reports
iv. engineering designs
v. independent project and dissertation
vi. team-working
vii. oral presentations by individuals and project teams

A student may normally enrol not more than twice for any module assessment. Students who fail a module twice of any value will be reported to the School Student Progress committee. Any module passed by resit will normally contribute at 40% to the degree classification.

Awards and progression
Students will be allowed to proceed from Stage 1 to Stage 2 when they have passed the equivalent of five Stage 1 modules taking into account any prerequisites.

Students who have not passed a Stage 1 module examination at the first sitting must attempt the examination again in August of that year, or the next available opportunity. Students with failed laboratory based coursework will be required to repeat the coursework the following year. All repeated coursework and examinations will be awarded a maximum mark of 40%. Students are only permitted four attempts at Stage 1 and Stage 2 examinations.

Students will normally be allowed to proceed from Stage 2 to Stage 3 when they have passed six Stage 2 modules and have six Stage 1 modules. Failed Stage 2 modules are likely to result in a student repeating a year subject to conditions set by the School Progress Committee.

Stage 2 students who must normally have passed, at the first attempt, a minimum of 6 level 2 modules and have achieved an average mark of not less than 60% may be considered, with the approval of the Adviser of Studies, for transfer to a MEng pathway.

Students are encouraged to participate with ERASMUS or other international Schemes, options are available for students to complete part of their degree at a recognised partner institution.

There are no opportunities to repeat Stage 3 assessment procedures.

The weighting between years follows the standard University regulations for a 3 year degree at:
Entry 2008 or before: Stage 2 – 25%, Stage 3 – 75%.
Entry 2009 or after: Stage 1 – 10%, Stage 2 – 30%, Stage 3 – 60%.
The predominance rule will be used to decide classifications at borderlines.

The degree will be classified in accordance with the University General Regulations, Study Regulations and Mark Scales.

Learning Outcomes: Knowledge and Understanding
Students graduating from the BEng programme will have achieved the following, knowledge and understanding, intellectual, practical and key transferable skills. The learning outcomes have references to the QAA Subject Benchmark Statement and are compatible with requirements for a degree accredited by the Institution of Chemical Engineers. These learning outcomes will be further developed by industrial placement during the Year of Professional Experience for students on the sandwich course.

Students should develop a knowledge and understanding of:
(1) mathematical methods used in chemical engineering;

(2) chemistry and physics appropriate to chemical engineering;
(3) principles of IT and communications ITC relevant to chemical engineering;
(4) general principles of design; and design techniques particular to chemical engineering; characteristics of engineering materials and components;
(5) management and business practices, professional and ethical responsibilities;
(6) manufacturing and operational practice, codes of practice and the regulatory framework and requirements for safe operation.

Teaching and Assessment Methods: Knowledge and Understanding
The following teaching/learning and assessment methods are used to enable these students to achieve and demonstrate these outcomes.

Learning and teaching:

- Acquisition of (1) and (2) is by means of a combination of lectures, tutorials and laboratory workshops;
- Acquisition of (3) is through a combination of IT laboratory workshops and some lectures;
- Acquisition of (4) is through group design projects, laboratory workshops and special projects with tutor face-to-face tutorials;
- Acquisition of (5) and (6) is through a combination of lectures, tutorials, group projects, case-studies, problem solving industrial visits and guided independent study.
- Much of the knowledge and understanding is developed across different courses and is not necessarily assessed explicitly.
- Feedback is given to students on laboratory reports and on formative work produced. Throughout the learner is encouraged to undertake independent reading both to supplement and consolidate what is being learned and to broaden their individual knowledge and understanding of the subject.

Assessment methods: Testing of the knowledge base is through a combination of unseen written examinations, assessed practical work, laboratory reports, assignments, class tests and presentations.

Learning Outcomes: Subject-specific Skills
Students should develop the intellectual skills that will enable them to:
(1) select and apply appropriate mathematical methods for modelling and analysing chemical engineering problems;
(2) use scientific principles in the development of chemical engineering solutions to: practical problems; modelling and analysis of chemical engineering systems, processes and products;
(3) select and apply appropriate computer based methods for modelling and analysing chemical engineering problems;
(4) analyse systems, processes and components requiring chemical engineering solutions, create processes or products through synthesis of ideas from a wide variety of sources;
(5) evaluate commercial risk;
(6) produce solutions to problems through the application of chemical engineering knowledge and understanding, undertake technical risk evaluation.

Teaching and Assessment Methods: Subject-specific Skills
The following teaching/learning and assessment methods are used to enable these students to achieve and demonstrate these outcomes.

Learning and teaching:
Acquisition of these skills (1-6) is through a variety of teaching methods: lectures; small group tutorials; group projects; IT and engineering laboratory workshops; independent laboratory projects; research/industrial projects, design projects and extended essays.

Many of these intellectual skills are developed across different courses and are not necessarily assessed explicitly. Problem solving and engineering design are core aspects of the pathway, with each individual module emphasising some aspect of problem solving and/or good design practice. Feedback is given to students on laboratory reports, project work and on formative work produced.

Assessment methods: Analysis and problem solving skills are assessed through a combination of unseen written examinations, extended essays and assignments. Design skills are assessed through design project reports, industrial reports, presentations, peer reviews and tutor interviews.

Learning Outcomes: Cognitive Skills
Students should develop the practical skills that will enable them to:
(1) use appropriate mathematical methods for modelling and analysing chemical engineering problems;
(2) use chemical engineering test and measurement equipment, in experimental laboratory work;
(3) use chemical engineering IT tools;
(4) practically test design ideas in laboratory and through simulation; with technical analysis and critical evaluation of results; research for information to develop ideas further;
(5) undertake economic feasibility studies;
(6) apply engineering techniques taking into account industrial and commercial restraints; manage projects.

Teaching and Assessment Methods: Cognitive Skills
The following teaching/learning and assessment methods are used to enable these students to achieve and demonstrate these outcomes.

Learning and teaching:

- Acquisition of these practical skills (1-6) is through a variety of teaching methods: IT and engineering laboratory workshops; independent laboratory projects; research/industrial projects.
- Many of these practical skills are developed across different courses and are not necessarily assessed explicitly. Practical skills are core aspects of the pathway. Feedback is given to students on laboratory reports and project work.

Assessment methods: Practical skills are assessed through chemistry, chemical engineering and IT laboratory reports, industrial reports and presentations.

Learning Outcomes: Transferable Skills
Students should develop the key/transferable skills that will enable them to:
(1) manipulate and sort data; present data in a variety of ways;
(2) use scientific evidence based methods in the solution of problems;
(3) use general IT tools;
(4) use creativity and innovation in problem solving; work with limited or contradictory information;
(5) effectively communicate and become life long learners;
(6) adapt an engineering approach to the solution of problems; mange time and resources; participate constructively as part of a team.

Teaching and Assessment Methods: Transferable Skills
The following teaching/learning and assessment methods are used to enable these students to achieve and demonstrate these outcomes.

Learning and teaching:

- Acquisition of these skills (1-6) is through a variety of teaching methods: group projects; IT and engineering laboratory workshops; independent laboratory projects; guided independent study, research/industrial projects and design projects. The project work involves using library resources (catalogues), web based resources (browsers) and personal contacts.

- Many of these key/transferable skills are developed across different courses and are not necessarily assessed explicitly. Key/transferable skills are core aspects of the pathway, with most individual modules incorporating them in some aspect. Feedback is given to students on presentations, project work and on formative work produced. Students apply the skill in meeting deadlines throughout the programme.

Assessment methods: Key/transferable skills are assessed through design project reports, industrial reports, presentations (group and individual), poster presentations, peer reviews and tutor interviews.

Quality Arrangements

The programme will be subject to the normal quality assurance procedures:

- Annual Programme Review.
- Review of individual units will be done following completion of each module.
- Students will form part of the review teams.
- Student views also will be sought through ‘Student Evaluation of Units’ forms and Student Evaluation of Teachers’ forms.
- Students on the programme will be represented on the Chemistry School Staff Consultative Committee.
- Students on the Programme will be provided with a Personal Tutor from the Chemistry Academic staff.