

## PROGRAMME SPECIFICATION



1	<b>Awarding Institution</b>	Newcastle University
2	<b>Teaching Institution</b>	Newcastle University
3	<b>Final Award</b>	BEng Hons
4	<b>Programme Title</b>	Chemical Engineering
5	<b>UCAS/Programme Code</b>	H810, H814 BEng Foundation
6	<b>Programme Accreditation</b>	IChemE, InstMC
7	<b>QAA Subject Benchmark(s)</b>	Engineering
8	<b>FHEQ Level</b>	6
9	<b>Date written/revised</b>	May 2013

### 10 Programme Aims

The aim of the Degree programme is to produce graduates who have a coherent understanding of Chemical Engineering, combining a sound theoretical grasp of the subject with practical experience and an awareness of their responsibilities to society and the environment. Graduates should be capable of becoming professional Chemical and Process engineers in industry or of following a postgraduate route into a research, industrial or academic career. In order to meet this aim, the Degree programme has the following objectives:-

- 1) To recruit good students from a range of geographical, social and academic backgrounds. To produce graduates who have vision and the ability to address the challenges posed by society through the deployment of the skills and knowledge gained during their Degree course.
- 2) To equip students with a knowledge and understanding of the subject, including the core material specified by the accrediting professional institutions (The Institution of Chemical Engineers and the Institute of Measurement and Control).
- 3) To provide opportunities for students to acquire further knowledge, both in breadth and depth, and to specialise according to their own interests as they develop over the duration of the programme.
- 4) To enable students to eventually meet the requirements of the accrediting Institutions for Chartered Membership
- 5) To equip students with appropriate practical skills in information processing, data analysis, problem solving, teamwork, and communication skills.
- 6) To encourage students to develop responsible attitudes towards the needs of society and the environment in the application of their engineering and economic knowledge and to ensure that they have particular regard for the importance of safety in their industrial life.
- 7) To encourage students to develop appropriate attitudes towards their own future professional development.
- 8) To provide an environment within the School such that students enjoy the University learning experience sufficiently to want to maintain contact with the School in its future recruiting, teaching, research and social activities.
- 9) To provide a programme of study which meets the FHEQ level 6 and which also takes account of the subject benchmarks in QAA Engineering and UK-Spec professional standards.

## **11 Learning Outcomes**

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas. The programme outcomes have references to the Benchmark Statements for Engineering.

### **Knowledge and Understanding**

On completing the programme students should have appropriate knowledge and understanding of:

- A1** Background Mathematics, Statistics and Chemistry that are relevant to Chemical and Process (C&P) Engineering.
- A2** The fundamental concepts, principles and theories of C&P Engineering.
- A3** Business and management techniques relevant to C&P engineering and Chemical Engineers.
- A4** The role of chemical engineers in society and the constraints within which their engineering judgement will be exercised, including the professional and ethical responsibilities of chemical engineers.
- A5** The environmental and safety issues that affect C&P engineering and the issues associated with sustainable engineering solutions.
- A6** Conceptual, elemental and detailed design of processes and process plant.
- A7** Safe operation of processes and plant, including the use of IT for design, control and management.
- A8** Codes of practice, design, the assessment of safety and environmental risks, and the legislative framework for safety.

### **Learning and Teaching Methods**

Knowledge and understanding is primarily imparted through a combination of lectures, tutorials, example classes, case studies, laboratory experiments, coursework and projects in all Stages. In some cases, the formal lectures are supplemented by computer assisted learning (CAL). A number of visiting lecturers and professors contribute to A5, A6, A7 and A8. Throughout the course, learners are encouraged to undertake independent reading to deepen, supplement and consolidate learning and teaching and to broaden their individual knowledge and understanding of the subject. In the final year students are given guidance and are directed to engineering literature related to their design projects. Feedback on essays, laboratory and project reports allows students to refine their presentation techniques in these areas, and to assess the level of their knowledge and understanding.

### **Assessment Strategy**

Testing the knowledge base is through a combination of unseen written examinations and assessed coursework in the form of laboratory experiment write-ups, coursework reports, project reports and presentations. The proportion of in-course and written examination towards the final module assessment is usually 25 / 75 although this can vary as appropriate for the module and level of study.

### **Intellectual Skills**

On completing the programme students should be able to:

- B1** Select and apply appropriate scientific principles, mathematical methods and computer based methods for modelling and analysing engineering problems
- B2** Analyse experimental or computational results and determine their strength and validity.
- B3** Analyse systems, processes and components requiring engineering solutions and to produce a conceptual or elemental design to a specification.
- B4** Use the scientific literature effectively and to search for information to develop concepts.
- B5** Produce a full design specification for a process or process plant.

- B6** Identify the required cost, quality, safety, reliability, appearance, fitness for purpose and environmental impact of the application of the design and assess commercial risk.
- B7** Project manage a task.
- B8** Determine the criteria for evaluating a design solution and evaluate an outcome of the design against the original specification

#### **Learning and Teaching Methods**

Subject-specific/professional skills are developed through laboratory experiments and project work (B1-B4), case study/design exercises throughout Stages 1, 2 and 3 (B5-B8). Lectures, tutorials, case studies and seminars of specific modules develop skills B1, B3, B5 (Safety & Engineering Practice, Computer Applications), B5-B6 and B8 (Plant Design) and B7 (Safety & Engineering Practice, Process Business Operations). From the first year, students are required, after appropriate guidance and with proper resources provided through Blackboard VLE, to search the literature for information and submit all written work in an appropriate scientific and engineering format so that B1-B4 are thoroughly integrated into all submitted work by the final Stage. Students are encouraged to develop appropriate professional and practical skills (B1-B4) by monitored attendance at laboratory sessions during all stages of their studies. Feedback on all submitted work enhances learning of the skills B5-B8 culminating in the Stage 3 design projects. Some projects are carried out in small groups (4-5) and some individually. All are monitored by an academic supervisor and in some cases an industrial supervisor provides additional support.

#### **Assessment Strategy**

Practical skills are assessed through laboratory experiment write-ups, coursework and project reports, presentations, group oral discussions, and unseen written examinations. Skills B5-B8 form a major part of the assessment of the Stage 3 design project.

#### **Practical Skills**

On completing the programme students should be able to:

- C1** Plan, conduct and report a programme of investigative work.
- C2** Analyse and solve engineering problems.
- C3** Design a process or process plant to meet a need.
- C4** Be creative in the solution of problems and in the development of designs.
- C5** Evaluate designs and make improvements.
- C6** Integrate and evaluate information and data from a variety of sources.
- C7** Take a holistic approach to solving problems and designing systems, applying professional judgements to balance risks, costs, benefits, safety, reliability, aesthetics and environmental impact.

#### **Learning and Teaching Methods**

Analysis and problem solving skills are developed through example classes, tutorials, coursework and project work. Experimental, research and design skills are developed through coursework activities, laboratory experiments, and design projects. Individual feedback is given to students on all work produced. Students in all years are encouraged, following appropriate guidance, to plan and carry out their investigative work and analyse the experimental data in critical manner. Feedback provided on all submitted work provides opportunities for students to improve their skills. In particular, project work provides the opportunity to develop skills C1-C7.

#### **Assessment Strategy**

Analysis and problem solving skills are assessed through unseen written examinations and coursework. Experimental, research and design skills are assessed through laboratory experiment write-ups, coursework reports and project reports, presentations and unseen written examinations. Creative and design skills are assessed through design project reports and design presentation.

<b>Transferable/Key Skills</b>
<p>On completing the programme students should be able to:</p> <p><b>D1</b> Communicate effectively (orally and in writing).  <b>D2</b> Apply mathematical skills through modelling and analysis.  <b>D3</b> Work as a member of a team (an interdisciplinary team where appropriate).  <b>D4</b> Develop ideas and solutions to engineering problems.  <b>D5</b> Use information and communications technology.  <b>D6</b> Manage resources and time, plan, organise and prioritise work effectively to meet deadlines.  <b>D7</b> Learn independently in familiar and unfamiliar situations with open-mindedness and in the spirit of critical enquiry.  <b>D8</b> Learn effectively for the purpose of continuing professional development and in a wider context throughout their career.</p>
<b>Learning and Teaching Methods</b>
<p>Transferable skills are developed through the learning and teaching programme outlined above (and in section 11). Basic communication skills D1 are acquired within an introductory module (Principles of Chemical Engineering) as well as through individual and team projects throughout other modules and the case study/design projects in each Stage. These are then developed through feedback on written reports and oral presentations made as part of coursework assignments. Skills D1-D3 are formally taught in specific skills modules (e.g. Principles of Chemical Engineering, Safety &amp; Engineering Practice) and the students obtain feedback to enhance their learning as parts of those modules. Additionally, transferable skills are also applied in many subject-specific modules with students required to find information and give oral and/or written presentations throughout all years of study. Deadlines for submission of coursework are enforced in compliance with University regulations, encouraging students to develop D6 and this is supported by guidance provided during Induction week at each Stage of the programme. Design problems at each stage provide an opportunity to develop skills D3-D8.</p>
<b>Assessment Strategy</b>
<p>Transferable and communication skills are assessed through coursework reports, presentations and oral examinations in a number of compulsory and optional modules throughout all stages. The assessment of the Stage 3 Design Project includes assessment of key skills.</p>

<b>12 Programme Curriculum, Structure and Features</b>
<b>Basic structure of the programme</b>
<p>Design and case study projects provide a central theme to each Stage. As well as technical competence, these offer a wide range of learning outcomes, generally including elements of new knowledge, a broad range of intellectual activities and significant Professional and Transferable skills. A substantial mathematical base is provided in each Stage, together with a range of modules providing core C&amp;P engineering knowledge. The more analytical subjects also address intellectual abilities and transferable skills. Laboratory classes cover both practical and transferable skills. Stage 1 provides foundations of knowledge and understanding of fundamental C&amp;P engineering issues such as energy and material balances, heat transfer and fluid properties. Foundations of chemistry/biochemistry, mathematics and computer applications are also provided. Safety and environmental impact are developed as a formal topic of study. Links between subject areas are strengthened by a number of case studies/design project problems drawing on student's understanding, developing problem solving further and requiring practical skill application.</p>

Stage 2 continues the approach established in Stage 1, with design and its wide range of outcomes remaining central to the course. Mathematical knowledge is developed for higher level study. Technical modules extend both analytical and qualitative knowledge of C&P engineering science.

Stage 3 contains a major group process plant design project, as befits the candidates' greater maturity and independence. The project addresses many learning outcomes including acquisition of new knowledge, intellectual abilities, practical skills and transferable skills. Modules for a range of technical C&P engineering studies develop understanding towards graduate level. There is also a strong management strand to this Stage in Process Business Operations.

#### **Key features of the programme (including what makes the programme distinctive)**

The Undergraduate year is 31 weeks, arranged in three terms and currently divided into two Semesters and including an Induction week at the beginning of Semester 1.

The programme normally lasts three years. Every Honours student studies 120 credits in each Stage, resulting in BEng candidates completing 360 credits. These credits are compulsory with some modules designated "core" and having implications for student progress.

Progression from Stage 1 to Stage 2 depends upon student achieving at least 40% for all core module marks and at least a 40% overall Stage average. Limited compensation of marks of at least 35% is permitted for non-core modules. Further details are contained in the University Examination Conventions.

There is a Faculty Foundation Year (*H814*) for candidates not adequately qualified to embark on Stage 1 of Degree Programme.

Particular features of the programme are:

- High content of laboratory-based practical work
- High content of design-based work in teams and individually

#### **Programme regulations (link to on-line version)**

<http://www.ncl.ac.uk/regulations/docs/>

### **13 Criteria for admission**

#### *Entry qualifications*

The full entry policy is stated on page 12 of the Chemical Engineering and Advanced Materials Undergraduate Study Brochure.

All applicants are considered individually on the basis of past academic performance and, in particular, predicted achievement.

The typical offer is in the range AAB-ABB at 'A' level including Mathematics and Chemistry and preferably Physics and/or Biology but excluding General Studies and Critical Thinking. Chemistry is accepted at AS level (grade A or B) if offered in combination with A level Mathematics and Physics. GCSE Physics or Dual Award Science (minimum Grade B) required if Physics not offered at A level.

The Foundation Year is suitable for applicants who do not have Chemistry and/or Mathematics at A-level. The standard requirement for BEng with Foundation Year is AAB-ABB in any subjects excluding General Studies and Critical Thinking. GCSE grade B in Mathematics and Chemistry (or Dual Award Science) required if not offered at A or AS level.

#### *Admissions policy/selection tools*

Offers are made on the basis of applicants' UCAS forms after which they are invited to a post application open day (PAOD). During the course of the PAOD applicants have an informal meeting with a member of academic staff.

#### *Non-standard Entry Requirements*

Students are eligible for direct entry into Stage 2 if they hold an appropriate Diploma in Chemical Engineering with suitable grades, typically an overall average of approximately 60% or equivalent. Direct entry to Stage 2 is also possible through accreditation of prior learning (APL). All such applications are considered on an individual basis: direct entry is only offered if there is a sufficient academic basis for confidence of successful completion of Stage 2.

#### *Additional Requirements*

##### *Level of English Language capability*

We comply with the standard University English Language requirement.

### **14 Support for Student Learning**

The Student Services portal provides links to key services and other information and is available at: <http://www.ncl.ac.uk/undergraduate/life/support/>

#### *Induction*

During the first week of the first semester students attend an induction programme. New students will be given a general introduction to University life and the University's principal support services and general information about the School and their programme, as described in the Degree Programme Handbook. New and continuing students will be given detailed programme information and the timetable of lectures/practicals/labs/ tutorials/etc. The International Office offers an additional induction programme for overseas students.

#### *Study skills support*

Students will learn a range of Personal Transferable Skills, including Study Skills, as outlined in the Programme Specification. Some of this material, e.g. time management is covered in the appropriate Induction Programme. Students are explicitly tutored on their approach to both group and individual projects.

Numeracy support is available through Maths Aid and help with academic writing is available from the Writing Centre (further information is available from the Robinson Library).

#### *Academic support*

The initial point of contact for a student is with a lecturer or module leader, or their tutor (see below) for more generic issues. Thereafter the Degree Programme Director or Head of School may be consulted. Issues relating to the programme may be raised at the Staff-Student Committee, and/or at the Board of Studies.

#### *Pastoral support*

All students are assigned a personal tutor whose responsibility is to monitor the academic performance and overall well-being of their tutees. In addition the University offers a range of support services, including one-to-one counselling and guidance or group sessions/workshops on a range of topics, such as emotional issues eg. Stress and anxiety, student finance and budgeting, disability matters etc. There is specialist support available for students with dyslexia and mental health issues. Furthermore, the Union Society operates a Student Advice Centre, which can provide advocacy and support to students on a range of topics including housing, debt, legal issues etc.

#### *Support for students with disabilities*

The University's Disability Support Service provides help and advice for disabled students at the University - and those thinking of coming to Newcastle. It provides individuals with: advice about the University's facilities, services and the accessibility of campus; details about the technical support available; guidance in study skills and advice on financial support arrangements; a resources room with equipment and software to assist students in their studies.

#### *Learning resources*

The University's main learning resources are provided by the Robinson and Walton Libraries (for books, journals, online resources), and Information Systems and Services, which supports campus-wide computing facilities.

All new students whose first language is not English are required to take an English Language Proficiency Test. This is administered by INTO Newcastle University Centre on behalf of Newcastle University. Where appropriate, in-session language training can be provided. The INTO Newcastle University Centre houses a range of resources which may be particularly appropriate for those interested in an Erasmus exchange.

### **15 Methods for evaluating and improving the quality and standards of learning and teaching**

#### *Module reviews*

All modules are subject to review by questionnaires which are considered by the Board of Studies. Changes to, or the introduction of new, modules are considered at the Board of Studies. Student opinion is sought at the Staff-Student Committee and/or the Board of Studies. New modules and major changes to existing modules are subject to approval by the FLTSEC.

#### *Programme reviews*

The Board of Studies conducts an Annual Monitoring and Review of the degree programme and reports to FLTSEC. The FLTSEC takes an overview of all programmes within the Faculty and reports any Faculty or institutional issues to the ULTSEC.

#### *External Examiner reports*

External Examiner reports are considered by the Board of Studies. The Board responds to these reports through FLTSEC. External Examiner reports are shared with institutional student representatives, through the Staff-Student Committee.

#### *Student evaluations*

All modules, and the degree programme, are subject to review by student questionnaires. Informal student evaluation is also obtained at the Staff-Student Committee, and the Board of Studies. The National Student Survey is sent out every year to final-year undergraduate students, and consists of a set of questions seeking students' views on the quality of the learning and teaching. The results from student surveys are considered as part of the Annual Monitoring and Review of the programme and any arising actions are captured at programme and School / institutional level and reported to the appropriate body.

#### *Mechanisms for gaining student feedback*

Feedback is channelled via the Staff-Student Committee and the Board of Studies.

#### *Faculty and University Review Mechanisms*

The programme is subject to the University's Internal Subject Review process. Every five years degree programmes in each subject area are subject to periodic review. This involves both the detailed consideration of a range of documentation, and a visit by a review team which includes an external subject specialist in addition to University and Faculty representatives. Following the review a report is produced, which forms the basis for a decision by ULTSEC on whether the programmes reviewed should be re-approved for a further five year period.

#### *Accreditation reports*

#### *Additional mechanisms*

All staff are subject to periodic peer observation of their teaching. Any issues arising are dealt with by the Board of Studies.

### **16 Regulation of assessment**

#### *Pass mark*

The pass mark is 40 (Undergraduate programmes)

#### *Course requirements*

Progression is subject to the University's Undergraduate Progress Regulations and Undergraduate Examination Conventions. In summary, students must pass, or be deemed to have passed, 120 credits at each Stage. Limited compensation up to 40 credits and down to a mark of 35 is possible at each Stage and there are resit opportunities, with certain restrictions.

#### *Weighting of stages*

The marks from Stages 2 and 3 will contribute to the final classification of the degree

The weighting of marks contributing to the degree for Stages 2:3 is 1:2

#### *Common Marking Scheme*

The University employs a common marking scheme, which is specified in the Undergraduate Examination Conventions, namely

	<b>Modules used for degree classification (DC)</b>	<b>Modules not used for degree classification</b>
<40	Fail	Failing
40-49	Third Class	Basic
50-59	Second Class, Second Division	Good
60-69	Second Class, First Division	Very Good
70+	First Class	Excellent

#### *Role of the External Examiner*

An External Examiner, a distinguished member of the subject community, is appointed by FLTSEC, after recommendation from the Board of Studies. The External Examiner is expected to:

- See and approve examination papers
- Moderate examination and coursework marking
- Attend the Board of Examiners
- Report to the University on the standards of the programme

In addition, information relating to the programme is provided in:

The University Prospectus (see <http://www.ncl.ac.uk/undergraduate/> or <http://www.ncl.ac.uk/postgraduate/>)

The School Brochure (contact [enquiries@ncl.ac.uk](mailto:enquiries@ncl.ac.uk))

The University Regulations (see <http://www.ncl.ac.uk/regulations/docs/>)

The Degree Programme Handbook

Please note. This specification provides a concise summary of the main features of the programme and of the learning outcomes that a typical student might reasonably be expected to achieve if she/he takes full advantage of the learning opportunities provided. The accuracy of the information contained is reviewed by the University and may be checked by the Quality Assurance Agency for Higher Education.



## Annex

### Mapping of Intended Learning Outcomes onto Curriculum/Modules

Module	Type	Intended Learning Outcomes			
		A	B	C	D
CME1020	Compulsory	1,2	1,2,4	1,2,6	1,2,4,5,6,7,8
CME1021	Compulsory	2	1,2,4	1,2,6	1,2,4,5,6,7,8
CME1023	Compulsory	2,6	2,4	1,2,6	1,2,4,5,6,7,8
CME1025	Compulsory	1,2,3,4,5,6,7,8	1,2,3,4,5,6,8	1,2,3,4,5,6	1,2,3,4,5,6,7,8
CME1026	Compulsory	1,2,6	1,2	1,4,6	1,2,4,5,6,7,8
CME1027	Compulsory	1,2,6	1,2	1,4,6	1,2,4,5,6,7,8
ENG1001	Compulsory	1	1	2,6	2,5,6,7,8
CME2016	Compulsory	1,2,6,7	1,2	1,2,6	1,2,4,5,6,7,8
CME2021	Compulsory	2,3,4,5,6,7,8	1,2,3,4,5,6,7,8	1,2,3,4,5,6	1,2,3,4,5,6,7,8
CME2022	Compulsory	2,6	1,2	2,6	1,2,4,5,6,7,8
CME2023	Compulsory	2,6	1,2,4,8	1,2,3,6	1,2,4,5,6,7,8
CME2024	Compulsory	2,5,6	1,2,3	1,2,3,4,6	1,2,4,5,6,7,8
CME2026	Compulsory	1	1,2,3	1,2,6	1,2,4,5,6,7,8
CME2027	Compulsory	1,2	1,2,4	1,2,3,4,6	1,2,4,5,6,7,8
CME2028	Compulsory	1,2	1,2,4	1,2,3,4,6	1,2,4,5,6,7,8
ENG2011	Compulsory	1	1	,6	2,5,6,7,8
CME3008	Compulsory	2,6,7	1,2	1,2,3,6	1,2,4,5,6,7,8
CME3032	Compulsory	2,3,6,7	1,2,3,7,8	1,2,3,4,5,6,7	1,2,3,4,5,6,7,8
CME3033	Compulsory	2,6	1,3,5,8	1,2,3,5	1,2,4,5,6,7,8
CME3034	Compulsory	2,5,6,7,8	1,2,6	1,2,4,6,7	1,2,4,5,6,7,8
CME3035	Compulsory	2,6	1,2,3	1,2,3,4,5	1,2,4,5,6,7,8
CME3036	Compulsory	2,6	1,2,3,8	1,2,3,4,5,6	1,2,4,5,6,7,8
CME3039	Compulsory	2,3,4,5,6,7,8	1,2,3,4,5,6,7,8	1,2,3,4,5,6,7	1,2,3,4,5,6,7,8
CME3011	Compulsory	2,7	2,4	2,6	1,2,4,5,6,7,8