UNIVERSITY OF NEWCASTLE UPON TYNE

DEGREE PROGRAMME SPECIFICATION

1. Awarding Institution: University of Newcastle upon Tyne

2. Teaching Institution: University of Newcastle upon Tyne

3. Programme Accredited by: IChemE, Energy Institute

4. Final Award: MEng (Hons)

Chemical & Process Engineering with Process Control
Chemical & Process Engineering with Bioprocess Engineering
Chemical & Process Engineering with Sustainable Engineering
Chemical & Process Engineering with Intensified Processing
Chemical & Process Engineering with European Language
Chemical & Process Engineering with Industry

5. Programme Titles: Chemical and Process Engineering

6. UCAS codes: H840, H830, H831, H832, H833, H8R9, H842

7. QAA Benchmarking Group: Engineering

8. Date of production / revision: January, 2005

9. 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 addition to a wide understanding of chemical and process engineering, the MEng programme is designed to provide scope for students to develop their understanding in both breadth and depth. 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.
2. 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.
3. 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 Energy Institute)
4. 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.
5. To enable students to eventually meet the requirements of the accrediting Institutions for Chartered Membership
6. To equip students with appropriate practical skills in information processing, data analysis,

problem solving, teamwork, and communication skills.

7. 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.
8. To encourage students to develop appropriate attitudes towards their own future professional development.
9. 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.

10. Intended Learning Outcomes; Teaching and Learning Strategies and Methods; Assessment Strategies and Methods

The programme provides opportunities for students to develop, integrate, practice and demonstrate knowledge and understanding, qualities, skills and other attributes in the chemical and process engineering areas. The programme outcomes have references to the QAA Benchmark Statements for Engineering. A successful student will have:

A Knowledge and understanding

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 Detailed knowledge and understanding of the essential facts, concepts, principles and theories of C&P Engineering.

A5 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.

A6 The environmental and safety issues that affect C&P engineering and the issues associated with sustainable engineering solutions.

A7 Conceptual, elemental and detailed design of processes and process plant.

A8 Safe operation of processes and plant, including the use of IT for design, control and management.

A9 Codes of practice, design, the assessment of safety and environmental risks, and the legislative framework for safety.

Teaching Strategy

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 A6, A7, A8 and A9. Teaching is enhanced by the provision of challenging open-ended tasks. A3, A5, A6, A8 and A9 are developed by MEng

(Industry) students whilst working for a company during the year in industry.

Learning Strategy
Throughout the course, learners are encouraged to undertake independent reading to deepen, supplement and consolidate what is being taught/learnt and to broaden their individual knowledge and understanding of the subject. In the final two years students are given guidance and directed to engineering literature related to their design and research 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. Exposure to industrial practice during the year in industry broadens A1-A9 for MEng (Industry) students.

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. Some students may also be examined through oral examination by the External Examiner.

B Subject-specific/professional skills:

The skills to:

B1 Execute safely a series of experiments and use laboratory equipment to generate data.

B2 Analyse experimental or computational results and determine their strength and validity.

B3 Prepare technical reports, specifications and give technical presentations.

B4 Use the scientific literature effectively and to search for information to develop concepts.

B5 Make engineering sketches and use computational tools and packages.

B6 Produce a conceptual or elemental design to a specification.

B7 Produce a full design specification for a process or process plant.

B8 Identify the required cost, quality, safety, reliability, appearance, fitness for purpose and environmental impact of the application of the design.

B9 Project manage a task.

B10 Determine the criteria for evaluating a design solution and evaluate an outcome of the design against the original specification.

B11 Investigate specific aspects of design in depth

B12 Carry out a research programme in a chosen area

Teaching Strategy
Subject-specific/professional skills are developed through laboratory experiments and project work (B1-B4, B12), design exercises throughout Stages 1, 2, 3 and 4 (B5-B11). Lectures, tutorials, case studies and seminars of specific modules develop skills B5 (Process Design, Computer Applications), B6-B8 and B10 (Plant Design) and B9 (Process Design, Economics and Project Management). From the first year, students are required, after appropriate guidance, to search the

literature for information and submit all written work in an appropriate scientific and engineering format so that B2-B4 are thoroughly integrated into all submitted work by the final two Stages. In addition to the above, MEng (Industry) students further develop B2-B11 whilst working for a company.

Learning Strategy
Students are encouraged to develop appropriate professional and practical skills (B1-B4) by monitored attendance at laboratory sessions during all stages of their studies. From the first year, all written work must be submitted in an appropriate scientific and engineering format and feedback on such work enhances learning of the skills B5-B12 culminating in the Stage 3 and Stage 4 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. B2-B11 are also practiced by those students on industrial placements.

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-B12 form a major part of the assessment of project work.

C Cognitive skills:

skills to:

C1 Plan, conduct and report a programme of novel 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.

Teaching Strategy
Cognitive skills are developed through the teaching and learning programme outlined above (and in more detail in section 11). Analysis and problem solving skills are further developed through example classes, tutorials, coursework and project work and, for MEng (Industry) during the year spent working in industry. Experimental, research and design skills are further developed through coursework activities, laboratory experiments, and research and design projects. Individual feedback is given to students on all work produced.

Learning Strategy
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 intellectual 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.

D Key (transferable) Skills

The skills to:

D1 Communicate effectively (orally and in writing), using more than one language where the student wishes to pursue language studies.

D2 Apply mathematical skills through modelling and analysis.

D3 Work as a member of a team (an interdisciplinary team where appropriate).

D4 Develop ideas and solutions to engineering problems.

D5 Use information and communications technology.

D6 Manage resources and time, plan, organise and prioritise work effectively to meet deadlines.

D7 Learn independently in familiar and unfamiliar situations with open-mindedness and in the spirit of critical enquiry.

D8 Learn effectively for the purpose of continuing professional development and in a wider context throughout their career.

Teaching Strategy
Transferable skills are developed through the teaching and learning programme outlined above (and in section 11). Basic communication skills D1 are acquired through a dedicated module (CPE131 Communications Skills) as well as individual and team projects throughout other modules (e.g. CPE203) and the design projects in each Stage. These are then developed through feedback on written reports and presentations made as part of coursework assignments. For MEng (Industry), the year in industry gives the opportunity to develop D1 and D3-D8 to a higher level.

Learning Strategy
Skills D1-D3 are formally taught in specific skills modules (e.g. CPE131 Communications Skills, CPE132 Analytical Techniques, Process Design modules) 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, 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.

Assessment Strategy
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 Stage 3 and Stage 4 major projects includes assessment of key skills.

11. Programme Features, Structure and Curriculum:

A Programme Features

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 four years. Every Honours student studies 120 credits in each Stage, resulting in MEng candidates completing 480 credits. These credits are a mixture of compulsory and optional modules (as listed in 11 C) with some modules designated "core" and having implications for student progress.

Progression from Stages 1 and 2 to the subsequent Stages depends upon student reaching an overall Stage average at least 40 with all core module marks also at least 40. Limited compensation of marks of at least 35 is permitted for non-core module. Further details are contained in the University Examination Conventions.

Continuation on the MEng programme beyond Stage 2 is dependent on achieving 50% in the Stage 2 assessment.

Students may choose electives during all Stages to suit their interests and capabilities. However, to complete the programme for H830, H831, H832,H833 and H8R9, certain electives will become compulsory and some major activities (eg CPE304, Process Design project) will be chosen so that they complement the theme of the MEng specialisation. Students for H842 take a modified Stage 4 to ensure coverage of all essential aspects of chemical engineering.

There is a Faculty Foundation Year 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
- An open-ended research project in Stage 4 that often contributes to the School's research programme
- An in-depth advanced study of a facet of a design or design process
- Opportunity to gain workplace skills through the Placement year
- Opportunity to develop language skills if desired

B Programme Structure

Design 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&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&P engineering issues such as energy and material balances, heat transfer and fluid properties. Foundations of chemistry, mathematics and computer applications are also provided.

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. Safety and environmental impact are further developed as a formal topic of study. There is an option to study Business Management.

Except for H842 and some H8R9 students, 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. It is set as an open-ended problem, allowing for creative development and full application of acquired 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 CPE302 Process Design, Economics and Project Management. Candidates may also elect to study 'Faculty' modules which aim to broaden knowledge and experience as well as introducing students to their peers studying other branches of engineering.

Stage 3 in industry is designed to broaden the students' knowledge of chemical engineering by exposure to chemical engineering in industry. Learning is focused on how problems are approached and solved by professional engineers and on constraints (safety, environmental and economic) that are placed on the solutions that engineers develop.

Stage 4 is designed to complete candidates' academic development towards Chartered Engineering status, which is endorsed by the IChemE and Energy Institute accreditation of the programmes. All students receive instruction in research methodology and then undertake an individual research project (or design project for H842 students), which enables them to demonstrate their full and final achievement of the learning outcomes for the course. With the exception of H842, students also undertake an individual, in-depth study of a facet of a design or a design process, usually based on their Stage 3 Design Project. Technical modules, which are predominantly quantitative, develop scientific knowledge to levels consistent with the students' future professional careers. Stage 4 H842 students complete a major group process plant design project and take modules from those available at Stages 3 and 4 of the other chemical and process engineering programmes to ensure they have studied all essential aspects of chemical engineering.

C Programme Curriculum

Stage 1

1. **Stage 1**

(a) Unless otherwise stated modules are not core.

(b) All candidates shall take the following compulsory modules:

Code	*Credits*	*Descriptive title*	*Type*
CPE110	(5)	Introduction to Chemical Engineering	
CPE111	(10)	Fluids 1	
CPE121	(10)	Heat Transfer 1	
CPE101	(10)	Process Safety	Core
CPE126	(10)	Computer Applications	
CPE129	(20)	Chemistry for Chemical Engineers	Core
CPE130	(5)	Computing for Chemical Engineers	
CPE133	(10)	Energy and Material Balances	
ENM105	(20)	Engineering Mathematics	

(c) Candidates for Honours in Sustainable Engineering shall take the following compulsory module in addition to those shown in (b) above:

CPE125 (5) Pollution Monitoring

(d) Candidates for Honours in Chemical and Process Engineering (Europe) shall take 20 credits of a modern European language selected with the approval of the Degree Programme Director in consultation with the School of Modern Languages in addition to those shown in (b) above.

(e) Candidates shall select optional modules from the list below, chosen with the approval of the Degree Programme Director, to bring the credit value for the Stage to 120.

Code	*Credits*	*Descriptive title*
CPE124	(5)	Particle Technology
CPE125	(5)	Pollution Monitoring
CPE131	(5)	Communication Skills
CPE132	(5)	Analytical Techniques for Chemical Engineers

Note: students electing to study a language should study the same option for the whole of Stage 1 and Stage 2.

2. **Stage 2**

(a) All Stage 2 modules are Honours modules.

(b) All candidates shall take the following compulsory modules:

Code	*Credits*	*Descriptive title*
CPE211	(10)	Fluids 2
CPE101	(10)	Process Safety*
CPE202	(15)	Heat Transfer
CPE223	(10)	Thermodynamics
CPE203	(5)	Biotechnology
CPE229	(15)	Reactor Engineering 1
CPE230	(15)	Introduction to Process Dynamics and Control
CPE231	(10)	Process Design 1
ENM223	(5)	Engineering Mathematics - Ordinary and Partial Differential Equations
ENM910	(5)	Engineering Mathematics - Vectors

* *2004/5 Only*

(c) Candidates for Honours in Chemical and Process Engineering (Europe) shall take 20 credits of a modern European language selected with the approval of the Degree Programme Director in consultation with the School of Modern Languages in addition to those shown in (b) above.

Note: students electing to study a language should study the same option for the whole of Stage 1 and Stage 2.

(d) Candidates shall select optional modules from the list below, with the approval of the Degree Programme Director, to bring the credit value for the Stage to 120.

Code	*Credits*	*Descriptive title*
CPE226	(5)	Drying and Crystallization
CAD203/		
CAD204	(5)	Student Tutoring
ENG201	(10)	Introduction to Business Management
ENM236	(5)	Statistics in Process Industries 1
ENM336	(5)	Statistics in Process Industries 2

Note: Students electing to study a language should study the same option for the whole of Stage 1 and Stage 2. ENG201 is a 10-credit module taken over both semesters. Students who elect to take ENG201 must take it in both semesters. Candidates may not take both CAD203 and CAD204.

(e) ***Transfer to the Degree of Bachelor of Engineering with Honours in Chemical and Process Engineering***

Candidates for the degree of Master of Engineering with Honours in Chemical and Process Engineering may transfer to the degree of Bachelor of Engineering with Honours in Chemical and Process Engineering during, or at the end of, Stage 2.

(f) ***Transfer to the Degree of Master of Engineering with Honours in Chemical and Process Engineering***

Candidates who have completed Stage 2 of the degree of Bachelor of Engineering with Honours in Chemical and Process Engineering may transfer to the degree of Master of Engineering with Honours in Chemical and Process Engineering subject to having passed all subjects in Stage 2 with an overall Merit performance as defined by the Faculty Progress and Concessions Committee or similarly designated body.

(g) ***Transfers within the Honours Options***

Candidates who are qualified to enter Stage 3 MEng may follow any one of the specified Honours streams regardless of their initial registration subject to specific pre-requisites for each Honours stream having been satisfied.

3. Stage 3

(a) All candidates, except those taking H842 Chemical & Process Engineering (Industry) whose curriculum is detailed in Section 5, shall take the following compulsory modules:

Code	*Credits*	*Descriptive title*
CPE304	(40)	Plant Design (MEng)
CPE305	(10)	Separation Processes 2
CPE203	(5)	Biotechnology*
CPE314	(10)	Reactor Engineering 2
CPE316	(10)	Process Control 2
CPE302	(10)	Process Design, Economics and Project Management
CPE329	(10)	Biochemical Engineering

* *2004/5 Only*

(b) Candidates for Honours in Bioprocess Engineering shall take CPE304 (40 credits), designing a biotechnology-based plant.

(c) Candidates for Honours in Intensified Processing shall take CPE304(40 credits), designing an intensified process plant.

(d) Candidates for Honours in Sustainable Engineering shall take CPE304 (40 credits) designing a process plant demonstrating best practice in sustainable engineering.

(e) Candidates for Honours in Chemical and Process Engineering (Europe) shall take 20 credits from advanced modules in the chosen European language specified by the Degree Programme Director in addition to 100 credits chosen from those shown in (a) above, or they may spend a year abroad studying chemical and process engineering at an approved higher education establishment in Europe where they will study a range of modules equivalent to those listed in (a) above and totalling 120 credits. The programme will be designed in close consultation with the host institution and will be subject to the approval of the Degree Programme Director. Assessment will normally be conducted by the host institution. Progress visits will be made by academic staff from the University of Newcastle upon Tyne. Candidates who have studied abroad and who fail to satisfy the examiners' assessment for Stage 3 with Honours in Chemical and Process Engineering (Europe) may not be reassessed but may be permitted to transfer to Stage 3 of the degree of Bachelor of Engineering with Honours in Chemical and Process Engineering.

(f) All candidates shall select optional modules, chosen with the approval of the Degree Programme Director, to a value of 120 credits (compulsory and optional modules) with optional modules chosen, from the following list:

Code	*Credits*	*Descriptive title*
CPE306	(5)	Solids Handling
CPE325	(5)	Chemical Process Optimization
CPE326	(5)	Process Measurement
CPE327	(5)	Data Management
ENG401	(10)	Computer-aided Engineering
ENG402	(10)	Management of New Product Introduction
ENM236	(5)	Statistics in the Process Industries 1
ENM336	(5)	Statistics in the Process Industries 2

Note: students who have taken languages in Stages 1 and 2 must take ENM236 as one of their Semester 2 electives. Neither ENM236 nor ENM336 may be repeated at Stage 3 if already taken in Stage 2. If ENM336 is taken at Stage 3, then ENM308 must be taken at Stage 4.

4. Stage 3 Industry - The Industrial Year

Candidates who have successfully completed Stage 2 with an overall Merit performance may choose to spend a year in Industry as the third year of the MEng (Industry) programme (H842). This year (Stage 3 Industry) is deemed the equivalent of 120 credits and successful completion of the Industrial Year enables the candidate to return to complete the programme by taking Stage 4 Industry as set out in paragraph 7. A candidate who fails to pass the Industrial Year is required to re-register for the BEng with Honours in Chemical and Process Engineering and proceed to BEng Stage 3.

Assessment for Stage 3 Industry will consist of four components:

(a) a technical assessment of the candidate by the industrial supervisor following School guidelines;

(b) a module on Process Control, taken by means of a week-long module taken at the University followed by independent supported study, selected from:

Code *Descriptive title*

PAQ803 Quality Technology

PAQ808 Environmental Management and Sustainability

PAQ814 Mathematical Modelling in Engineering

PAQ811 Chemometrics and Signal Processing

(c) a dissertation or a project completed by the candidate during the year in industry together with a poster presentation of the work;

(d) a report on skills acquired containing a summary of Chemical Engineering theory and practice learnt during the year in industry. A diary of the candidate's year in industry will also be submitted as supporting evidence. The diary will not be assessed.

The percentage contribution of the strands of the assessment will be (a) 30 per cent; (b) 20 per cent; (c) 30 per cent; (d) 20 per cent.

Honours performance is detailed in section 9(c).

5. **Stage 4**

(a) All candidates, except those taking H842 Chemical & Process Engineering (Industry) whose curriculum is detailed in Section 7, shall take the following compulsory modules:

Code *Credits* *Descriptive title*

CPE498 (50) Research Project

CPE421 (10) Enhanced Design Project

CPE318 (5) Laboratory and Project Work

CPE853 (5) Research Methodology and Experimental Data Management

(b) In addition candidates for Honours in Chemical and Process Engineering shall select modules to a value of 50 credits from the following list. The final selection shall be subject to the approval of the Degree Programme Director, who may also exercise discretion to approve alternative option modules which may be appropriate to the programme.

Code *Credits* *Descriptive title*

CPE325 (5) Chemical Process Optimization

CPE412 (10) Process Control 3 - Robust Control

CPE413 (10) Process Control 4 - Digital Control

CPE414 (10) Process Control 5 - Model-based Control

CPE415 (10) Process Control 6 - Non-linear Control

CPE419 (10) Process Intensification

CPE424 (5) Bioreactor Engineering

CPE441 (5) Applications of Fluid Dynamics

CPE803 (10) Sustainable Processing, Energy and Materials Technology

CPE808 (5) Design for a Sustainable Environment

CPE402 (10) Sustainable Engineering

ENM308 (5) Multivariate Method

ENM316 (5) Finite Element Method

Note: students who have taken ENM336 at Stage 3 must take ENM308 as one of their electives. CPE325 may not be repeated at Stage 4 if already taken in Stage 3.

(c) Candidates for Honours in Bioprocess Engineering shall take the following compulsory modules totalling 35 credits and a further 15 credits from the elective list in (b) above.

Code Credits Descriptive title

CPE424 (5) Bioreactor Engineering

AES824 (10) Fermentation Processes

AES825 (10) Novel Organisms and Natural Products

AES828 (10) Environmental Systems and Modelling

In addition, Enhanced Design CPE421 (10) and Research Project CPE498 (50) will be specifically related to Bioprocess Engineering.

(d) Candidates for Honours in Process Control shall take the following modules totalling 40 credits and a further 10 credits from the elective list in (b) above.

Code Credits Descriptive title

CPE412 (10) Process Control 3 - Robust Control

CPE413 (10) Process Control 4 - Digital Control

CPE414 (10) Process Control 5 - Model-based Control

CPE415 (10) Process Control 6 - Non-linear Control

In addition, Enhanced Design CPE421 (10) and Research Project CPE498 (50) will be specifically related to Process Control.

(e) Candidates for Honours in Sustainable Engineering shall take the following compulsory modules totalling 20 credits and a further 30 credits from the elective list in (b) above.

Code Credits Descriptive title

CPE803 (10) Sustainable Processing, Energy and Materials Technology

CPE402 (10) Sustainable Engineering

In addition, Enhanced Design CPE421 (10) and Research Project CPE498 (50) will be specifically related to Sustainable Engineering.

(f) Candidates for Honours in Intensified Processing shall take the following compulsory modules totalling 30 credits in addition to 20 credits from the elective list in (b) above.

Code Credits Descriptive title

CPE419 (10) Process Intensification

CPE873 (10) Intensified Heat and Mass Transfer and Reaction Processes

CPE845 (10) Intensification of Environmental and Chemical Processes

In addition, Enhanced Design CPE421 (10) and Research Project CPE498 (50) will be specifically related to Process Intensification.

(g) Candidates for Honours in Chemical and Processing Engineering (Europe) may take Stage 4 MEng as specified in 4(a) and (b) above with the option of carrying out the Research Project CPE498 (50) in an academic institution in the appropriate European country in Semester 2.

6. **Stage 4 Industry**

(a) All candidates for Chemical & Process Engineering (Industry) shall take the following compulsory modules:

Code Credits Descriptive title

CPE302 (10) Process Design, Economics and Project Management

CPE307 (10) Processing for Purpose

CPE304 (40) Plant Design (MEng)

CPE329 (10) Biochemical Engineering

CPE305 (10) Separation Processes 2

CPE316 (10) Process Control 2

CPE314 (10) Reactor Engineering 2

(b) All candidates shall select optional modules chosen with the approval of the Degree Programme Director, with a total value of 20 credits, from the following list:

Code	*Credits*	*Descriptive title*
CPE325	(5)	Chemical Process Optimization
CPE326	(5)	Process Measurement
CPE327	(5)	Data Management
ENG402	(10)	Management of New Product Innovation
ENM236	(5)	Statistics in the Process Industries 1
ENM336	(5)	Statistics in the Process Industries 2
CPE402	(10)	Sustainable Engineering
CPE419	(10)	Process Intensification
CPE412	(10)	Process Control 3 - Robust Control
CPE413	(10)	Process Control 4 - Digital Control
CPE414	(10)	Process Control 5 - Model-based Control
CPE415	(10)	Process Control 6 - Non-linear Control
CPE306	(10)	Solids Handling

Note: students who have taken languages in Stages 1 and 2 must take ENM236 as one of their Semester 2 electives. Neither ENM236 nor ENM336 may be repeated at Stage 4 Industry if already taken in Stage 2.

(c) Depending upon the nature of the experience gained in Stage 3 Industry, some of the compulsory modules listed in (a) above may be inappropriate. In this case, replacement modules may be selected from those listed as electives under (b) with the approval of the Degree Programme Director.

7. **Assessment Methods**

The following assessment methods will be used: unseen written examination papers; in-course assessments of practical classes; in-course assessments of examples classes; assessments of project work; dissertation assessments; open book examination papers.

Details of the assessment pattern for each module are specified in the Degree Programme Handbook.

8. **Honours Performance**

(a) The Stage 1 Honours module, CPE129, contributes towards Honours performance at the same weighting as the Stage 2 Honours modules.

(b) The Stage 1 module, CPE129, and Stage 2 modules together contribute at a weighting of 30 per cent towards Honours performance whilst the assessment of modules from Stage 3 and Stage 4 contributes towards Honours performance at a weighting of 70 per cent.

(c) For a student who successfully completes Stage 3 Industry and returns to complete Stage 4 Industry, Honours performance will be calculated with the Stage 1 and Stage 2 modules detailed in (a) and (b) above contributing at a weighting of 30 per cent, the Stage 3 Industry contributing 20 per cent and Stage 4 Industry contributing at a weighting of 50 per cent.

9. **Transfer to the Ordinary Degree of Bachelor of Engineering in Chemical and Process Engineering**

Candidates registering before September 2004 who meet the conditions set out in the regulations for the Ordinary degree of Bachelor of Engineering in Chemical and Process Engineering may transfer to that programme, subject to the approval of the Faculty Progress and Concessions Committee or similarly designated body, at the end of Stages 1 or 2.

Curriculum Map

Development of specific Intended Learning Outcomes occurs through the modules shown in the Curriculum Map on the following pages.

	Intended Learning Outcome	**Module codes**
A1	Background Mathematics, Statistics and Chemistry that are relevant to Chemical and Process (C&P) Engineering	CPE129,CPE132,ENM105, ENM223,ENM236,ENM910, ENM308,ENM316,ENM336,
A2	The fundamental concepts, principles and theories of C&P Engineering	CPE101,CPE110,CPE111, CPE121,CPE133,CPE125, CPE203,CPE223, CPE226,CPE229,CPE230, CPE302,CPE305,CPE306, CPE316,CPE318, CPE325,CPE326, CPE327, CPE328,CPE412/3/4/5, CPE419.CPE424,CPE441, CPE803
A3	Business and management techniques relevant to C&P engineering and Chemical Engineers.	ENG201,CPE302, CPE304, ENG402, Industry Year
A4	Detailed knowledge and understanding of the essential facts, concepts, principles and theories of C&P Engineering	CPE124, CPE211, CPE231, CPE202, CPE203, CPE211, CPE221, CPE314, CPE318, CPE304, CPE305, CPE325, CPE326, CPE327, CPE328, CPE329, CPE419, CPE424, CPE441, CPE803, Industry Year
A5	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	CPE101,CPE110,CPE125, CPE231,CPE304,CPE329, CPE402,CPE808,ENG404
A6	The environmental and safety issues that affect C&P engineering and the issues associated with sustainable engineering solutions	CPE101,CPE110,CPE125, CPE304,CPE402,CPE803, CPE808
A7	Conceptual, elemental and detailed design of processes and process plant	CPE101,CPE110,CPE126, CPE133,CPE202,CPE223, CPE226,CPE229,CPE231, CPE302,CPE305,CPE306, CPE304,CPE329, CPE419,CPE424
A8	Safe operation of processes and plant, including the use of IT for design, control and management	CPE101,CPE126,CPE130, CPE132,CPE221,CPE230, CPE231,CPE302,CPE305, CPE316,CPE304,CPE325, CPE326,CPE327,CPE424, CPE412/3/4/5, Industry Year
A9	Codes of practice, design, the assessment of safety and environmental risks, and the legislative framework for safety	CPE101,CPE125,CPE221, CPE229,CPE302,CPE304, CPE329,CPE402,CPE424, CPE808, CPE853, Industry Year

B1	Execute safely a series of experiments and use laboratory equipment to generate data.	CPE129,CPE130, CPE202,CPE203,CPE211, CPE226,CPE305,CPE316, CPE318,CPE329,CPE498, Industry Year
B2	Analyse experimental or computational results and determine their strength and validity	CPE129,CPE130, CPE202,CPE203,CPE211, CPE226,CPE305,CPE316, CPE318,CPE329,CPE498, ENM308, Industry Year
B3	Prepare technical reports, specifications and give technical presentations	CPE129,CPE130, CPE131, CPE202,CPE203,CPE211, CPE226,CPE305,CPE316, CPE318,CPE329,CPE498, Industry Year
B4	Use the scientific literature effectively and to search for information to develop concepts	CPE110,CPE131,CPE202, CPE203,CPE306,CP304, CPE419,CPE421,CPE424, CPE498, CPE808, Industry Year
B5	Make engineering sketches and use computational tools and packages	CPE126,CPE130,CPE132, CPE230,ENM236,ENM336, CPE302,CPE305,CPE316, CPE304,CPE329,CPE498, Industry Year
B6	Produce a conceptual or elemental design to a specification	CPE110,CPE133,CPE202, CPE302,CPE306,CPE329, Industry Year
B7	Produce a full design specification for a process or process plant	CPE304
B8	Identify the required cost, quality, safety, reliability, appearance, fitness for purpose and environmental impact of the application of the design	CPE133,CPE202,CPE304
B9	Project manage a task	CPE304, Industry Year
B10	Determine the criteria for evaluating the design solution and evaluate the outcome of the design against the original specification	CPE110,CPE133,CPE202, CPE304,ENG401,ENG402, Industry Year
B11	Investigate specific aspects of design in depth	CPE421,CPE498,ENG401, Industry Year
B12	Carry out a research programme in a chosen area	CPE498,CPE853

C1	Plan, conduct and report a programme of novel investigative work	CPE129,CPE131,CPE202, CPE203,CPE211,CPE305, CPE316,CPE318,CPE329, CPE421,CPE498,ENM336 ENG401, Industry Year
C2	Analyse and solve engineering problems	As A2 and A4 +CPE441, CPE803,ENG401
C3	Design a process or process plant to meet a need	CPE110,CPE133,CPE202, CPE302,CPE306,CPE304, CPE329
C4	Be creative in the solution of problems and in the development of designs	CPE110,CPE133,CPE202, CPE304,CPE402,CPE421, CPE808,ENG401, Industry Year
C5	Evaluate designs and make improvements	CPE110,CPE133,CPE202, CPE304, CPE402,CPE421, CPE808, ENG401, Industry Year
C6	Integrate and evaluate information and data from a variety of sources	All modules
C7	Take an holistic approach to solving problems and designing systems, applying professional judgements to balance risks, costs, benefits, safety, reliability, aesthetics and environmental impact	CPE304,CPE402,CPE808, ENG402, Industry Year
D1	Communicate effectively (orally and in writing), using more than one language if the student wishes to pursue language studies.	CPE110, CPE131, Languages, CPE203, CPE302,CPE304,CPE329, CPE402,CPE421,CPE498, CPE808, Industry Year
D2	Apply mathematical skills through modelling and analysis	CPE126,CPE130,CPE132, CPE230,ENM236,ENM336, CPE305,CPE316,CPE304, CPE419,CPE441,CPE498, ENM308,ENG401, Industry Year
D3	Work as a member of a team (an interdisciplinary team where appropriate)	CPE110,CPE202,CPE203,CPE304, ENM modules, ENG201, CAD modules, Languages, CPE402,CPE808, ENG402, Industry Year
D4	Develop ideas and solutions to engineering problems	As A4
D5	Use information and communications technology	All modules
D6	Manage resources and time, plan, organise and prioritise work effectively to meet deadlines	All modules with in course assessment and project work
D7	Learn independently in familiar and unfamiliar situations with open-mindedness and in the spirit of critical enquiry	All modules
D8	Learn effectively for the purpose of continuing professional development and in a wider context throughout their career	All modules

12. Criteria for Admission

The full entry policy is stated on page 17 of the Undergraduate Chemical Engineering prospectus.

All applicants are considered individually on the basis of past academic performance and potential for achievement. For MEng, we normally expect ABB to BBB achievement at 'A' level in appropriate subjects, including Mathematics and Chemistry. We ask for BCC for intending MEng students with 'A' level subjects not matching the requirements who will progress to the Faculty Foundation Year. For BEng, we normally ask for a BBB to CCC performance for direct entry to both Stage 1 and the Foundation Year. From 2004, we use interviews as part of the selection process, which take into account contextual factors which may affect the academic performance of individual applicants (such as attending a poorly performing School etc).

Students who enter on the BEng stream may transfer to the MEng stream at the end of Stage 2 if they achieve a Pass with Merit for that stage. Pass with Merit is taken to be equivalent to a 2-1 standard.

Students are eligible to enter directly into the 2nd year of the degree programme if they hold diplomas in Chemical Engineering with suitable grades. Typically, we look for a final average of 60% or equivalent. Even then, all applications are considered on an individual basis, to ensure that the applicant has the necessary background to successfully complete Stage 2. Otherwise, the applicant will be offered entry into Stage 1.

13. Support for Students

Induction
The first week of the first term/semester is an Induction Week with no formal teaching. During this period all students will be given detailed programme information relating to their Stage and the timetable of lectures/practicals/labs/ tutorials/etc. In particular, all new students will be given general information about the School and their course, as described in the Degree Programme Handbook. The International Office offers an additional induction programme for overseas students (see http://www.ncl.ac.uk/international/coming_to_newcastle/orientation.phtml).

Study skills support
Students will learn a range of Personal Transferable Skills, including Study Skills, as outlined in the Programme Specification.

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 Stage Tutor, Degree Programme Director or Head of School may be consulted. Issues relating to the programme may be raised at the undergraduate Staff/Student Committee, and/or at the undergraduate 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. Details of the personal tutor system can be found at http://www.ncl.ac.uk/undergraduate/support/tutor.phtml. In addition, the University offers a range of support services, including the Student Advice Centre, the Student Counselling Service, the Mature Student Support Service, and a Childcare Support Officer, see http://www.ncl.ac.uk/undergraduate/support/welfare.phtml.

Support for Special Needs
Support for students with special needs is provided as required and the University's Disability Support Service can be consulted where appropriate. For further details see http://www.ncl.ac.uk/undergraduate/support/disability.phtml.

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, see http://www.ncl.ac.uk/undergraduate/support/acfacilities.phtml.
All new students whose first language is not English are required to take an English Language test in the Language Centre. Where appropriate, in-sessional language training can be provided. The Language Centre houses a range of resources for learning other languages which may be particularly appropriate for those interested in an Erasmus exchanges. See http://www.ncl.ac.uk/undergraduate/support/langcen.phtml.

14. Methods of evaluating and improving the quality and standards of teaching learning and assessment

Undergraduate Board of Studies
Programme quality is maintained by the undergraduate BoS which, in its regular meetings, reviews all aspects of teaching, learning and assessment.

Module reviews
All modules are subject to review by questionnaires which are considered by the School Teaching & Learning Committee (STLC), which then reports to the undergraduate Board of Studies. Changes to, or the introduction of new, modules are considered at STLC and at the undergraduate Board of Studies. Student opinion is sought through student questionnaires (see below), at the undergraduate Staff/Student Committee and through student representation on STLC and the undergraduate Board of Studies. New modules and major changes to existing modules are subject to approval by the Faculty Teaching and Learning Committee.

Programme reviews
The undergraduate Board of Studies conducts an Annual Monitoring and Review of the degree programme and reports to Faculty Teaching and Learning Committee.

External examiner reports
External Examiner reports are considered by the undergraduate Board of Studies under Reserved Business, in the absence of the student representatives. The Board responds to these reports through Faculty Teaching and Learning Committee.

Accreditation reports
This programme is accredited by The Institution of Chemical Engineers and the Energy Institute.

Student evaluations
All modules are subject to review by student questionnaires. The School operates a policy of seeking feedback on overall views on each module delivered in each Semester. In addition, two modules in each Semester and each Stage are selected by the Stage Tutors to be subjected to detail student feedback. Informal student evaluation is also obtained at the undergraduate Staff/Student Committee, and the undergraduate Board of Studies.

Feedback mechanisms
Feedback to students is effected via the undergraduate Staff/Student Committee and the undergraduate Board of Studies.

Faculty and University Review Mechanisms
The Programme is subject to the University's Internal Subject Review programme, see http://www.ncl.ac.uk/aqss/qsh/internal_subject_review/policy_09.01.03.pdf

Peer review of teaching
University requirement for peer observation and review of teaching is reflected in the School policy.

15. Regulation of Standards

Pass Mark
The pass mark, as defined in the University's Undergraduate Examination Conventions (http://www.ncl.ac.uk/calendar/university.regs/ugexamconv.html), is 40.

Course Requirements
Progression is subject to the University's Undergraduate Progress Regulations (http://www.ncl.ac.uk/calendar/university.regs/ugcont.html) and Undergraduate Examination Conventions (http://www.ncl.ac.uk/calendar/university.regs/ugexamconv.html). In summary, students must pass 120 credits at each Stage. Limited compensation down to 35 is possible at each Stage for non-core modules and there are resit opportunities, with certain restrictions.

Weighting of Stages
Modules taken at Stages 2, 3 and 4 are Honours modules and the three stages contribute to the award of the final degree in the ratio 30/35/35 with the exception of H842 which is 30/20/50.

Common Marking Scheme
The University employs a common marking scheme, which is specified in the Undergraduate Examination Conventions (http://www.ncl.ac.uk/calendar/university.regs/ugcont.html), namely

	Honours	**Non-honours**
<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

The allocation of marks is governed by the Faculty Marking Criteria which are published and made available to all students in their Degree Programme Handbook.

Role of the External Examiner
An External Examiner, a distinguished member of the subject community, is appointed by Faculty Teaching and Learning Committee, 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 Meeting usually held in June
Report to the University on the standards of the programme

16. Indicators of Quality and Standards

Professional Accreditation Reports
H840 is accredited by The Institution of Chemical Engineers and the Energy Institute. At the last accreditation visit (March 2004)), both Institutions accredited the programme and provided some valuable recommendations which are currently being addressed.
H830/1/2/3 and H8R9 are provisionally accredited. A full accreditation exercise will occur once the first students have graduated from these programmes.
H842 is currently being considered by the IChemE for accreditation at MEng level with a decision expected in February 2005.

Internal Review Reports
This programme is due for Internal Subject Review in Semester 1 of the 2005/2006 academic year.

Previous QAA Reports
This programme received a QAA Subject Review in October 1995 and achieved a score of 21/24.

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve if he/she 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.

17. Other Sources of Information:

The University Prospectus (see http://www.ncl.ac.uk/undergraduate/)

The Departmental Prospectus (see http://www.ncl.ac.uk/undergraduate/subjects/xxx)

The University and Programme Regulations (see http://www.ncl.ac.uk/calendar/pdf/uniregs.pdf and http://www.ncl.ac.uk/calendar/sae/)

The Degree Programme Handbook

QAA Subject Review Report