

## PROGRAMME SPECIFICATION



<b>1</b>	<b>Awarding Institution</b>	Newcastle University
<b>2</b>	<b>Teaching Institution</b>	Newcastle University
<b>3</b>	<b>Final Award</b>	MSc / Postgraduate Diploma
<b>4</b>	<b>Programme Title</b>	Applied Process Control
<b>5</b>	<b>UCAS/Programme Code</b>	5029 /3319
<b>6</b>	<b>Programme Accreditation</b>	Institute of Measurement and Control
<b>7</b>	<b>QAA Subject Benchmark(s)</b>	Engineering
<b>8</b>	<b>FHEQ Level</b>	7
<b>9</b>	<b>Date written/revised</b>	March 2008

### 10 Programme Aims

The manufacturing industry depends on process control technology to maintain a competitive edge. Control engineers apply engineering principles to design, build, and manage sophisticated computer-based instrumentation and control systems in the manufacturing industries. As a result, they need to understand the fundamental principles of Chemical Engineering as well as key aspects of mathematics, statistics, and information technology as well as process control methodologies. The interdisciplinary nature of their education uniquely qualifies them to effectively manage the challenges of modern process control technology. As a result, engineers with training in process control are in demand and enjoy a wide range of career possibilities in the chemical process industries.

The aim of the degree programme is to produce graduates that understand industrial processes, the potential of modern control theory as well as possess the ability to implement the methodologies in an effective manner. The postgraduate education and training that will lead to highly skilled personnel that are capable of carrying out industrial research and development in advanced process supervision and control.

The MSc qualification meets the designated learning outcomes at level 7 of the National Qualifications Framework.

### 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 (subject) (X).

#### A. Knowledge and Understanding

The programme provides opportunities for students to develop and demonstrate knowledge, understanding, skills and other attributes associated with the theme of Process Control. By the end of the programme the typical student will be able to:

1. Demonstrate a clear understanding of chemical process dynamics and conventional control procedures.
2. Understand the theoretical basis of a number of modern model based approaches to process control.
3. Understand fundamental concepts of process modelling and optimisation relevant to the processing industries.
4. Demonstrate a clear understanding of the principles of statistical process control and multivariate statistics.
5. Demonstrate knowledge of the latest research developments in the subject area and an appreciation of how they impact on process control practice.
6. A particular topic connected with process control studied in-depth as part of a research

project for students on the MSc programme.

### **Teaching and Learning Methods**

Acquisition of A1 to A5 is through a combination of lectures, tutorials, coursework and project work. A6 is through a research project and dissertation for the MSc programme. During the taught component of the course students are expected to undertake independent reading to support lecture material. Each module specification includes a directed reading list to complement the lecture material. Tutorial material and observation and discussion during laboratory sessions enable the student to assess progression of their learning and aid the development of understanding.

### **Assessment Strategy**

Knowledge and understanding are assessed by formal and class examinations as well as coursework and preparation of a Dissertation. Written unseen examinations generally include short answer questions, equations and calculations. Assessed coursework comprises scientific/technical reports, tutorial sheets, computer based laboratories and laboratory work. For MSc students only, the project element of the degree programme is assessed by Dissertation. Depending upon the projects undertaken for the MSc, the majority of all of A1-A6 are assessed via Dissertation. Further assessment by the external examiner through viva voce examination is possible if it is felt necessary to assess learning of aspects broader than the project.

## **B. Intellectual Skills**

On completing the programme students should be able to:

1. Select and apply appropriate methods for analysing process modelling and control problems.
2. Apply strategies for the appropriate selection of relevant information and technologies from a wide body of knowledge.
3. Synthesise information from a number of sources in order to gain a coherent understanding of theory and practice of process control
4. Evaluate research and a variety of information and evidence critically.
5. Solve problems that require original thought.

### **Teaching and Learning Methods**

#### *Teaching/learning methods and strategies*

The cognitive skills associated with B1-B3 are developed during the modules on research methodology, process modelling and control during which a number of mini-projects are undertaken. Coursework, tutorial sessions and mini-projects associated with the first two semesters modules are designed to develop cognitive skills B1-B3 and develop the confidence required for B5. The research methodology module and the research project provides the opportunity for the students to develop the skills associated with B4 and B5.

#### *Learning Strategy*

Students are encouraged to acquire cognitive skills during the analysis and solution of process control, modelling and optimisation problems as well as through the analysis of plant data in computer based laboratory sessions. The MSc research project encourages the development of B5, extending the prior studies to a more advanced academic level.

### **Assessment Strategy**

Cognitive skills (B1-B5) are assessed by means of coursework (laboratory experiments, computer based problem solving and tutorial problems). All or the majority of B1-B5 are examined by means of the research project, dissertation and if required viva voce examination at the discretion of the external examiner.

## **C. Practical Skills**

On completing the programme students should be able to:

1. Understand the principles, applications and limitations of process control techniques and demonstrate an advanced understanding of some techniques.
2. To apply typical schemes for the control of a variety of items of plant.

3. Analyse data and develop process models.
4. Demonstrate an ability to use commercial software packages relevant to process modelling and control.
5. Plan, execute and report a research project.
6. Search for and retrieve information from a wide range of sources.

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

##### *Teaching Strategy*

An understanding of the principles and limitations of process control techniques (C1) is provided by lecture sessions and mini-project studies. Laboratory based experiments reinforce this and also provide insight into application issues (C2) and the use of software packages (C4). The ability to analyse a problem and develop process models is taught through lectures and by case studies in several course modules. C5 and C6 are taught during the module on research methodology and skills are developed extensively during the research project.

##### *Learning Strategy*

The students acquire skills (C1-C4) through putting into practice the information disseminated in lectures in laboratory and computer based project sessions. The skills gathered during the first two semesters are reinforced and further developed during their research project study as are skills C5 and C6

#### **Assessment Strategy**

Subject specific and practical skills (C1-C4) are assessed by means of coursework reports, unseen written examinations and the research project dissertation.

#### **D. Transferable/Key Skills**

On completing the programme students should be able to:

1. Communicate effectively and at all levels via written reports and/or oral presentations.
2. Use library facilities and other sources of reference material.
3. Use IT resources.
4. Organise workload and meet deadlines.
5. Work efficiently and effectively as part of a team and where necessary to delegate or receive instruction.
6. Analyse and understand a problem and realise that there may be more than one solution, choosing that which is most appropriate in the circumstances.

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

##### *Teaching Strategy*

Key skills are formally taught in the early part of the course with a series of presentations and lectures on information sources (D2) and IT skills (D3). The enforcement of deadlines in the submission of coursework and reports encourages the development of D4. Group working is undertaken in laboratories to develop D5. The independent working aspects of D5 are predominantly taught within the research project but are also developed during the coursework undertaken throughout the programme. The MSc research project in the final stages of the programme allows the further development of all, or the majority of, the key skills (D1-D6).

##### *Learning Strategy*

The students acquire the skills associated with D2-D3 through the research methodology modules and by actively participating in the laboratory sessions, putting into practice the information provided in lecture sessions early in the programme. Throughout the programme the students are assessed on coursework / mini-projects for which deadlines are imposed. The students learn how to prioritise and organise their time to ensure adherence to the deadlines (D4). The process control laboratories are undertaken in teams to ensure that the students gain an ability to work with others (D5). The MSc research project provides the personnel challenge that builds the skill of independent work and problem solving (D5-D6). Communication skills (D1) are developed through technical presentations and report writing associated with all modules.

## Assessment Strategy

Key skills are not independently assessed. The coursework and research project assessment all determine the extent to which the skills have been acquired and exploited. The predominant means of assessment of all key skills (D1-D6) is through the research project during which written dissertation and possible viva voce at the discretion of the external examiner all determine the extent to which key skills have been acquired.

## 12 Programme Curriculum, Structure and Features

### Basic structure of the programme

The programme of study begins annually in September and MSc and Diploma candidates take compulsory and optional modules to a total credit value of 180 for the MSc and 120 for the Diploma. MSc students submit a Dissertation of credit value of 60 credits. The candidates take the following compulsory modules.

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

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

MSc: [http://www.ncl.ac.uk/regulations/programme/2009-2010/documents/5029APCMScGW210409\\_000.pdf](http://www.ncl.ac.uk/regulations/programme/2009-2010/documents/5029APCMScGW210409_000.pdf)

Diploma: <http://www.ncl.ac.uk/regulations/programme/2009-2010/documents/3319APCDipGW210409.pdf>

## 13 Criteria for admission

The programme is suitable for students with a good degree, (2:2 minimum or equivalent), in engineering or a pure or applied science subject. Applicants for whom English is not their first language are required to provide proof of a command of the English language to a level where it is sufficiently high so as not to lead to a likelihood of failure. This is measured by means of an IELTS score of 6.5 or above or a TOEFL score of 575 or above.

### *Alternative entry qualifications*

Rarely students with a lesser qualification but relevant industrial experience may be accepted on merit.

### *Admissions policy*

Upon receipt of a completed application form, UK based students are invited to visit the School of Chemical Engineering and Advanced Materials to meet current students and to attend an informal interview. Offers of places are made to suitably qualified candidates following interview / visit and are conditional upon the applicant achieving a minimum of a 2nd class degree and upon the provision of satisfactory references. There are funded studentships which are awarded upon a competitive basis taking degree grade, references and experience and interview performance into account.

Applicants not based in the UK are not required to attend an interview.

Level of English Language capability

## 14 Support for Student Learning

### *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 principle 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.

Help with academic writing is available from the Writing Centre.

#### *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 teaching and learning**

#### *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 School Teaching and Learning Committee and 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 Faculty Teaching and Learning Committee.

#### *Programme reviews*

The 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 Board of Studies. The Board responds to these reports through Faculty Teaching and Learning Committee. 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 the students' views on the quality of the learning and teaching in their HEIs. With reference to the outcomes of the NSS and institutional student satisfaction surveys actions are taken at all appropriate levels by the institution.

#### *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 two-day review 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 University Teaching and Learning Committee on whether the programmes reviewed should be re-approved for a further five year period.

#### *Accreditation reports*

#### *Additional mechanisms*

## **16 Regulation of assessment**

#### *Pass mark*

The pass mark is 40 (Undergraduate programmes)

The pass mark is 50 (Postgraduate 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.

Progression is subject to the University's Masters Degree Progress Regulations, Taught and Research and Examination Conventions for Taught Masters Degrees. Limited compensation up to 40 credits of the taught element and down to a mark of 40 is possible and there are reassessment opportunities, with certain restrictions.

#### *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

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

**Summary description applicable to postgraduate Masters programmes**

**Summary description applicable to postgraduate Certificate and Diploma programmes**

<50	Fail
50-59	Pass
60-69	Pass with Merit
70 or above	Pass with Distinction

<50	Fail
50 or above	Pass

*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
- 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/calendar/university.regs/>)

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.

## Mapping of Intended Learning Outcomes onto Curriculum/Modules

		Modules																							
	Codes	Type	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5	D6
Process Control 3	CME4006			x									x	x			x			x		x	x		x
Process Control 4	CME4007			x									x	x			x			x		x	x		x
Process Control 5	CME4008			x			x		x					x			x			x		x	x		
Process Control 6	CME4009			x			x		x					x			x			x		x	x		
Control of Unit Operations	CME8007		x											x						x		x	x		
Optimization	CME8008				x									x						x		x	x		
Matlab Computing and Research Methodology	CME8009									x		x						x	x		x	x	x		
Management of multifaceted projects	CME8209																			x	x		x		
Statistical Process Control	CME8013					x														x	x	x	x		
Data Ana. and Rec. for Control	CME8014					x			x							x				x			x		
Artificial Neural Networks	CME8015				x								x			x				x			x		
Process Control Laboratory	CME8016		x												x		x			x				x	
Modelling and Simulation	CME8017				x				x				x			x	x			x		x	x		
Mathematical Modelling in Engineering	ENG8008				x					x		x											x	x	
<b>Dissertation</b>	CME8099						x	x			x	x	x	x					x	x	x	x	x		x