PROGRAMME SPECIFICATION	

1	**Awarding Institution**	Newcastle University
2	**Teaching Institution**	Newcastle University
3	**Final Award**	MSc
4	**Programme Title**	Industrial Quality Technology
5	**UCAS/Programme Code**	5030
6	**Programme Accreditation**	N/A
7	**QAA Subject Benchmark(s)**	Engineering
8	**FHEQ Level**	Level 7
9	**Date written/revised**	May 2010

10 Programme Aims

The primary aim of the course is to train postgraduates to have competencies across the boundaries of process analytical technology, process control, chemical engineering and quality technology. Key training areas will be in applied mathematics and industrial statistics, chemical and process engineering, quality technology, process control and optimisation, and process analytical technologies, together with business and project management.
Specifically, the course aims to provide:

(i) competencies in chemical and process engineering, process control, process analytics, quality technology, industrial statistics, process chemometrics and business and project management.
(ii) the ability to integrate the different disciplines to solve multifaceted problems.
(iii) an understanding of the relevant state-of-art methodologies and an appreciation of how and when to apply them.
(iv) the ability to make judgements about, and take responsibility for, issues of process operability, safety and quality, and project viability.

In addition to these academic and technical skills, the course also aims to equip graduates with a suite of key skills, including the ability to communicate effectively, the ability to employ IT and information resources appropriately, the ability to prioritise work and meet deadlines, the ability to work alone and with others and the ability to use initiative to solve problems.

11 Learning Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the areas listed below.

The programme outcomes have references to the benchmark statements for Engineering QAA114 06/06.

Knowledge and Understanding

The programme provides opportunities for the students to develop and demonstrate:

A1. competency in chemical and process engineering, process control, process analytical technologies, quality technology, industrial statistics, process chemometrics and business and project management to a level commensurate with that required for industrial problem solving via process analytical technologies and quality control technologies.

A2. an ability to solve multifaceted problems at the interdisciplinary interface of the subject areas covered in A1.

A3. an understanding of the latest research developments of the subject areas considered in A1 and an appreciation of how they may impact on industrial process analytical and quality control practice.

A4. an understanding of the procedures for the justification and progression of a process

analytical and quality control project in an industrial environment.

A5. an understanding of the importance of process safety in process operation and improvement and the procedures by which safety is considered.

Teaching and Learning Methods

Teaching strategy

Specialist knowledge and understanding (A1-A5) are primarily imparted via lecture classes, and tutorial sessions. These are supported by computer based learning and laboratory sessions. Industrial specialists contribute to providing a practical perspective for A4 and A5 through case studies and lecture classes. Laboratory based projects provide core teaching in process analytical methods.

Learning strategy

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 enables the student to assess progression of their learning and aid the development of understanding.

Assessment Strategy

Knowledge and understanding of A1-A5 are assessed by means of unseen written examinations and by coursework. Examination questions are where possible multi-part with increasing depth that probe student understanding. Clear guidance to students on the marking strategy is provided for each question. The assessed coursework comprises reports on laboratory and computer based study. Feedback is provided to the students in a timely fashion to aid future assessment. Depending on the projects undertaken for the MSc, the majority of A1-A5 are assessed via dissertation and poster presentation. The external examiner and members of the Board of Studies provide assessment of the poster presentation. Further assessment by the external examiner through viva voce examination is possible if they feel it is necessary to assess the learning of aspects broader than the project.

Intellectual Skills

On completing the programme students should be able to:

B1. understand the principles, applications and limitations of process analytical techniques and an advanced understanding of some of these techniques.

B2. understand quality control techniques and how the methods are applied on process plant.

B3. have the ability to identify process applications where benefits from improved analysis and/or quality control can lead to financial gain.

B4. have the ability to analyse process data associated with plant operation and data from process analytical devices. This involves the use of statistical procedures for critical appraisal of process features and improvement opportunities.

Teaching and Learning Methods

Teaching Strategy

An understanding of the principles and limitations of process analytical techniques (B1) is provided by lecture sessions and mini-project studies. Laboratory based experiments reinforce this and also provide insight into application issues. Quality control (B2) understanding is achieved through lecture sessions, a mini project in which design and tuning is considered and the consideration of industrial case studies. Visiting industrial practitioners of quality improvement strategies and control techniques provide vital practical insight. The ability to analyse a problem and identify whether process analytical techniques and / or control are a solution (B3) is primarily achieved through the research projects but also covered by case studies in several course modules. Finally, the underpinning techniques of statistical data analysis (B4) are taught via lecture sessions early in the MSc programme and are drawn on throughout other modules and used extensively in their research project.

Learning Strategy
The students acquire skills (B1-B4) 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. All projects build on the skills gained in B4 and a balance from B1 – B3 depending on the project focus.

Assessment Strategy

Subject specific and practical skills (B1-B4) are assessed by means of coursework reports, unseen written examinations and research project dissertation and associated poster presentation. The balance of assessment between B1-B4 for the research project depends on the precise research subject. The option is there for the external examiner to undertake a viva voce examination at their discretion.

Practical Skills

On completing the programme students should have:

C1. the ability to critically assess the quality of information provided by process analytical devices and general information from the process plant
C2. the ability to interpret data from process analytical devices and other process measurements and critically appraise its significance using appropriate statistical techniques.
C3. the ability to critically assess the value and limitations of existing information on a given subject
C4. the ability to formulate or recognise key hypotheses, to test hypotheses using logical and consistent quantitative or qualitative arguments and to identify key data which allow such tests to be made.
C5. the ability to critically assess the value and limitations of new data in relation to existing information on a given subject, to draw logical conclusions and to identify further experimentation requirements
C6. the ability to solve problems that require original thought.

Teaching and Learning Methods

Teaching Strategy
The cognitive skills associated with C1-C2 specifically are developed during the modules on process analytics during which a number of mini-projects are undertaken. Coursework associated with the modules on industrial statistical data analysis allows cognitive skills in process data analysis in general to be developed. Coursework, tutorial sessions and mini-projects associated with the first two semester modules are designed to develop cognitive skills C1-C5 and bring the confidence required for C6. Subsequently the research projects provide the opportunity for the students to develop the skills associated with C6.

Learning Strategy
Students are encouraged to acquire cognitive skills during the analysis of process analytical data and other plant data in computer based laboratory sessions. The procedures involve decisions regarding the pre-processing of information, selection of techniques for information extraction and model building and appraisal of the results. The methods are described in lecture sessions following which the students are first guided through their use and are then expected to perform analysis of new problems posed during the laboratory sessions. By this means C1-C5 are delivered. The research project encourages the development of C6, extending the prior studies to a more advanced academic level.

Assessment Strategy

Cognitive skills (C1-C6) are assessed by means of coursework (laboratory experiments, computer based problem solving and tutorial problems). All or the majority of C1-C6 are examined by means of the research project, poster, dissertation and if required viva voce examination at the discretion of the external examiner.

Transferable/Key Skills

On completing the programme students should have:

D1. The ability to communicate by means of presentations of research findings and concise and well written documents.
D2. The ability to use information sources from the library and internet based sources
D3. The ability to use IT resources
D4. The ability to plan and prioritise work to meet deadlines
D5. The ability to work independently and within teams.
D6. The ability to solve problems that are open ended.

Teaching and Learning Methods

Teaching Strategy
Key skills are formally taught in the early part of the course through the integration of information on information sources (D2) and IT skills (D3) in the compulsory modules. The enforcement of deadlines in the submission of coursework and reports encourages the development of D4. Group working is undertaken in process analytical 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 research project in the final stages of the programme allows the development of all the key skills (D1-D6) and draws on those introduced earlier in the programme.

Learning Strategy
The students acquire the skills associated with D2-D3 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 coursework has a heavy bias towards manipulation of data to interpret information. Software and IT skills (D3) are essential to achieve this and interpretation of the information requires comparison with previous studies. To achieve this, the students have to develop the skills D2. The process analytical laboratories are undertaken in teams to ensure that the students gain an ability to work with others (D5). The research project provides the personnel challenge that builds the skill of independent work and problem solving (D5-D6). The presentation of information involves the students completing coursework assignments with feedback enabling them to enhance their communication skills (D1).

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 poster presentation, written dissertation and possible viva voce at the discretion of the external examiner all determine the extent to which key skills have been acquired. When the project is undertaken in collaboration with industry, the student is expected to present the results of their study to the industrial partner.

12 Programme Curriculum, Structure and Features

Basic structure of the programme

All students take the following compulsory modules

CME8201	Introduction to Analytical Chemistry	10
CME8203	Quality Technology	10
CME8204	Process Control Systems	10
CME8205	Process Data Modelling	10
CME8206	Design of Experiments and Multivariate Data Analysis	10
CME8207	On-Line Process Analysis	10
CME8295	IQT Industrial Project	60

CME8504	Biomeasurement Technologies I	10

Students take one of the following modules:

CME8202	Principles of Process Engineering	10
ENG8010	Introduction to Mathematics and Statistics	10

Students take further modules to a value of 40 credits

CME8017	Modelling and Simulation	5
CME8208	Environmental Management and Sustainability	10
CME8210	Time Series and System Identification	10
CME8212	Model Based Predictive Control	10
CME8213	Non-Linear Process Modelling	10
CME8214	Process Optimisation in Practice	5
ENG8007	Methods and Techniques of Mathematical Modelling	10
ENG8008	Mathematical Modelling in Engineering	10

All the 10 credit module courses are of one week duration. The 5 credit modules are of the order of 2 and 3 days for ~~CME8030~~ CME8017 and CME8214 respectively. Details of timings of modules are published in the IQT Student Handbook which is updated every year.

A curriculum map showing a breakdown of the learning outcomes in terms of the course modules is appended at the end of this document.

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

The programme is of one year duration and undertaken on a modular basis. The option to study on a part-time basis is also available. The programme consists of two parts. The taught component runs from late September (the start of Semester 1) until April. The research project runs from May until the end of August. The student must satisfy the examiners in the taught component of study before progressing to the research project.

The foundation and compulsory modules that the students undertake are of one week duration intensive teaching followed by time for the students to assimilate the information gained and complete the coursework assessments. The students have two modules that are introductory in nature. They then undertake seven compulsory modules and forty credits are selected from seven 10 credit modules and two 5 credit modules. The options are chosen in consultation with the Degree Programme Director to ensure that they are suitable for the student's background and that the necessary pre-requisite skills are possessed.

The research projects all involve the interpretation of process information for the improvement of quality. As such computer based data interpretation and assessment of plant performance features in all projects. Some may involve simulation and others may have a larger component of experimental study. Where possible, industrial involvement in the research project is sought to bring an appreciation of practical difficulties. This may involve the analysis of industrial data or could go as far as undertaking trials on industrial plant. The students are encouraged to publish the results arising in their dissertations where possible.

Programme regulations (link to on-line version)

MSc: http://www.ncl.ac.uk/regulations/programme/

Diploma: http://www.ncl.ac.uk/regulations/programme/

13 Criteria for admission

Entrance Criteria

The programme is suitable for students with a good degree, (2:2 minimum or equivalent), in engineering or a pure or applied science subject. Students must also fulfil language requirements and provide satisfactory references. 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.

Applicants with Non-Standard Qualifications
Applicants who hold non-standard qualifications and/or have relevant experience are considered on an individual basis with a decision on acceptance being made by the Dean of Postgraduate Studies.

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 on the applicant achieving a minimum of a 2nd class degree and on the provision of satisfactory references. ~~Through the CTA, EPSRC provides funded studentships which are awarded on a competitive basis taking degree grade, references, experience and interview performance into account.~~

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

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 INTO Newcastle University Centre (In-sessional English classes).

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 e.g. 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-sessional 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 50 (Postgraduate programmes)

Course requirements

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 Taught Postgraduate Examination Conventions, namely:

Summary description applicable to postgraduate Masters programmes		**Summary description applicable to postgraduate Certificate and Diploma programmes**	
<50	Fail	<50	Fail
50-59	Pass	50 or above	Pass
60-69	Pass with Merit		
70 or above	Pass with Distinction		

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)~~

The University Regulations
http://www.ncl.ac.uk/students/progress/staff-resources/information/contact/regs.htm

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	Codes	Type	A1	A2	A3	A4	A5	B1	B2	B3	B4	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5	D6
Modelling and Simulation	CME8017																						
Introduction to Analytical Chemistry	CME8201		X		X	X		X		X	X	X	X						X	X	X	X	
Principles of Process Engineering	CME8202		X				X					X	X					X	X	X		X	
Quality Technology	CME8203		X	X	X			X		X		X	X	X			X	X	X	X	X	X	X
Process Control Systems	CME8204		X			X	X		X	X									X	X	X	X	X
Process Data Modelling	CME8205		X								X	X	X					X		X	X	X	
Design of Experiments and Multivariate Data Analysis	CME8206			X	X						X			X	X	X		X			X	X	X
On-line Process Analysis	CME8207		X	X	X	X		X			X	X	X	X			X	X	X	X	X	X	
Environmental Management and Sustainability	CME8208		X				X											X			X	X	
~~Management of Multifaceted Projects~~	~~CME8209~~		~~X~~			~~X~~												~~X~~	~~X~~		~~X~~	~~X~~	
Time Series and System Identification	CME8210		X						X						X	X				X	X	X	
Model Based Predictive Control	CME8212		X		X				X						X	X				X	X	X	X
Non-linear Process Modelling	CME8213				X						X	X	X						X	X	X	X	X
Process Optimisation in Practice	CME8214		X		X										X	X		X			X	X	
Research Project	CME8295		X	X	X	X				X		X	X	X	X	X	X	X	X	X	X	X	X
Biomeasurement Technologies I	CME8504																						
Methods and Techniques of Mathematical Modelling	ENG8007				X						X										X	X	
Mathematical Modelling in Engineering	ENG8008				X				X		X										X	X	
Introduction to Mathematics and Statistics	ENG8010		X				X					X	X									X	