PROGRAMME SPECIFICATION	

1	**Awarding Institution**	Newcastle University
2	**Teaching Institution**	Newcastle University
3	**Final Award**	MSc / Postgraduate Diploma
4	**Programme Title**	Clean Technology
5	**UCAS/Programme Code**	5028 / 3316
6	**Programme Accreditation**	Energy Institute, (EI); Institute of Environmental Management and Assessment, (IEMA)
7	**QAA Subject Benchmark(s)**	Engineering
8	**FHEQ Level**	Level 7
9	**Date written/revised**	May 2010

10 Programme Aims

The MSc and Diploma in Clean Technology was set up in 1992 to address the needs of industry in recruiting students of Science or Engineering with a broad based environmental education and understanding of the sustainable engineering practices to be employed, rather than relying on typically end-of-pipe solutions.

The programme aims:-

To provide the theoretical and practical training necessary to equip graduates with the advanced knowledge and skills appropriate for successful careers in environmental management and protection.

To allow disciplinary conversion of engineers or pure or applied scientists into sustainable engineers, where the students have an understanding of the environmental, economic and social issues associated with the operation of industrial processes and the need for and application of cleaner technologies.
It covers the environmental issues surrounding processes within organisations and businesses, including the legislative framework and explains how to minimise pollution and resource usage whilst operating a productive and sustainable company. The innovative aspects of the course revolve around the combination of taught programme with the opportunity for MSc students to carry out a practical industrially based project for their Dissertation. However students wishing to undertake research based with the School are also encouraged and have the opportunity to work with leading edge researchers in fields such as fuel cells, electrochemistry and combustion technologies

In addition to these skills the course also equips post graduates with a number of key skills including problem solving, effective communication strategies, the ability to use IT and library resources appropriately and effectively, the ability to work alone or as part of a team, to prioritise their work and meet deadlines.

The objectives of the course are to :-

- To provide the theoretical and practical training necessary to equip graduates with the advanced knowledge and skills appropriate for successful careers in environmental management and protection.
- To allow disciplinary conversion of engineers or pure or applied scientists into sustainable engineers where the students have an understanding of the environmental, economic and social issues associated with the operation of industrial processes and the need for, an application of cleaner technologies.
- To develop and improve the student's key skills alongside their academic and

technical abilities. These will include the ability to communicate and present effectively both orally and in writing, to work alone or as part of a team and to motivate and manage personnel. Where possible the students are encouraged to develop these skills as part of an industrial placement carried out with local businesses.

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.

Knowledge and Understanding

On completing the programme students should:

1. Advanced knowledge and understanding of pollution sources and impacts on the environment
2. Knowledge and understanding of modern approaches to pollution detection, control and remediation
3. Advanced knowledge and understanding of the techniques that may used to minimise resource usage, utilities and waste
4. Understanding of the principle tools and techniques used for clean design and manufacture and awareness of cleaner technologies.
5. Awareness and understanding of environmental legislation and the requirements it imposes upon industry.
6. A higher level awareness of the environmental, economic and social pressures put upon industry and demonstration of the means to achieve a more sustainable business

Teaching and Learning Methods

Teaching Strategy

Specialist knowledge and understanding is primarily imparted via lectures classes and seminars. This is supplemented by the use of industrially based case studies and workshops, (A1, 4) and site visits, (A1, 2 3 and 6), as well as lectures from industrial managers and environmental consultants, (A5, 6). Students are also strongly encouraged to attend locally arranged seminars and conferences such as those offered by the Energy Institute, IEMA or IChemE with transport being provided when required.

Learning Strategy

Students are expected to carry out directed reading and appropriate reading lists are given on all module outline forms. In addition a dedicated reading room is provided for the students, which is supplied with an up to date selection of relevant journals, books and periodicals covering all aspects of the course as well as copies of previous student Dissertations. Active involvement in case studies and workshops, (A1, 4) increases the student's awareness of the issues and concerns of both industry and the public. Observation and discussion of site visits, (A1, 2, 3, 6) aid in the development of understanding. Discussion and participation in lectures given by outside speakers, and attendance at local conferences (A5, 6) give students an appreciation of the real issues facing industry today as well as the requirement for an effective communication strategy.

Assessment Strategy

Knowledge and understanding are assessed by formal and class examinations as well as coursework and for MSc students only, preparation of a Dissertation. Written unseen examinations include essays, short answer questions, multiple choice, and some equations and calculations. Assessed coursework comprises scientific/technical reports, essays, oral and video presentations, role playing and poster presentations. For MSc students, The project element of the degree programme is assessed by Dissertation together with a poster presentation to which all examiners, industrial supervisors and lecturers are invited and where the external examiner has the opportunity to talk to all of the students.

Intellectual Skills

On completing the programme students should be able to:

1 An understanding of the practical implications of implementing and maintaining an environmental management system (EMS).

2 Auditing skills for both general environmental, waste and energy auditing.

3 The ability to measure and monitor utilities, raw materials and waste arising during industrial processing and target strategies for reduction, reuse and recycle.

4 The ability to appraise and assess data from a wide variety of sources and apply appropriate statistical techniques.

Teaching and Learning Methods

Teaching Strategy
An understanding of the requirements and implementation of an EMS, (B1) are provided both within the course Business and Environmental Managements and Practical Environmental Auditing and more extensively through the student's time spent on their industrial projects. In addition the various approaches taken by industry and commerce in addressing issues of sustainable development in a business context are widely demonstrated by the visiting lecturers during many of the modules.
Environmental Auditing, Monitoring and Targeting as well as data management skills, (B2,3,4),are taught in the modules covering Energy Management, Practical Environmental Auditing and
Business and Environmental Management

Learning Strategy
Students are given the opportunity to apply their acquired practical skills through mini audits, class exercises and where appropriate during their industrial placements.

Assessment Strategy

Specific understanding and application of the key skills is assessed through formal written examination, write ups of workshop and auditing exercises and the outcomes from the student Dissertations.

Practical Skills

The programme provides opportunity for students to develop and demonstrate:-

1 The ability to critically assess the value and limitations of cleaner technologies and waste minimisation options.

2 The ability to solve problems, bearing in mind there may be more than one solution and the chosen one must be that which will ensure a more sustainable future based on environmental protection, economic viability and social acceptance.

3 The ability to process data, seeing trends and patterns and relate this to other variables such as production figures.

Teaching and Learning Methods

Teaching Strategy
Approaches to waste minimisation and the potential applications and limitations of cleaner technologies (C1) are taught in the modules: Sustainable Design and Manufacture I and II, Clean Technology Applications, Sustainable Processing and Energy Materials Technology
The ability to solve problems and evaluate sustainable solutions, (C2) is addressed in a number of modules where case studies are used such as Business and Environmental

Management, Sustainable Industry, Sustainable Design and Manufacture I and II.

Data processing skills (C3) are taught in Basic Chemical Engineering, Energy Management, Practical Environmental Auditing

Learning Strategy
Students learn to handle and process data through practical exercises involving in particular Environmental Auditing. In addition their projects give them many instances where they have to collect, collate and handle data from a variety of sources and apply appropriate statistical techniques. Problem solving skills are employed across all elements of the course.

Assessment Strategy

Assessment is through formal essay style examinations, (C1, 2) and coursework where the practical exercises and designs are written up, (C3). The ability to solve problems is a key element of the case studies that form a key element of much of the course. .

Transferable/Key Skills

On completing the programme students should be able to:

1 The ability to communicate effectively and at all levels via written reports and/or oral presentations.

2 The ability to use library facilities and other sources of reference material

3 The ability to organise their workload and meet deadlines.

4 The ability to work efficiently and effectively as part of a team and where necessary to delegate or receive instruction.

4 The ability to analyse and understand a problem and realise that there may be more than one solution, choosing that which is most appropriate in the circumstances.

5 The ability to communicate issues concerning Sustainable Development effectively to a broad and diverse audience.

Teaching and Learning Methods

Teaching Strategy
Students are given a dedicated seminars during induction week and later in the course prior to starting their projects on report writing, use of library facilities and working effectively both alone and as part of a team, (D2,3,4). This is also detailed in the course handbook. Particular attention to the handling of oral presentations, (D1) is given during the modules Pollution Monitoring, Business and Environmental Management, Practical Environmental Auditing ,Sustainable Industry and Sustainable Design and Manufacture I and II,
The abilities to solve problems using specific tools such as decision matrixes is taught in Sustainable Design and Manufacture I (D5), although by its very nature is a subject that is covered in all case study based workshops. The course handbook goes into great details on the requirements of report and Dissertation writing, how to give oral presentations and avoidance of plagiarism.

Team work skills are discussed prior to the initiation of each workshop and through participation in modules involving group presentations, (A1, 4). Students are also given a seminar organised specifically for them by the Careers Department on presentation and interview skills and another on writing CVs. Prior to commencing their Dissertation projects, students have a session with a visiting lecturer from industry who has supervised many MSc Clean Technology students in the past who talks about what they can expect once they start

working within a company or organisation, how to conduct themselves and how to avoid any pitfalls.

Learning Strategy
Communication skills are assessed throughout the course when students are required to give oral presentations both alone or as part of a team. Feedback on these is given to the students who may have the opportunity to see themselves perform on video.
Problem solving and working as part of team is covered through involvement in workshops and case studies. The ability to see another person's point of view and communicate effectively is addressed during the workshops where students are required to role play.

Assessment Strategy

Key skills are not directly assessed but are a component of the assessment procedures for individual and groups presentations and joint and individual written reports. Presentations are marked, (by both staff and peers) on the basis of their structure, content, style and effectiveness of their communication skills.

12 Programme Curriculum, Structure and Features

Basic structure of the programme

The programme of study begins annually in September and MSc and Diploma students take compulsory and optional taught modules to a total credit value of 120. The taught element of the course ends in April. MSc students only then carry out a research project, submitted in mid August which is usually industrially or public sector based and write a Dissertation of credit value 60. The basic premise of this course is that it puts sustainable development and environmental management, into a real life commercial context. So topics such as sustainability; resource and utility use business management are common threads which run throughout the course, although there is more detail in specific modules. Many modules run as workshop type formats where group investigative work is undertaken and the students can develop their team working, communication and presentations skills. All MSc students are offered the opportunity to apply for an industrial placement of approx. 4 months where they should be able to put much of the theory into practice as well as seeing how different the "real" world is. The project undertaken on placement is written up as a dissertation.

A significant number of visiting lecturers from industry or consultancies are used in the teaching of the course. These are often people who have had students on placement before or indeed are themselves former students.

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/

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

13 Criteria for admission

The MSc programme is suitable for students with a good degree, (2:2 minimum or equivalent), in engineering or a pure or applied science subject.
Diploma students need a minimum 3rd Class or Ordinary first degree, in engineering or a pure or applied science subject. Students must also fulfil language requirements, (TOEFL 575 or above or IELTS >6.5) and provide satisfactory references.

Alternative entry qualifications

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

Admissions policy

On enquiry to the School, or on receipt of application, a letter or e-mail is sent with full details of the programme and a copy of the current year's handbook. Applicants are invited to visit the school and / or enter into correspondence with the Course Director/Administrator should they need more information.

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 the Degree Programme Director Issues relating to the programme should be raised at the Staff-Student Committee, and/or at the Board of Studies.

Pastoral support

All students are assigned a personal tutor, usually the DPD 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. MSc Clean Technology students also have the use of their own dedicated resource room which has desks and IT facilities as well as Library resources.

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

Mechanisms for gaining student feedback
Feedback is channelled via the Staff-Student Committee and the Board of Studies or directly to students verbally or by email if a faster response is required. .

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 review 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
These are available form both recent Accreditations by EI and IEMA.

Additional mechanisms

16 Regulation of assessment

Pass mark
The pass mark is 50 (Postgraduate programmes)

Course requirements

Progression is subject to the University's Postgraduate 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 (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.

Annex

Mapping of Intended Learning Outcomes onto Curriculum/Modules

Module	Codes	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**B 1**	**B 2**	**B 3**	**B 4**	**C1**	**C2**	**C3**	**D1**	**D2**	**D3**	**D4**	**D5**
Environmental Engineering for Developing Countries	CEG8107			X								X				X			**X**
Contaminated Land	CEG8608	X	X										X			X			
Biogeochemistry of Pollution Control	CEG8610	X	X							X		X	X			X			
Occupational and Environmental Monitoring	CME8001	X	X			X										X	X		
Sustainable Processing and Energy Materials Technology	CME8002			X	X					X	X	X	X			X	X		
Pollution Monitoring	CME8010	X	X			X									X	X	X	X	
Basic Chemical Engineering	CME8011	X		X							X			X	X	X	X	X	**X**
Business and Environmental Management	CME8012	X				X	X	X	X	X		X	X		X	X	X	X	**X**
Air Pollution	CME8018	X	X			X										X	X		
Energy Management	CME8019			X		X			X	X	X	X	X	X	X	X	X		
Sustainable Design and Manufacture 2	CME8035			X	X		X			X		X	X		X	X	X	X	**X**
Practical Environmental Auditing	CME8024			X		X	X	X	X	X	X			X	X	X	X	X	X
Sustainable Design and Manufacture 1	CME8037			X	X		X			X		X	X		X	X	X	X	**X**
Sustainable Industry	CME8038				X		X			X		X	X		X	X	X	X	
Clean	CME8041	X	X									X				X	X	X	

Technology Applications																			
Fuel Cell Systems I	CME8043																		
Fuel Cell Systems II	CME8044																		
Dissertation (MSc only)	CME8098						X				X	X	X		X	X		X	X
Foundations of Environmental Law and policy	LAW8035	X				X										X	X		
Renewable Energy, Hydrogen and Fuel Cell Technology	SPG8007			X						X		X	X			X	X		
Renewable Energy Biomass and Waste Technology	SPG8008			X						X		X	X			X	X		