PROGRAMME SPECIFICATION	

1	**Awarding Institution**	Newcastle University
2	**Teaching Institution**	Newcastle University
3	**Final Award**	MSc
4	**Programme Title**	Environmental Engineering
5	**Programme Code**	5038
6	**Programme Accreditation**	CIWEM, JBM, RICS
7	**QAA Subject Benchmark(s)**	Engineering
8	**FHEQ Level**	7
9	**Last updated**	May 2011

10 Programme Aims

1) To provide graduates from a variety of backgrounds with the advanced conceptual understanding, detailed technical knowledge and problem solving skills to enable them to provide clean water, treat wastewater, manage solid waste, remediate contaminated land and control air pollution, for careers in environmental industries worldwide.
2) To provide an entry route into an appropriate professional institution such as the Chartered Institution of Water and Environmental Management (CIWEM), the Institution of Civil Engineers (ICE) and the Royal Institution of Chartered Surveyors (RICS).
3) To ensure that the key skills of our students develop in parallel with their academic and technical abilities. These key skills include the ability to communicate effectively, the ability to employ IT and library resources appropriately, the ability to prioritise work and to meet deadlines, the ability to work alone and with others, and the ability to use initiative and 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 following areas. The programme outcomes incorporate elements of the QAA Subject Benchmark Statement for Engineering, particularly the enhanced learning outcomes expected of level 7 graduates. The learning outcomes most relevant to these are marked (E).

Knowledge and Understanding

On completing the programme students should:

A1 Have a comprehensive understanding of mathematical and scientific analytical methods appropriate to Environmental Engineering and research investigations

A2 Demonstrate advanced knowledge and critical awareness of Environmental Engineering theory of physical, chemical and biochemical processes and design in selected areas of study (E)

A3 Have an understanding of applications of IT to the selected fields of study

A4 Know the principles of Engineering Project Management and Design including awareness of design data and the development of a basis of design

A5 Be aware of specific examples of Environmental Engineering design with consideration of principles of Integrated Pollution Prevention and Control

A6 Be aware of management principles and business practices, including professional and ethical responsibilities and aspects of sustainability (E)

A7 Have an understanding of design, construction and operations practice and awareness of requirements for health and safety issues (E)

Teaching and Learning Methods

Acquisition of A1 and A2 is through a combination of lectures, tutorials, example classes, group and individual presentations, laboratory activities and coursework.
Outcome A3 is achieved by lectures, tutorials and, where appropriate, hands-on computer exercises. Acquisition of A4 and A5 is partly by lecture and tutorial, but depends increasingly on case studies, student investigations and oral and poster presentations. Individual investigations to greater depth are frequently needed during the design and research projects. The broader professional outcomes, A6, are taught by lectures and tutorials supporting the Environmental Engineering Design and Project Management module.
Outcome A7 is covered in lectures and developed in design tutorials, but is also central to experimental project investigations.

Assessment Strategy

Formative assessment occurs through tutorial examples, coursework and a major dissertation. The primary means of assessing factual knowledge is the closed book examination. This is supported by assessed coursework, the Design Project, and case studies, which involve oral, written and poster presentations.

Intellectual Skills

On completing the programme students should be able to:

B1 Understand and use engineering and scientific principles in the development of solutions to practical problems (E)
B2 Select and apply appropriate designs to solve problems in Environmental Engineering context
B3 Use scientific principles in the modelling and analysis of Environmental Engineering systems and processes (E)
B4 Select and develop appropriate computer based methods for modelling and analysis of problems (E)
B5 Demonstrate an appreciation of the need for multi-disciplinary inputs where appropriate, in the creation of new design criteria and analytical methods
B6 Produce solutions to problems through the application of engineering and scientific knowledge and understanding (E)
B7 Demonstrate originality in the application of knowledge (E)
B8 Evaluate critically current research (E)
B9 Evaluate current methodologies and develop critiques of them (E)

Teaching and Learning Methods

Outcomes B1 – B4 are initially encountered in lectures, laboratory and design classes and through case studies, but are developed principally during the Environmental Engineering Design and Project Management projects. Acquisition of B5 is introduced through lectures and case studies and may form a major part of the project. B6 is introduced in lectures and developed through tutorials, case studies, the design and the project. Outcomes B7-B9 will be developed through lecture material and further developed during the dissertation module.

Assessment Strategy

Unseen examinations are used to assess intellectual abilities. Assessed coursework and designs provides further opportunities to demonstrate intellect and ability. The project, which is assessed by dissertation, oral and poster presentations, provides final evidence of the levels attained.

Practical Skills

On completing the programme students should be able to:

C1 Use relevant analytical and measurement equipment

C2 Competently carry out experimental laboratory work
C3 Plan, execute and present a research project
C4 Use engineering IT tools where appropriate
C5 Design a system, component or process in an Environmental Engineering context
C6 Test innovative ideas through laboratory work or simulation followed by technical analysis and critical evaluation of results
C7 Deal with complex issues both systematically and creatively (E)
C8 Demonstrate decision making in complex and unpredictable situations (E)
C9 Make sound judgments in the absence of complete data (E)
C10 Demonstrate self-direction and originality in tackling and solving problems (E)
C11 Act autonomously in planning and implementing tasks (E)
C12 Apply engineering techniques taking account of environmental, industrial and commercial constraints (E).

Teaching and Learning Methods

Outcomes C1-C3, and C7 are acquired principally through laboratory work and experience of the project. Acquisition of C4 is initially through lectures, developed through hands-on exercises and assignments. Further individual learning may also form a significant part of the project. C5 is introduced through lectures and developed through case studies. It will frequently form a central part of the project. Lectures and tutorials provide initial experience of C6 – C11, but the project forms the principal vehicle for their acquisition. Outcome C12 is introduced through lectures. Some projects may require further individual learning in this area.

Assessment Strategy

Outcome C1 is assessed in part through coursework from teaching laboratories, and again in the Materials and Methods section of the final Dissertation. C2 and C3 are assessed in the Project Brief presentations. C4 is not explicitly assessed, but can add to the value of the Environmental Engineering Design and Project Management projects. Outcomes C5 to C8 are assessed through coursework from individual modules, and especially through the Design and Research Projects.

Transferable/Key Skills

On completing the programme students should be able to:
D1 Retrieve information from literature/databases and manipulate and present data in a variety of ways
D2 Use scientific evidence-based methods in the solution of problems (E)
D3 Be creative and innovative in problem solving (E)
D4 Effectively communicate with specialist and non specialist audiences
D5 Learn independently in a range of situations, preparing for lifelong learning
D6 Efficiently use general IT skills
D7 Manage time and resources, plan laboratory-based programmes, assess hazards and risks and work safely (E)
D8 Exercise initiative and personal responsibility
D9 Work effectively as a part of a team

Teaching and Learning Methods

Outcomes D1-D9 are introduced through examples in lectures and reinforced by coursework tasks throughout the Programme, but particularly through involvement in the Design (especially D9) and Research (excluding D9) project modules.

Assessment Strategy

Skills D1-D3 are essential to complete examination and assignments to a satisfactory standard.
Skills D4 and D6 are assessed as part of a number of coursework tasks.
Outcomes D5-D8 are essential to satisfactorily complete the Research project, which also requires command of outcomes D1-D4.

D9 is part of the assessment for some items of coursework and an essential element of the Design project assessment.

12 Programme Curriculum, Structure and Features

Basic structure of the programme

The full time MSc is a 12 month programme consisting of 180 credits. The taught component is made up of one 20 credit and seven 10 credit compulsory taught modules, and one optional 10 credit taught module (from a choice of three). This is complemented by an 80 credit research dissertation project.

Most of our taught modules are delivered as intensive one week short courses, followed by a week of further reading or coursework. The course is therefore ideally suited for those working in industry to attend on a part time basis over a longer period of ideally 2 but up to 4 years. Most of our modules are also available as one-week CPD courses.

Although most modules are designed to work as 'stand-alone' short courses, some modules (particularly the Environmental Engineering Design and Project Management and the Dissertation modules) require some prior knowledge from other modules, so for part time students, the order in which modules are taken needs to be planned in discussion with the Degree Programme Director.

The first module (Core Concepts in Environmental Engineering) provides the core knowledge and skills base for the wide range of students that embark on our Programme.

The next six taught modules introduce students to the breadth and depth of topics within Environmental Engineering, and equip them with knowledge, technical and problem-solving skills (Introduction to Practical Hydraulics, Air Pollution, Solid Waste Management, Water Supply and Treatment, Wastewater Engineering and Environmental Engineering for Developing Countries). These modules are assessed by a combination of examination and coursework.

The central 20 credit module (Environmental Engineering Design and Project Management) introduces project management and design skills and gives students the opportunity to apply knowledge and skills from other modules in a creative team project setting.

The final taught module is a choice from three (Contaminated Land, Groundwater Contamination and Remediation, and Engineering Biology through Molecular Microbial Ecology).

The research project is a chance for students to specialise, and is a challenging and rewarding experience. Students carry out their research in our own well equipped laboratories, UK field sites, in industry or overseas, and are assessed by the dissertation plus an academic poster and oral presentation.

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

Newcastle University has a tradition in training environmental engineers since 1963. Today, the demand for good environmental engineers is greater than ever, for the future of the environment, health and quality of life of the world’s population.

The Environmental Engineering Programme at Newcastle is unique in its breadth while maintaining its focus in environmental engineering. In addition to the engineering and scientific aspects, we emphasize the social, economic and institutional context in developed and in developing countries. Our industrial collaborators provide guest speakers, field visits and project support.

Central to the Programme is the Environmental Engineering Design and Project Management module, which challenges the students to apply knowledge and skills from the other modules to an unfamiliar problem and integrates project management, design skills and team working into the process.

From the start of the Programme, students are encouraged to become active student members of CIWEM, record and reflect on their professional development and consider their

route to full membership of a professional institution, through the completion of a Professional Portfolio aligned to CIWEM competencies.

Newcastle University is a world leader in Engineering Biology through Microbial Ecology. This new module has therefore been introduced to get the latest generation of tools in molecular microbial ecology into the hands of engineers. Molecular microbial ecology has the power to revolutionise our ability to monitor and design microbial methods. The students choosing this module will get hands on experience with classical molecular methods such as fluorescent in situ hybridisation (FISH), quantitative PCR (QPCR) and denaturing gradient gel electrophoresis (DGGE), and next generation sequencing technologies (454 sequencing) including crucial data de-noising and analysis.

Programme regulations (link to on-line version)

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

13 Criteria for admission

Entry qualifications

A minimum of a second-class Honours degree, or an international equivalent, in an engineering, science or related subject.

Admissions policy/selection tools

Upon receipt of a completed application form via the electronic E2R system, eligible and suitably qualified candidates are made automatic conditional or unconditional offers of places by the Graduate School. Overseas qualifications are assessed by the Graduate School using NARIC http://www.naric.org.uk/ and the 2006 Nigerian NUC university and course accreditation ratings http://www.nucnigeria.info/accre.htm. Where uncertainty exists applications are referred to the Degree Programme Director (DPD). The DPD invites all UK-based applicants to visit the School for an introduction to the Programme and tour of our facilities. Applicants not based in the UK are not required to attend an interview. Decisions are based on qualifications, references, any relevant work experience, and the applicants' personal statements.

Non-standard Entry Requirements
Candidates without the typical qualifications will be considered, especially those with relevant professional experience, but there is no Diploma entry route.

Additional Requirements

Level of English Language capability
IELTS 6.5 (or equivalent)

14 Support for Student Learning

The Student Services portal provides links to key services and other information and is available at: https://my.ncl.ac.uk/students/

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 and help with academic writing is available from the Writing Centre (further information is available from the Robinson Library).

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

Pastoral support
All students are assigned a personal tutor whose responsibility is to monitor the academic performance and overall well-being of their tutees. In addition the University offers a range of support services, including one-to-one counselling and guidance or group sessions / workshops on a range of topics, such as emotional issues 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 Board of Studies and/or the School Teaching and Learning Committee. 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, Learning and Student Experience Committee.

Programme reviews
The Board of Studies conducts an Annual Monitoring and Review of the degree programme and reports to Faculty, Learning and Student Experience Committee. The FTLSEC takes an overview of all programmes within the Faculty and reports any Faculty or institutional issues to the University 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, Learning and Student Experience 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 results from student surveys are considered as part of the Annual Monitoring and Review of the programme and any arising actions are captured at programme and School / institutional level and reported to the appropriate body.

Mechanisms for gaining student feedback
Feedback is channelled via the Staff-Student Committee and the Board of Studies.

Faculty and University Review Mechanisms
The programme is subject to the University's Internal Subject Review process. Every five years degree programmes in each subject area are subject to periodic review. This involves both the detailed consideration of a range of documentation, and a 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
The MSc Environmental Engineering degree programme is accredited by the Joint Board of Moderators (Institution of Civil Engineers, Institution of Structural Engineers, Chartered Institution of Highways and Transportation, and the Institute of Highway Incorporated Engineers) as meeting the requirements for Further Learning for a Chartered Engineer (CEng) for candidates who have already acquired an Accredited CEng (Partial) BEng (Hons) or an Accredited IEng (Full) BEng/BSc (Hons) undergraduate first degree, for intakes up to 2011. See http://www.jbm.org.uk/ for further information.

The programme is also accredited by the Chartered Institution of Water and Environmental Management (CIWEM, http://www.ciwem.org/education/accreditation) as contributing to the academic requirements for the appropriate CIWEM membership grade for students that graduate from the Programme from 2006-7 to 2012-13.

The programme is also accredited by the Royal Institution of Chartered Surveyors (RICS, http://www.rics.org.

Additional mechanisms
Strategic and pedagogical review takes place annually via School and Environmental Engineering staff group Teaching Away Days.

16 Regulation of assessment

Pass mark
The pass mark is 50%

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.

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, following recommendation from the Board of Studies. The External Examiner is expected to:

i. See and approve assessment papers
ii. Moderate examination and coursework marking
iii. Attend the Board of Examiners
iv. Report to the University on the standards of the programme

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

The University Prospectus: http://www.ncl.ac.uk/postgraduate/

The School Brochure http://www.ncl.ac.uk/marketing/services/print/publications/ordering/

Degree Programme and University Regulations: http://www.ncl.ac.uk/regulations/docs/

The Degree Programme Handbook (available via the internal website)

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

		Intended Learning Outcomes			
Module	**Type**	**A**	**B**	**C**	**D**
CEG8101	Compulsory	1	1, 9	1,2,8,9	1, 4,5,6,7,8
CEG8102	Compulsory	1,2,3	1,2,3,4,6	4,5	1,2,4,5,6,7,8
CEG8103	Compulsory	1,2,5	1,2,3,6	1,2,5,8,9,	1,2,4,5,6,7,8
CEG8104	Compulsory	1, 2,5	1,2,3,6	1,2,5,8,9,	1,2,4,5,6,7,8
CEG8105	Compulsory	1,2,3,5,6	1,2,3,5,6	4,5,8,9,	1,2,3,4,5,6,7,8
CEG8107	Compulsory	1,2,3,5,6,7	1,2,5,6,7,8,9	3,5,7,8,9,10,11,12	1,2,3,4,5,6,7,8,9
CEG8108	Compulsory	1,2,3,4,5,6,7	1,2,3,5,6,7,8,9	3,5,7,8,9,10,11,12	1,2,3,4,5,6,7,8,9
CEG8405	Compulsory	1,2,3,5	1,2,3,4,6	4,5,6,7,9	1,2,4,5,6,7,8
CEG8199	Compulsory	1,2,3,4,5,6,7	1,2,3,4,5,6,7,8,9	1,2,3,4,6,7,8,9,10,11,12	1,2,3,4,5,6,7,8
CEG8106	Optional	1,2,3,5,	1,2,3,4,6	4,5,8,9,	1,2,4,5,6,7,8
CEG8109	Optional	1,2,3,5	1,3,5,6,9	1,2,4,12	1,2,7
CEG8608	Optional	1,2,5	1,2,3,6	3,4,7,8,9,10,11	1,2,3,4,5,6,7,8,9