

## PROGRAMME SPECIFICATION



1	<b>Awarding Institution</b>	Newcastle University
2	<b>Teaching Institution</b>	Newcastle University
3	<b>Final Award</b>	MSc
4	<b>Programme Title</b>	Environmental Engineering
5	<b>Programme Code</b>	5038
6	<b>Programme Accreditation</b>	JBM, CIWEM, RICS
7	<b>QAA Subject Benchmark(s)</b>	Engineering
8	<b>FHEQ Level</b>	7
9	<b>Last updated</b>	May 2014

### 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 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.

3) To provide a programme that meets the accreditation requirements of the Joint Board of Moderators (JBM [www.jbm.org.uk](http://www.jbm.org.uk)) 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.

4) To provide an entry route into an appropriate professional institution such as the Chartered Institution of Water and Environmental Management (CIWEM [www.ciwem.org.uk](http://www.ciwem.org.uk)) and the Royal Institution of Chartered Surveyors (RICS [www.rics.org/uk](http://www.rics.org/uk)).

5) To provide a programme designed to achieve the EC<sup>UK</sup> Output Standards for Accredited Engineering Programmes and take account of the QAA's FHEQ Qualification Descriptors, the QAA Subject Benchmark Statement for Engineering, and the University's Graduate Skills Framework.

EC<sup>UK</sup> Output Standards for Accredited Engineering Programmes:

<http://www.engc.org.uk/ecukdocuments/internet/document%20library/AHEP%20Brochure.pdf>

QAA's FHEQ Qualification Descriptors:

<http://www.qaa.ac.uk/AssuringStandardsAndQuality/Qualifications/Pages/default.aspx>

University's Graduate Skills Framework:

<http://www.ncl.ac.uk/quilt/modules/gsf.htm>

### 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:

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

### **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, and developed throughout the Programme in the Professional Development in Environmental Engineering module and by participation in seminars and the involvement with the CIWEM Newcastle Young Members Group that is a requirement of the 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
- 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
- B4 Select and develop appropriate computer based methods for modelling and analysis of problems
- 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
- B7 Demonstrate originality in the application of knowledge

B8	Evaluate critically current research
B9	Evaluate current methodologies and develop critiques of them
<b>Teaching and Learning Methods</b>	
<p>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.</p>	
<b>Assessment Strategy</b>	
<p>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.</p>	
<b>Practical Skills</b>	
<p>On completing the programme students should be able to:</p> <ul style="list-style-type: none"> <li>C1 Use relevant analytical and measurement equipment</li> <li>C2 Competently carry out experimental laboratory work</li> <li>C3 Plan, execute and present a research project</li> <li>C4 Use engineering IT tools where appropriate</li> <li>C5 Design a system, component or process in an Environmental Engineering context</li> <li>C6 Test innovative ideas through laboratory work or simulation followed by technical analysis and critical evaluation of results</li> <li>C7 Deal with complex issues both systematically and creatively</li> <li>C8 Demonstrate decision making in complex and unpredictable situations</li> <li>C9 Make sound judgments in the absence of complete data</li> <li>C10 Demonstrate self-direction and originality in tackling and solving problems</li> <li>C11 Act autonomously in planning and implementing tasks</li> <li>C12 Apply engineering techniques taking account of environmental, industrial and commercial constraints</li> </ul>	
<b>Teaching and Learning Methods</b>	
<p>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.</p>	
<b>Assessment Strategy</b>	
<p>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.</p>	

### **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
- D3 Be creative and innovative in problem solving
- 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
- 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. Outcomes D4, D5 and D7 are particularly developed in the Professional Development module.

### **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. The Professional Portfolio, assessed by interview in the Professional Development module, requires the students to reflect on the majority of the Transferable Skills above.

## **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 eight 10 credit compulsory taught modules, and one optional 10 credit taught module (from a choice of three). This is complemented by a 70 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 Professional Development in Environmental Engineering module is the only 10 credit module that is not taught in a week block, and instead runs throughout the Programme. Its focus is on employability skills, and participation in seminars and the involvement with the CIWEM Newcastle Young Members Group are also a requirement of the module.

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. This is assessed by interview and forms part of the employability skills focussed module Professional Development for Environmental Engineers.

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 PG Admissions team in Kings Gate. Overseas qualifications are assessed by the PG Admissions team in Kings Gate using the database set up by the international office, supported also by NARIC <http://www.naric.org.uk/>. 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) with at least 6 in each component.

### **14 Support for Student Learning**

The Student Services portal provides links to key services and other information and is available at: <http://www.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 Development Centre (further information is available from the Robinson Library).

#### *Academic and Pastoral support*

Each undergraduate and taught postgraduate student will be assigned a personal tutor.\* A personal tutor is one part of a wider network of advice and guidance available to students to support their personal and general academic development. The module leader acts as the first point of contact for subject-specific academic advice. Thereafter the Degree Programme Director or Head of School may be consulted. Issues relating to the programme may be raised at the Student-Staff Committee, and/or at the Board of Studies. Within the academic unit, students may also receive additional academic and pastoral advice from a range of other student-facing staff including degree programme directors, dissertation/project supervisors, and administrative support staff.

\*Arrangements may vary for students taking special types of provision.

The University also offers a wide range of institutional services and support upon which students can call, such as the Writing Development Centre, Careers Service and Student Wellbeing Service. This includes 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 Student Union 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 team 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 Board of Studies and/or the School Teaching and Learning Committee. Student opinion is sought at the Student-Staff Committee and/or the Board of Studies. New modules and major changes to existing modules are subject to approval by the Faculty Learning, Teaching 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, Teaching and Student Experience Committee. The FLTSEC takes an overview of all programmes within the Faculty and reports any Faculty or institutional issues to the Faculty Learning, Teaching and Student Experience Committee.

#### *External Examiner reports*

External Examiner reports are considered by the Board of Studies. The Board responds to these reports through Faculty Learning, Teaching and Student Experience Committee. External Examiner reports are shared with institutional student representatives, through the Student-Staff Committee.

#### *Student evaluations*

All modules, and the degree programme, are subject to review by student questionnaires. Informal student evaluation is also obtained at the Student-Staff 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 Student-Staff Committee and the Board of Studies.

#### *Faculty and University Review Mechanisms*

Every six years degree programmes in each subject area undergo periodic review. This involves both the detailed consideration of a range of documentation, and a review visit by a review team (normally one day in duration) which includes an external subject specialist and a student representative. Following the review a report is produced, which forms the basis for a decision by University Learning, Teaching and Student Experience Committee on whether the programmes reviewed should be re-approved for a further six year period.

#### *Accreditation reports*

The 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. See [www.jbm.org.uk](http://www.jbm.org.uk) for further information.

The programme is accredited by the Chartered Institution of Water and Environmental Management (CIWEM, [www.ciwem.org.uk](http://www.ciwem.org.uk)) as contributing to the academic requirements for the appropriate CIWEM membership grade for students that graduate from the Programme.

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

#### *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 20 credits of the taught element and down to a mark of 40% is possible and there are reassessment opportunities, with certain restrictions. A Masters student who fails more than 40 credits of the taught element of the programme will not normally be permitted to continue or be reassessed without the support of the chair of the board of examiners.

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



**Summary description applicable to postgraduate Masters programmes**

<50	Fail
50-59	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 Website: <http://www.ncl.ac.uk/ceg/study/postgraduate/taught/index.htm>

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

Degree Programme Handbook and the School Handbook: [CeG community on Blackboard](#).

The Module Catalogue: <http://www.ncl.ac.uk/module-catalogue/>

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	Type	Intended Learning Outcomes			
		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
CEG8110	Compulsory	6,7	8	4,11,12	4,5,6,7,8
CEG8405	Compulsory	1,2,3,5	1,2,3,4,6	4,5,6,7,9	1,2,4,5,6,7,8
CEG8198	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