PROGRAMME SPECIFICATION	

1	**Awarding Institution**	Newcastle University
2	**Teaching Institution**	Newcastle University
3	**Final Award**	MSc
4	**Programme Title**	Geotechnical and Geological Engineering
5	**Programme Code**	5041 F/P
6	**Programme Accreditation**	IStructE
7	**QAA Subject Benchmark(s)**	Engineering
8	**FHEQ Level**	7
9	**Last updated**	May 2024

10 Programme Aims

1) The primary purpose of this programme is to provide graduate civil engineers and geoscientists with the advanced conceptual understanding, detailed factual knowledge, specialist technical skills and an awareness of responsibilities to society and the environment appropriate for success as an engineering geologist practicing in a range of contexts (e.g. civil engineering, mineral extraction and/or environmental industries).

2) The programme is also designed to be capable of taking graduates of other numerate disciplines, such as geophysics, engineering, physics and mathematics, and converting them into skilled engineering geologist. To this end, the programme addresses:

(i) the principles of engineering geology, and their application in a range of contexts (including civil engineering, mineral extraction and environmental)
(ii) the site investigation, testing, interpretation and reporting process
(iii) the integration of diverse geological evidence (e.g. field observation; laboratory test results; hydrogeological data; soil contamination data, etc.) in order to assess hazards and risks arising from natural and man-made phenomena
(iv) key aspects of geotechnical design, e.g. foundations, slopes, retaining walls.

3) In addition to these academic and technical skills, the programme also aims to equip its graduates with a suite of transferable skills, including 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.

4) To provide a programme that meets the accreditation requirements of the Institute of Structural Engineers (IStructE) 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.

5) To provide a programme designed to meets the standards set by the Engineering Council's Accreditation of Higher Education Programmes (AHEP3, May 2014). http://www.engc.org.uk/engcdocuments/internet/Website/Accreditation%20of%20Higher%20Education%20Programmes%20third%20edition%20(1).pdf

6) To provide a programme that develops the skills, attributes and values defined in the University's Graduate Skills Framework.
https://www.ncl.ac.uk/ltds/assets/documents/str-gsf-framework.pdf

Programme Learning Objectives

On successful completion of the programme, students will have acquired a much deeper knowledge and understanding of Engineering Geology than would be expected at undergraduate level, together with many new skills.

Specifically, students will have gained:

- An advanced knowledge and understanding of the principles of engineering geology and of their applications in a civil engineering context
- An advanced knowledge and understanding of the engineering properties and characteristics of soils and rocks
- An advanced knowledge and understanding of the site investigation process from design, through testing and interpretation, to reporting
- An advanced knowledge and understanding of the geotechnical design process, and of the design of foundations, slopes and retaining walls
- A knowledge and understanding of the application of appropriate mathematical methods and IT tools, in engineering geology
- A knowledge and understanding of construction practice and an awareness of requirements for safe operation.
- The ability to identify the geological data relevant to a given engineering scenario, generate such data from field observation or through the employment of appropriate laboratory testing techniques, and interpret these data in an engineering context
- The ability to skilfully employ appropriate numerical methods for modelling and analysing problems in engineering geology
- The ability to select and apply ideas, concepts and data, from both science and engineering, in order to generate creative and innovative designs which provide optimal solutions to geotechnical problems
- The ability to skilfully employ appropriate software to support the design of these solutions
- The ability to evaluate the quality of engineering geological data collected through the use of testing and measurement equipment in field and laboratory environments
- The ability to present and summarise such data, and to critically appraise its significance, using numerical techniques
- The ability to critically assess the value and limitations of existing information on a given subject
- 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
- 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 appropriate avenues for further study
- The ability to solve problems
- The ability to communicate by means of well prepared, clear and confident presentations and concise and grammatical written documents
- The ability to use library and other information sources skilfully and appropriately
- The ability to use IT resources skilfully and appropriately
- The ability to plan, organise and prioritise work activities in order to meet deadline
- The ability to work independently, with initiative, and also in teams

11 Learning Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas. The programme outcomes have references to the benchmark statements for Engineering.

Knowledge and Understanding

On completing the programme students should have:

A1 An advanced knowledge and understanding of the principles of engineering geology and their applications in a civil engineering, environmental and extractive industries context

A2 An advanced knowledge and understanding of the engineering properties and characteristics of soils and rocks

A3 An advanced knowledge and understanding of the application of mathematical methods in engineering geology

A4 A knowledge and understanding of aspects of construction practice and an awareness of requirements for safe operation.

A5 A knowledge and understanding of the application of geotechnical design processes in specific site developments

A6 A knowledge and understanding of the applications of computational methods in engineering geology

Teaching and Learning Methods

Specialist technical knowledge and understanding (A1-A6) are primarily imparted through lecture classes, many of which involve lecturers from industry. Lectures are supported by a range of field trips and site visits (A1-A2), tutorials (A2, A3, A4, A6), laboratory and other practical activities (A2, A4) and coursework projects (A3-A6).

Throughout the taught component of the course, students are encouraged and expected to engage in independent reading, and are supported in this by the provision of individual module reading lists. Observations and discussions on field trips and site visits (A1-A2), active participation in tutorials and practical classes (A2, A4) and engagement in coursework projects (A3-A6) all assist in the development of understanding.

Assessment Strategy

Formative assessment occurs through tutorial examples and coursework. For summative purposes, unseen examinations and project-based coursework are employed to assess factual knowledge and understanding.

Coursework involves both written and oral presentations. Some, or all, of A1-A6 (depending on topic) are also examined by means of a dissertation and presentation.

Intellectual Skills

On completing the programme students should be able to:

B1 Select and apply appropriate mathematical methods for modelling and analysing problems in engineering geology

B2 Select and develop appropriate computer based methods for modelling and analysis of problems

B3 Use scientific principles to demonstrate creative and innovative ability in the syntheses of solutions and in formulating designs for remediation of geotechnical problems

B4 Use scientific principles in the modelling and analysis of systems and processes of importance to the engineering geologist

B5 Produce solutions to problems through the application of engineering knowledge and understanding

B6 Undertake technical risk evaluation.

Teaching and Learning Methods

Understanding and experience of the analytical and testing techniques used in engineering geology (B1), are provided in the lectures, laboratory and other practical classes. Numerical skills (B1-B4) are formally taught in lectures and computer-based practical classes and are practised in design exercises.

Students are encouraged to acquire skills B1 and B2 through reflection on lectures, and active participation in the laboratory, and other practical classes. Lectures and design exercises allow students first to acquire, and then practise, their design skills (B3, B4). Familiarity with B1-B5 is reinforced, and further developed, as students apply their new skills to the analysis and solution of real problems.

Assessment Strategy

Subject specific and practical skills (B1-B5) are assessed by means of coursework exercises (e.g. calculations, design exercises, technical reports) and by unseen written examination. Some, or all, of B1-B5 (depending on topic) are also examined by means of a dissertation and presentation.

Practical Skills

On completing the programme students should be able to:
C1 Evaluate the quality of geotechnical data collected through the use of testing and measurement equipment in field and laboratory environments
C2 Present and summarise such data, and to appraise critically its significance, using numerical techniques
C3 Critically assess the value and limitations of existing information on a given subject
C4 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 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 appropriate avenues for further study
C6 Use engineering IT tools where appropriate
C7 Solve problems

Teaching and Learning Methods

Practical skills C1-C7 are developed during laboratory sessions, site investigation and design exercises and are also addressed within the individual student dissertation, whilst tutorials, field exercises and attendance at School research seminars enable skills C3-C7 to be developed further.

Assessment Strategy

Practical skills (C1-C6) are assessed by means of coursework in the form of site investigations, laboratory classes and reports, and written examinations. Some, or all, of C1-C6 (depending on topic) are also examined by means of a dissertation and presentation. C7 is primarily assessed through coursework design reports, field class exercises and a dissertation.

Transferable/Key Skills

On completing the programme students should be able to:
D1 Communicate by means of well prepared, clear and confident presentations and concise and grammatical written documents
D2 Retrieve information from literature/databases and manipulate and present data in a variety of ways
D3 Efficiently use general IT skills
D4 To plan, organise and prioritise work activities in order to meet deadlines
D5 To work independently, with initiative, and also in teams as required.
D6 Be creative and innovative in problem solving

Teaching and Learning Methods

Key skills D1-D4 are formally taught as part of the individual dissertation while opportunities may also be provided to develop all of these skills. Management of workload in order to meet deadlines (D4) is also promoted by means of coursework deadlines, whilst team working skills (D5) are developed by group exercises. These also provide opportunities for students to improve their problem-solving abilities (D6), and to extend their communication, library, IT, and time management skills (D1-D4).

Assessment Strategy

Key skills (D1-D4) are assessed via written examinations, the production of a research brief, and presentations. Communication (D1), library (D2) and IT (D3) skills, and the ability to meet deadlines (D4) work independently (D5) and solve problems (D6) are indirectly assessed by other coursework items (e.g. ground modelling exercises, technical reports, design projects), and all key skills (D1-D6) are examined by means of a project dissertation

12 Programme Curriculum, Structure and Features

Basic structure of the programme

This is a one-year full-time modular programme. It consists of 100 credits of compulsory, technical modules, 20 credits of optional modules and a 60 credit Dissertation. The taught component runs from late September to Easter, with the Dissertation submitted in August. Successful completion of the taught component is required in order for a student to progress to the Dissertation. All modules are taught in two week blocks (= 10 credits) or three/four weeks (= 20 credits) allowing students to become deeply immersed in a subject, and facilitating part-time study by students abroad or in industry.

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

This is a one-year full-time modular programme. It consists of two parts: a 120-credit *taught component*, which runs from late September until June, and a 60-credit *research project*, for which a dissertation is submitted in August. Successful completion of the taught component is required in order for a student to progress to the dissertation project.

Following induction, and introductory sessions, the technical modules which make up the taught component of this programme lead the student sequentially and logically from the principles of engineering geology through to its applications, and complete the conversion of relatively inexperienced graduates into competent consultants. The technical content of the course is closely aligned with the research interests of the staff, enabling the modules to include cutting edge material which is constantly updated.

The overseas residential Field Trip at the end of Semester 2 allows the content of the

technical modules to be applied and explored in the context of a wide range of exemplar sites.

The taught component of the Dissertation introduces the generic skills required in order to successfully initiate, carry out, and report on a significant research project and provides training in the use of appropriate statistics for data analysis and interpretation. With the guidance of the project supervisor each student will practice and develop the majority of the key skills in the course of their dissertation. Dissertations are closely aligned to the research interests of the Group and School, and may have input from industry research collaborators.

Research projects are often laboratory based, but may also involve field studies or numerical modelling work. During the project, students are usually based in the School, perhaps working in one of our established research groups, but the dissertation might entail working elsewhere, in collaboration with another industrial or academic partner. Students are encouraged and given support if they wish to seek publication of the results/findings of their dissertations.

Beyond the standard technical Engineering Geology route opportunities are provided for students to optionally follow alternative broadening paths exploring aspects of climate change and its relationship to Engineering Geology practice or business, consultancy and entrepreneurial aspects of the engineering geology.

The course is run by the 'Geotechnical and Structural Engineering' group in the School of Civil Engineering and Geosciences and is closely partnered with the sister MSc Geotechnical Engineering course. Throughout the programme students will find themselves immersed in an environment combining students from civil engineering, geological and other scientific backgrounds and cross-pollination of academic training and experience is actively encouraged.

An innovative feature of the course is that all technical modules are taught in short (generally one or two-week) blocks. These occupy students, largely full-time, until the module has been completed and students then progress to the next module. This structure enhances student learning by allowing later units to build on the concepts, knowledge and skills gained during those taught earlier and facilitates part-time study by students abroad or in industry.

Programme regulations (link to on-line version)

5041F/P

13 Support for Student Learning

Generic information regarding University provision is available at the following link.
Generic Information

14 Methods for evaluating and improving the quality and standards of teaching and learning

Generic information regarding University provision is available at the following link.
Generic Information

Accreditation reports
The programme is accredited for further learning by the Joint Board of Moderators (Institution of Civil Engineers (ICE)), Institution of Structural Engineers (IStructE) and Institution of

Highways and Transportation (IHT)). It is reviewed every 5 years following a visit from a JBM review panel made up of academics and professional engineers. The results and feedback from the JBM panel are considered by the Board of Studies.

The programme is also accredited for learning towards Chartered Geologist status by the Geological Society. It is reviewed every 5 years by a sub-panel of the Geological Society executive. The results and feedback from the panel are considered by the Board of Studies.

Additional mechanisms

15 Regulation of assessment

Generic information regarding University provision is available at the following link.

Generic Information

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

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

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

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.