1 Awarding Institution	**University of Newcastle upon Tyne**

2 Teaching Institution	**University of Newcastle upon Tyne**

3 Final Award	**BSc (Hons)**

4 Programme title	**Surveying and Mapping Science**

5 Programme Accredited by:	**The Royal Institution of Chartered Surveyors** **The Institution of Civil Engineering Surveyors**

6 UCAS Code	**H244**

7 QAA Subject Benchmarking Group(s)	**Engineering**

8 Date of production/revision	**November 2004**

9 Programme Aims:

The undergraduate degree programme, which is firmly established within the Faculty of Science, Agriculture and Engineering, aims to produce graduates with a sound knowledge and understanding of spatial data collection, analysis, management and presentation. The programme covers aspects of measuring, mapping, recording and managing information about an area which may be urban or rural, mountainous, coastal or on the open sea, and may range in size from a land parcel to a continent. The bias is towards the measurement methods used to collect information: the degree course gives a rigorous engineering-based education. Graduates are able to establish, undertake, manage and develop projects involving engineering surveying, geodesy, photogrammetry, cartography, GIS/LIS, hydrographic survey and computing and thereby follow a wide choice of professional careers within geomatics. Alternatively they may apply their skills in a range of other careers.

10(a) Programme Intended Learning Outcomes:

A Knowledge and understanding

A1 Fundamentals of measurement and spatial data collection

A2 An appreciation of the concepts of accuracy and precision in spatial data handling

A3 Knowledge of the application of spatial data in navigation, precise measurement and deformation monitoring

A4 The role of geomatics in the broad fields of engineering, applied science and technology

A5 An understanding of the impact of information technology on geomatics

A6 A good grounding in the basic sciences of mathematics, geophysics and physics

A7 Management and business practices within geomatics

A8 Professional and ethical responsibilities

A9 The academic requirements of the partner professional institutions (The Royal Institution of Chartered Surveyors and the Institution of Civil Engineering Surveyors)

B Subject-specific/professional skills

B1 Field skills: planning; observation; recording and processing; application of scientific principles in the field

B2 Programming skills

B3 Experimental design: hypothesis testing; use of equipment, hardware and software; assessment of results

B4 Project management for geomatics

C Cognitive skills

C1 Data analysis: mathematical analysis; image processing and interpretation

C2 Synthesis: appropriate data modelling and integration (including data from other disciplines)

C3 Critical analysis: appraisal of data and development of argument

C4 Research skills and independent student learning

C5 Problem solving

D Key (transferable) skills

D1 Communication: written, oral and interpersonal at a level appropriate for the target audience

D2 Teamwork: coordination, leadership and resolving conflicts both in the field and in the laboratory

D3 Planning and organisation: setting objectives; allocating resources; time management

D4 Initiative and adaptability: responding to change; working independently

D5 Numeracy: understanding and using numbers and mathematics correctly

D6 Literacy: ability to read critically and with purpose

D7 IT: effective use of a wide range of computing technology

10(b) Intended Learning Outcomes, Teaching and Learning Strategies and Methods, Assessment Strategies and Methods

A Knowledge and understanding

Successful students will have acquired knowledge of, and demonstrated understanding of:

A1 Fundamentals of measurement and spatial data collection
A2 An appreciation of the concepts of accuracy and precision in spatial data handling
A3 Knowledge of the application of spatial data in navigation, precise measurement and deformation monitoring
A4 The role of geomatics in the broad fields of engineering, applied science and technology
A5 An understanding of the impact of information technology on geomatics
A6 A good grounding in the basic sciences of mathematics, geophysics and physics
A7 Management and business practices within geomatics
A8 Professional and ethical responsibilities
A9 The academic requirements of the partner professional institutions (The Royal Institution of Chartered Surveyors and the Institution of Civil Engineering Surveyors)

Teaching strategy
The School recognises that a variety of teaching and learning methods is necessary to achieve the intended learning outcomes. The primary mechanism for teaching knowledge and understanding is by lectures, but these are strongly supported, for most modules, by an extensive and integrated practical programme. Lectures give the students basic knowledge and understanding of all aspects from above (A1 – A9), whilst practicals strengthen understanding and application in A1 – A3, A5 and A6 in particular. Other teaching methods such as fieldwork, outside visits and lectures from visiting speakers ensure that practical applications and contemporary practice in geomatics (A4, A7 – A9) are fully covered.

Learning strategy
Students are required to be active in their learning and not merely passive recipients of information. They are also encouraged to manage their own learning through research and project-based work. An increasing emphasis is placed on team working, both in the classroom and in fieldwork and practical work. Some modules explicitly concentrate on professional and practical aspects of applied geomatics, involving discussion and seminars. Student-centred learning forms a major component of several modules. Independent reading is encouraged by the provision of reading lists for all modules. Independent research work (dependent on choice of topic) can address many of the aspects listed above.

Assessment strategy
The larger proportion of assessment is undertaken by traditional closed-book, written examinations, although some modules are assessed by multiple-choice testing. A significant proportion of assessment is, however, continuous coursework assessment and this allows for formative development of knowledge and understanding.

B Subject-specific/professional skills

Successful students will have developed the following subject-specific skills:

B1 Field skills: planning; observation; recording and processing; application of scientific principles in the field
B2 Programming skills
B3 Experimental design: hypothesis testing; use of equipment, hardware and software; assessment of results
B4 Project management for geomatics

Teaching strategy
Field skills (B1) are developed through extensive outdoor practical sessions and residential fieldcourses. These also ensure that experimental and project management skills (B3, B4) are also introduced and taught. Other practical skills, including programming (B2), are taught in lectures and indoor and laboratory practical sessions.

Learning Strategy
All the skills listed above are introduced progressively throughout the three year degree programme such that considerable independence in the application of these skills is achieved by the end of the degree programme.

Assessment Strategy
Examinations assess many of the skills listed above, but it is the hands-on practical experience and the subsequent coursework which yields the major summative assessment of these skills. A major residential fieldcourse forms one discrete module whose results (both individual and team) are assessed (B1). Programming skills (B2) are similarly assessed through examination and coursework submission in specific modules. Project management (B4) is assessed in the Professional Practice module.

C Cognitive skills

Successful students will possess the following generic cognitive skills:

C1 Data analysis: mathematical analysis; image processing and interpretation
C2 Synthesis: appropriate data modelling and integration (including data from other disciplines)
C3 Critical analysis: appraisal of data and development of argument
C4 Research skills and independent student learning
C5 Problem solving

Teaching Strategy
The emphasis in this course on accurate data handling and rigorous data manipulation ensure that students quickly acquire general cognitive skills enabling them to correctly and effectively manage spatial data. Hands-on exercises promote effective data analysis and develop critical skills (C1, C3). The integration of data from numerous sources, and the implications of such integration, are also covered in detail (C2). Courses on research methods and practical research exercises ensure generic skills in research and problem solving are also taught (C4, C5). There is an emphasis on teaching skills for independent learning.

Learning strategy
Students are constantly exposed to practical work and spatial data handling. They learn through supervision, experience, discussion and consideration of case studies that data handling skills are essential for a professional geomatician. The major research project also presents an environment within which students learn a great deal about generic cognitive skills.

Assessment strategy
The cognitive skills listed above are assessed particularly in the final year research project, but other coursework submissions which detail practical work undertaken also need to show evidence of cognitive skills.

D Key (transferable) skills

Successful students will have attained the following core skills:

D1 Communication: written, oral and interpersonal at a level appropriate for the target audience
D2 Teamwork: coordination, leadership and resolving conflicts both in the field and in the laboratory
D3 Planning and organisation: setting objectives; allocating resources; time management
D4 Initiative and adaptability: responding to change; working independently
D5 Numeracy: understanding and using numbers and mathematics correctly
D6 Literacy: ability to read critically and with purpose
D7 IT: effective use of a wide range of computing technology

Teaching strategy
Many of these skills are taught, practised and assessed in a large number of modules. The 'key skills' matrix published in the student handbook demonstrates that, at every Stage in the degree programme, a significant range of core skills are taught, in formal modules and during induction week.
Written and oral presentation skills (D1) are taught explicitly in Stage 2 Design modules, as well as in tutorial elements of Stage 1 modules. Teamwork (D2) is a particular strength of this degree programme and is taught both on residential fieldcourses and in other modules where students undertake practical exercises (indoor and outdoor) in teams. Planning and organisation skills (D3) are regarded as generic and are taught specifically in research methods and professional practice modules. Techniques of initiative and adaptability (D4) are similarly addressed in the professional practice and management modules. Numeracy (D5) is specifically addressed in a range of basic and additional maths modules; Literacy (D6) is encouraged with the incorporation of reading lists into every module outline form; and IT use (D7) is taught in the vast majority of modules which rely upon digital equipment, software packages and student-written programs.

Learning strategy
Students learn about these key skills in a number of ways: they are practised in specific modules as detailed on the 'key skills' matrix published in the student handbook, and we would particularly highlight the role of communication, problem solving, teamwork and IT skills which the students are exposed to. Good study habits are engendered from the beginning of Stage 1, as induction week programmes (including a compulsory management skills residential weekend taken at the end of week 2 of Stage 1) address all these elements.

Assessment strategy

Key skills are assessed through the summative marking of a range of pieces of work, including fieldcourse reports, oral presentations, major research project submission, abstracting exercises, library and information search coursework, presentations on professional issues. The 'key skills' matrix published in the student handbook indicates the modules where these skills are explicitly assessed, but it should be noted that all coursework submission, and a significant amount of formal examination assessment, will take competence in key skills into account.

11(a) Programme Features

This is a three year full-time modular programme consisting of 120 credits per year for three years. Using university conventions, 10 credits are equivalent to 100 hours of study time (all contact hours plus private study). Students are expected to take 60 credits in each semester (half teaching year), although imbalances are permitted. Modules offered by the School can be worth 10, 20 or 30 credits, although it is possible for students on this degree programme to take some modules from outside the School: these may have credit weights which vary from this.

The compulsory and optional modules at Stage 1 give a firm foundation across the subject matter of geomatics: the study programme is shared 100% with the degree course in Geographic Information Science (F862). Students receive a full appreciation of the broad nature of the discipline and receive supporting material in areas of mathematics, computing science, with some possibilities of taking modules in geography instead. A full understanding of the integration of mathematics and computing science with the tasks of precise spatial data recording and presentation, map and image handling and accurate measurement is achieved. Practical work, seminars, a residential fieldcourse, a residential management skills course and the introduction of IT into most modules give students an in-depth appreciation of the nature of the subject and the methods by which it is taught.

Progress from Stage 1 to Stage 2 is dependent on passing all modules: modules can be re-sat and can be passed by compensation up to a maximum of 40 credits. University regulations govern issues such as number of attempts at re-sit assessment and the time period within which degree courses can be taken.

Stages 2 and 3 offer a range of compulsory and some optional modules which allow for specialisation in the areas of measurement and spatial data handling. There are opportunities to follow modules which deal with other aspects of geomatics in an integrated manner: modules in areas such as mapping, GIS, image handling and computer programming can be taken thus ensuring a wide view of the whole discipline

Many Stage 3 modules have Stage 2 pre-requisites, but it is possible to take some optional modules from the Stage 2 programme during Stage 3. Both Stages are equally weighted in the determination of the final degree classification. Progress from Stage 2 to Stage 3 requires all modules taken in the second year to be passed. However, at the end of Stage 2 re-sits for failed modules are possible and further failure of any module can be ‘compensated’ up to a maximum of 30 credits.

Stage 3 also includes a substantial 30 credit compulsory research project, to which students have been introduced through the compulsory design module in Stage 2 and in Stage 3 induction week teaching. The project requires advanced knowledge and understanding and promotes the acquisition, use and assessment of many cognitive and key skills.

Particular features of the degree programme include:

- Choice of some modules at Stage 1 (dependent on mathematics ability)

- Common Stage 1 programme with the degree course in Geographic Information Science (allowing for transfer to this degree course at the end of Stage 1)
- Possibilities of transfer the Ordinary degree in Geomatics, or the Ordinary degree in Science, for those students who fail to progress on the Honours degree course
- A balance of vocational, scientific and professional education and training
- Significant fieldwork opportunities
- Considerable exposure to advanced contemporary digital technology
- An in-depth research training and the opportunity to undertake an individual research project
- An appreciation, within a research-active university School, of the nature and impact of research activity in geomatics
- A full range of professional and management modules
- The fostering of an *esprit de corps* through team-building exercises, group work in practicals, the small and friendly nature of the geomatics part of the School and the existence of social (student Geomatics Society) and formal (Staff Student Committee) avenues of interaction.
- The opportunity, through visiting speakers and strong links with the surveying and mapping industry, to gain an understanding of the nature, scope and impact of contemporary British and international commerce and enterprise within the discipline.

Curriculum and Programme Structure

The modular structure of the programme and the curriculum, as indicated by the module titles, is laid out here. This is followed by a series of matrices which indicate the contribution of the modules to the learning outcomes.

Modules in bold are compulsory

Stage 1

Code	Value	Semester	Title
SVY 102	**(10)**	**1**	**Geographic Information**
SVY 106	**(10)**	**2**	**Fieldcourse**
SVY 108	**(10)**	**2**	**An Introduction to GPS and its Applications**
SVY 109	**(10)**	**2**	**Photogrammetry and Remote Sensing**
SVY 110	**(10)**	**1**	**Information Technology 1**
SVY 111	**(10)**	**2**	**Information Technology 2**
SVY 112	**(10)**	**2**	**Quantitative methods for geomatics**
SVY 113	**(20)**	**1 & 2**	**Surveying**
CIV 114	**(10)**	**1 & 2**	**Integrated Design I**

Other modules are taken to achieve the total of 120 credits of study. For students without A Level Mathematics at a high grade, the modules SFY001 (10) Semester 1 Basic Mathematics and SFY003 (10) Semester 1 Foundation Mathematics I must be taken.

Stage 2

Code	Value	Semester	Title
SVY 203	**(10)**	**1**	**Observation Processing and Analysis**
SVY 205	**(10)**	**1**	**Survey Mathematics**
SVY 207	**(10)**	**2**	**GPS Theory and Practice**
SVY 213	**(10)**	**2**	**Geographic Information Systems**
SVY 214	**(10)**	**2**	**Software Development for Geomatics**
SVY 218	**(10)**	**1**	**Remote Sensing - Data Acquisition and Processing**
SVY 225	**(10)**	**2**	**Photogrammetry & Laser Scanning I**
SVY 226	**(20)**	**1&2**	**Digital Methods for Topographic & Engineering Surveying**
CIV 214	**(10)**	**1&2**	**Integrated Design II**
CIV 306	**(10)**	**1**	**Elements of Economics & Business Finance**
LAW 253	**(10)**	**1**	**Law and Land Use**

Stage 3

Code	Value	Semester	Title
SVY 306	**(10)**	**1 & 2**	**Aspects of Applied Geomatics**
SVY 307	**(10)**	**1**	**Geophysical Geodesy**
SVY 309	**(10)**	**2**	**Offshore Surveying**
SVY 320	**(30)**	**1 & 2**	**Individual Research Project**

SVY 322	**(10)**	**2**	**Geophysical Surveying**
CIV 835	**(10)**	**1**	**Professional Practice**

Optional modules (subject to pre-requisites): 40 credits from the following, if not taken before

SVY 206	(10)	1	Mapping Practices
SVY 213	(10)	2	Geographic Information Systems
SVY 214	(10)	2	Software Development for Geomatics
SVY 218	(10)	1	Remote Sensing: Data Acquisition and Processing
SVY 225	(10)	1	Photogrammetry & Laser Scanning I
SVY 227	(10)	2	Databases for GIS
SVY 304	(10)	2	Cartographic Data Handling
SVY 317	(10)	2	Digital and Close Range Photogrammetry
SVY 318	(10)	2	Remote Sensing Systems and Applications
SVY 331	(10)	1	Geographic Information Users and Uses

In some circumstances, and with the approval of the Degree Programme Director, alternative modules may be added to the list of possible options. The main criterion for such approval will be that all intended learning outcomes can still be achieved.

It should be noted that during the interim year 2004/5 arrangements have been put in place to modify module delivery. In particular, some modules which were offered at Stage 2 in 2003/4 have been transformed into Stage 3 modules. These modules were taken by current Stage 3 students, during their Stage 2, so will not be offered this year.

SVY 332 (was SVY 222) (10) 1 Map Projections and Geodetic Datums
will be compulsory from 2005/6 onwards

SVY 333 (was SVY 224) (10) 2 Introduction to Programming in Java
will be optional from 2005/6 onwards

Furthermore, a new module will replace SVY317, and be compulsory for Stage 3

SVY 323 (10) 2 Photogrammetry and Laser Scanning II

These modules are not explicitly included in the matrix which follows:

Bold modules, compulsory; light modules, optional

A Knowledge and understanding	**Modules within which Knowledge and understanding are taught, practised and/or assessed**
A1 Fundamentals of measurement and spatial data collection	**SVY113, SVY106, SVY108, SVY109** **SVY226, SVY203, SVY207, SVY218, SVY225,** SVY227 **SVY307, SVY309,** SVY317**, SVY322**
A2 An appreciation of the concepts of accuracy and precision in spatial data handling	**SVY113, SVY102, SVY106, SVY108, SVY109** **SVY226, SVY203,** SVY206**, SVY207, SVY213, SVY218, SVY225** SVY304, **CIV835, SVY307, SVY309,** SVY317, SVY318, **SVY322**
A3 Knowledge of the application of spatial data in navigation, precise measurement and deformation monitoring	**SVY113, SVY102, SVY106, SVY108, SVY109** **SVY226, SVY203,** SVY206, **SVY207, SVY213, SVY218, SVY225, LAW253** SVY304, **CIV835, SVY306, SVY307, SVY309,** SVY331, SVY317, SVY318
A4 The role of geomatics in the broad fields of engineering, applied science and technology	**SVY113, SVY102, SVY108, SVY109, CIV114** **SVY226, SVY203,** SVY206, **SVY207, SVY213, SVY214, SVY218, SVY225, CIV214**, **CIV306** SVY304, **CIV835, SVY306, SVY307, SVY309,** SVY331, SVY317, SVY318, **SVY322**
A5 An understanding of the impact of information technology on geomatics	**SVY113, SVY102, SVY110** **SVY213, SVY214,** SVY227 SVY304, **CIV835, SVY306**
A6 A good grounding in the basic sciences of mathematics, geophysics and physics	**SVY110, SVY112** **SVY203, SVY205, SVY214, SVY225**
A7 Management and business practices within geomatics	**LAW253, CIV214, CIV306** **CIV835, SVY306**
A8 Professional and ethical responsibilities	**CIV114** **CIV214, CIV306** **CIV835, SVY320**
A9 The academic requirements of the partner professional institutions (The Royal Institution of Chartered Surveyors and the Institution of Civil Engineering Surveyors)	These areas of knowledge and understanding encompass the vast majority of the syllabus and are therefore introduced, practised and assessed in all the modules within the degree programmes: they are therefore not detailed here.

B Subject-specific/professional skills	**Modules within which Subject-specific/professional skills skills are taught, practised and/or assessed**
B1 Field skills • planning • observation • recording and processing • application of scientific principles in the field	**SVY113, SVY106** **SVY226, SVY207, CIV214** **SVY309, SVY322**
B2 Programming skills	**SVY111** **SVY214** SVY304
B3 Experimental design • hypothesis testing • use of equipment, hardware and software • assessment of results	**SVY113, SVY102, SVY111, SVY106, SVY112, SVY108, CIV114** **SVY226, SVY203, SVY205,** SVY206, **SVY207, SVY213, SVY214, SVY218, SVY225,** SVY227, **CIV214** SVY304, **SVY307, SVY309,** SVY331, SVY317, SVY318, **SVY320, SVY322**
B4 Project management for geomatics	**CIV114** **CIV214, CIV306** **CIV835, SVY320**

C Cognitive skills	**Modules within which Cognitive skills are taught, practise and/or assessed**
C1 Data analysis • mathematical analysis • image processing and interpretation	**SVY113, SVY102, SVY110, SVY106, SVY112, SVY108, SVY109** **SVY226, SVY203, SVY205, SVY207, SVY218, SVY225,** SVY227 **SVY307, SVY309,** SVY317, SVY318
C2 Synthesis • appropriate data modelling • appropriate data integration	**SVY113, SVY102, SVY106, SVY108, SVY109** **SVY203,** SVY206, **SVY207, SVY213, SVY218, SVY225,** SVY227 SVY304, **SVY306, SVY307, SVY309, SVY317, SVY320, SVY322**
C3 Critical analysis • appraisal of data • development of argument	**SVY113, SVY102, SVY106, SVY112, SVY108, SVY109** **SVY226, SVY203,** SVY206, **SVY207, SVY213, SVY218, SVY225, LAW253, CIV214, CIV306** SVY304, **CIV835, SVY306, SVY307, SVY309,** SVY331, **SVY320**
C4 Research skills and independent student learning	**CIV114** **CIV214** **SVY306,** SVY331, **SVY320**
C5 Problem Solving	**SVY113, SVY102, SVY110, SVY106, SVY112, SVY108, SVY109, CIV114** **SVY205,** SVY206, **SVY214, LAW253, CIV214** **SVY306, SVY307,** SVY318, **SVY320, SVY322**

D Key (transferable) skills	Modules within which key skills are taught, practised and/or assessed
D1 Communication • written (w) • oral (o) • interpersonal (I)	**(w)SVY113, (w)SVY102, (w)SVY106, (w)SVY108, (w)SVY109** **(w)SVY226, (w)SVY203,** (w)SVY206, **(w)SVY207, (w)SVY213, (w)SVY214, (w)SVY218, (w)SVY225, (w)CIV214** **(w)CIV835, (w)SVY307,** (w)SVY331, (w)SVY318, **(w)SVY320, (w)SVY322** **(o)SVY113, (o)SVY102, (o)SVY106, (o)SVY108, (o)SVY109, (o)CIV114** **(o)SVY226, (o)SVY213 (o)SVY218, (o)CIV214, (o)LAW25** **(o)CIV835, (o)SVY306, (o)SVY307,** (o)SVY331, (o)SVY317 **(o)SVY320** **(I) Interpersonal** communciation skills are introduced, practised and assessed in the vast majority of modules within the degree programmes.
D2 Teamwork • coordination • resolving conflicts • leadership	**SVY113, SVY102, SVY106, CIV114** **SVY226, SVY207, CIV214, SVY213** **CIV835, SVY307, SVY309,** SVY331
D3 Planning and Organising • setting objectives • allocating resources • time management	**SVY113, SVY110, SVY106, CIV114** **Stage 2 INDUCTION, SVY226, SVY203,** SVY206, **SVY213 CIV214, CIV306** **Stage 3 INDUCTION,** SVY304, **CIV835, SVY309, SVY320**
D4 Initiative and adaptability • responding to change • working independently	**SVY106, SVY 107, SVY108, CIV114** **CIV214** **CIV835, SVY309, SVY320**
D5 Numeracy • understanding numbers and mathematics • using numbers and mathematics correctly	These skills are introduced, practised and assessed in the vast majority of modules within the degree programmes, and are therefore not detailed here.
D6 Literacy • reading critically and with purpose	These skills are introduced, practised and assessed in the vast majority of modules within the degree programmes, and are therefore not detailed here.
D7 IT • effective use of a wide range of computing technology	These skills are introduced, practised and assessed in the vast majority of modules within the degree programmes, and are therefore not detailed here.

12 Mapping ILOs against FHEQ requirements for BSc and BEng programmes

Programme BSc in Surveying and Mapping Science

Level H (Honours undergraduate degree)

Intended Learning Outcomes

The intended learning outcomes of the award were compared to the descriptors at the Honours degree level of the FHEQ, and it was found that the former were consistent with the latter as below.

Curriculum

The links between the programme learning outcomes and the curriculum are set out in this programme specification (Section 11 above). As the programme outcomes covered the FHEQ descriptors, the latter were also covered in the curriculum.

Assessment

The links between the programme learning outcomes and assessment are also set out in this programme specification (Section 10b) above). As the programme outcomes covered the FHEQ descriptors, the latter were also covered in the curriculum.

Achievement

As students have to achieve the outcomes to gain the award, and the outcomes are consistent with the FHEQ descriptors, the provider considers that students achieve the latter. The external examiners confirmed in their reports for 2003-4 that the descriptors were met.

Codes given for Programme Intended Learning Outcomes (Section 10a in the Degree Programme Specifications)

FHEQ Attributes	***ILOs***
Honours degrees are awarded to students who have demonstrated: i a systematic understanding of key aspects of their field of study, including acquisition of coherent and detailed knowledge, at least some of which is at or informed by, the forefront of defined aspects of a discipline;	A1-A9 B1-B4
ii an ability to deploy accurately established techniques of analysis and enquiry within a discipline;	C1-C5
iii conceptual understanding that enables the student: • to devise and sustain arguments, and/or to solve problems, using ideas and techniques, some of which are at the forefront of a discipline; and	C3, C5

• to describe and comment upon particular aspects of current research, or equivalent advanced scholarship, in the discipline;	C4
iv an appreciation of the uncertainty, ambiguity and limits of knowledge;	A2, C1, C3
v the ability to manage their own learning, and to make use of scholarly reviews and primary sources (eg refereed research articles and/or original materials appropriate to the discipline).	B3, C2, C3, C4, D6
Typically, holders of the qualification will be able to: a apply the methods and techniques that they have learned to review, consolidate, extend and apply their knowledge and understanding, and to initiate and carry out projects;	B4, D2, D3, D4
b critically evaluate arguments, assumptions, abstract concepts and data (that may be incomplete), to make judgements, and to frame appropriate questions to achieve a solution - or identify a range of solutions - to a problem;	C3, C5
c communicate information, ideas, problems, and solutions to both specialist and non-specialist audiences;	D1
and will have: d qualities and transferable skills necessary for employment requiring: • the exercise of initiative and personal responsibility;	D2, D3, D4
• decision-making in complex and unpredictable contexts; and	D4
• the learning ability needed to undertake appropriate further training of a professional or equivalent nature.	C1-C5 D1-D7

13 Criteria for Admission

Students are admitted through the UCAS scheme on an individual basis but typical entrance requirements are listed below. The intention is to admit students who are highly likely to achieve an Honours degree.

The programme is designed for students with an interest in the measurement and use of spatial data and/or an interest in the science, engineering and technology of earth data collection and management. Students should therefore be committed to the application of rigorous scientific procedures in handling precise and accurate data; they should exhibit the flexibility of thought to apply their knowledge to a range of tasks; they should be aware of the integrated nature of contemporary science, engineering and technology. As students from a wide range of backgrounds are capable of meeting these requirements, admissions criteria are very broad. There are minimum science-based entry requirements, but we equally weight experience, interest and potential, as indicated on both the Personal Statement and the Referee's Report on the UCAS form.

All candidates should have at least GCSE Grade B in Mathematics if not offered to a higher level.

In addition, various combinations of higher level qualifications are appropriate:

- A level, Advanced Vocational Certificate of Education, AS level

BCC from 18 units with at least 12 units from 6- or 12- unit qualifications.

- Scottish Qualifications

ABBB at Higher grade. Mathematics required to Higher grade. Combinations of Higher and Advanced Highers accepted.

- Other Qualifications

BTEC National Diploma in any subject with 4 Level 3 passes at Merit Grade plus Mathematics at Level 3 at Distinction Grade.

Access qualifications – a module in Mathematics essential (at Credit Level for courses which are graded); modules in geographical, computer science and engineering subjects desirable (at Merit level for courses which are graded).

For mature students, it is expected that some indication of success at recent further education level is evident, along with some relevant experience in a field of science, engineering or technology.

- International Qualifications

These are accepted subject to a minimum science requirement with each candidate considered on their merits, e.g.
International Baccalaureate, minimum of 28 points with Mathematics at grade 5.

Almost all applicants will be offered a place on the basis of their UCAS application form alone (the exceptions are some mature students with non-conventional qualifications or background). All are invited to an Open Day at which they receive

a full programme of informative talks and tours, an informal personal interview and the chance to meet current students.

14 Support for Students and Their Learning

- A **comprehensive Degree Programme Handbook** is produced with a) general information about the School and its administration b) details of working practices c) sources of support d) information about the degree programme and its delivery e) details of modules and f) regulations. This Handbook is also available on the web, alongside a wide range of programme specific information, including some module material in HTML or posted on Blackboard.

- The **Induction Week Programme** offers a full and informative week for each year group covering study skills, social and development aspects, introduction to teaching and administrative aspects. For Stage 1, the induction programme includes a compulsory residential 'management-skills' weekend; there is also the opportunity to be assessed on mathematical ability and thus be guided into the most appropriate choice of mathematics (or other) modules in Stage 1. Induction week programmes are also arranged for Stages 2 and 3.

- Each student is allocated a **Personal Tutor** to provide academic advice regarding choice of modules, reflection on progress and guidance in learning strategy. Accessible at all times, they also provides a source of pastoral support, which is particularly important for overseas and mature students.

- The **Degree Programme Director** is also accessible throughout the year.

- During Stage 3 students have access to a personal **Research Project Supervisor**.

- There is a wide range of **University Support Services**, all detailed in the Student Handbook. These include a) Disability Unit b) Student Counselling Service c) Student Welfare d) Careers Service.

- The excellent **University Library** enables access to books, journals, local and on-line databases, self-tuition programmes in study skills.

- The university's **Information Systems and Services (ISS)**, through its distributed computing resources across campus, and within Halls of Residence, gives e-mail, access to the web, and use of all necessary software.

- Within the School there is access to further advanced **School Facilities**, including computing resources, and a full range of surveying, photogrammetric, mapping and geodetic equipment.

- There is a wide range of other **Learning Resources** in the form of study rooms, staff (academic and technical support staff typically work closely with all students and there is a favourable staff student ratio) and equipment (School equipment is supplemented by hired equipment when necessary for research project and fieldcourse work).

15 Assessment and progress in the degree programme

The Assessment rules are given in the *Undergraduate Examination Conventions*. The minimum pass mark is normally 40%, but there is limited compensation for marks of 35-40% at all but the final Stage. Candidates for all but the final Stage may normally repeat assessments on up to three occasions. All Honours candidates must complete one Stage before proceeding to the next**.**

Stages 2 and 3 contribute equally to the **Honours classification**. Stage 1 marks are not directly incorporated into the averaging process, the method used for degree classification. Subject to the other provisions of the *Undergraduate Examination Conventions*, the link between marks and classification is as given below:

Mark	Class of Honours
<40	Fail
40-49	Third Class
50-59	Second Class, Lower Division
60-69	Second Class, Upper Division
70+	First Class

External Examiners are involved in assessment at Stages 2 and 3. Currently, one external examiner is appointed as an academic examiner, whilst a second external examiner represents one of the accrediting bodies (RICS). Duties normally include approval of Examination Papers; vetting of in-course assessments and examination scripts; interviewing a selection of candidates in a *viva voce* prior to the June Board of Examiners; attending the June Board and participating in its deliberations; reviewing any subsequent special cases, either by correspondence or in special circumstances by subsequent visits to Newcastle; preparing an annual report with observations and recommendations; if necessary, communicating a confidential report to the vice-chancellor. The external examiners can expect a prompt response to their annual report from the Board of Studies which is charged with addressing issues which they raise.

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

The standards and quality of the programme are continuously monitored by reference to comments from students, staff, employers and external organisations including QAA. The aim is to continually ensure that the programme achieves its stated aims, meets the national Benchmarking Statement for the discipline and produces graduates in line with developments in the subject and the changing needs of employees.

a) Mechanisms for review

Student questionnaires
External Examiners' reports
Annual review of progression statistics and employment records
Detailed interaction with recent graduates, employers and accreditation bodies
Annual Monitoring and Review
Internal Subject Review
QAA Academic Review

b) Committees responsible for monitoring quality and standards

Board of Studies
Staff/Student Committee
Board of Examiners
School Teaching and Learning Committee
School Executive Committee
Faculty Teaching and Learning Committee
University Teaching and Learning Committee