PROGRAMME SPECIFICATION	

1	**Awarding Institution**	Newcastle University
2	**Teaching Institution**	Newcastle University
3	**Final Award**	MSci
4	**Programme Title**	Mapping and Geospatial Data Science Mapping and Geospatial Data Science with Year in Industry
5	**UCAS/Programme Code**	H270, H271
6	**Programme Accreditation**	
7	**QAA Subject Benchmark(s)**	Engineering, Building & Surveying
8	**FHEQ Level**	Level 7
9	**Date written/revised**	May 2021

10 Programme Aims

1. To address 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.
2. To produce graduates with a sound knowledge and understanding of spatial data collection, analysis, management and presentation.
3. To equip graduates with the ability to undertake, manage and develop projects involving engineering surveying, geodesy, photogrammetry, cartography, GIS/LIS, hydrographic survey and computing.
4. To provide a balance of rigorous vocational, scientific, engineering-based and professional education and training.
5. To provide an in-depth research training and the opportunity to undertake an individual research project, along with an appreciation, within a research-active university School, of the nature and impact of research activity in geomatics.
6. For the programme with Year in Industry, to provide practical experience of the application of both technical and transferable skills in the surveying sector workplace and recording of those skills towards professional qualification.

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 and for Building & Surveying. The mapping of intended learning outcomes onto modules is detailed in the Annex.

Knowledge and Understanding

On completing the programme students should 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 Chartered Institution of Civil Engineering Surveyors).

Teaching and Learning Methods

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.

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.

Intellectual Skills

On completing the programme students should possess the following generic intellectual skills:

B1 Data analysis: mathematical analysis; image processing and interpretation.
B2 Synthesis: appropriate data modelling and integration (including data from other disciplines).
B3 Critical analysis: appraisal of data and development of argument.
B4 Research skills and independent student learning.
B5 Problem solving.

Teaching and Learning Methods

The emphases 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 (B1, B3). The integration of data from numerous sources, and the implications of such integration, is also covered in detail (B2). Courses on research methods and practical research exercises ensure generic skills in research and problem solving are also taught in each Stage of the programme (B4, B5). There is an emphasis on teaching skills for independent learning.

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.

Practical Skills

On completing the programme students should be able to demonstrate the following subject-specific skills:

C1 Field skills: planning; observation; recording and processing; application of scientific principles in the field.
C2 Programming skills.
C3 Experimental design: hypothesis testing; use of equipment, hardware and software; assessment of results.
C4 Project management for geomatics.

Teaching and Learning Methods

Field skills (C1) are developed through extensive outdoor practical sessions and residential fieldcourses. These also ensure that experimental and project management skills (C3, C4) are also introduced and taught. Other practical skills, including programming (C2), are taught in lectures and indoor and laboratory practical sessions.

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. Major residential fieldcourses form two discrete modules, in Stage 1 and at the beginning of Stage 3, whose results (both individual and team) are assessed (C1). Programming skills (C2) are similarly assessed through examination and coursework submission in specific modules. Project management (C4) is assessed in the Professional Practice module.

Transferable/Key Skills

On completing the programme students should 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. Analytics and Statistics: understanding and applying mathematics correctly and to apply within the subject.
D6 Literacy: ability to read critically and with purpose.
D7 IT: effective use of a wide range of computing technology.
D8 Record and reflect on technical and transferable graduate skills towards professional qualification.

Teaching and Learning Methods

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 the Stage 2 CEG2721 Bim and Geospatial Data Modelling, as well as in the tutorial module in Stage 1 and the centrally delivered research module. 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, Analytics and Statistics (D5) is specifically addressed in a range of maths modules and specific mathematically focused 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. The Year in Industry placement in particular, provides students with the opportunity to develop and record professional skills in the context of the workplace (D8).

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 during Week 1 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.

12 Programme Curriculum, Structure and Features

Basic structure of the programme

This is a four year full-time modular programme consisting of 120 credits per year for four 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 content of the study programme is shared overwhelmingly with the BSc degree courses in Geographic Information Science (F862) and Surveying and Mapping Science (H244). 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 management skills course (immediately after Induction Week),

an Easter vacation residential fieldcourse, 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. The professional awareness event held during October helps Stage 1 students (and re-iterates for Stages 2, 3 and 4 students) to understand the nature of the discipline in practice.

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 (although 'core' modules cannot be compensated). 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. Through optional module choice, students have an opportunity to expand their knowledge of non-geomatics subjects.

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 40 credits.

Progress onto the MSci is possible from the BSc of GIS and SMS if the average student performance at the end of Stage 2 is at least 55%.

Students opting to spend a year on industrial placement would normally do this between Stages 3 and 4.

Students who have entered the BSc of Geographic Information Science (F862) and would like to transfer onto to MSci route after Stage 2 will be required to take some Stage 2 modules (CEG2710, CEG2705) in Stage 3 as these serve as pre-requisites for other modules in Stage 3 and Stage 4.

Stage 3 then allows all students, regardless of their original BSc or MSci programme registration, to accumulate a broad portfolio of subject knowledge and skills from across the spectrum of geomatics. These module will incorporate more subject specific modules, which will enhance the students learning, knowledge and skills in the area of Geomatics with modules, such as Offshore surveying, environmental Informatics and Geohazards. At the beginning of Stage 3 a further residential field trips will take place allowing to apply the acquired knowledge of Stage 2 in practise and combining the skills of several modules into a combined project.

Progress from Stage 3 to Stage 4 requires all modules taken in the third year to be passed. However, at the end of Stage 3 re-sits for failed modules are possible and further failure of any module can be 'compensated' up to a maximum of 40 credits.

Stage 4 includes a substantial 40 credit compulsory research project, to which students are supported with an accompanying research methods module. The project requires advanced knowledge and understanding and promotes the acquisition, use and assessment of many cognitive and key skills. The final degree classification will be determined by the combination of Stage 2, 3 and 4 average marks with weighting 1:2:3

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

Particular features of the degree programme include:

- Choice of some modules at Stage 1 (dependent on mathematics ability).
- Almost completely common Stage 1 programme with the BSc degree course in Geographic Information Science (allowing for transfer to this degree course at the end of Stage 1).
- Allows transfer from BSc Geographic Information Science and Surveying and Mapping Science.
- 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 CEG Society) and formal Student-Staff Committee) avenues of interaction; in addition to the operation of a 'buddy' system for incoming students.
- 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.
- All students have the opportunity to undertake a Year in Industry if they can secure a placement and demonstrate suitable performance and motivation by the end of Stage 2, which is again reviewed at the end of Stage 3. In addition to independent search and utilisation of the resources available through the University Careers Service, our Industrial Liaison Officer will support interested students in their efforts to secure a placement. Some students will therefore transfer between programmes with and without Year in Industry.

Programme regulations (link to on-line version)

Degree of Master of Science with Honours in Mapping and Geospatial Data Science H270 & H271
https://teaching.ncl.ac.uk/docs/regsdocs2021/documents/-RH270_H271.pdf

13 Support for Student Learning

Generic information regarding University provision is available at the following link.
https://www.ncl.ac.uk/ltds/assets/documents/qsh_progspec_generic_info.pdf

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. https://www.ncl.ac.uk/ltds/assets/documents/qsh_progspec_generic_info.pdf	

15 Regulation of assessment
Generic information regarding University provision is available at the following link. https://www.ncl.ac.uk/ltds/assets/documents/qsh_progspec_generic_info.pdf

In addition, information relating to the programme is provided in:
The University Prospectus: http://www.ncl.ac.uk/undergraduate/degrees/#subject 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.