

Programme Specification¹



UNIVERSITY
of
GLASGOW

1. Programme Title:	MSc Geospatial and Mapping Sciences
2. Final Award and SCQF level and credits:	MSc, 180 credits @ SCQF level 11 PG Diploma, 120 credits @ SCQF level 11 PG Certificate, 60 credits @ SCQF level 11
3. Awarding Institution:	University of Glasgow
4. Teaching Institution (if different):	
5. Faculty:	Physical Sciences
6. Department:	Geographical & Earth Sciences
7. Programme accredited by:	Royal Institution of Chartered Surveyors Institution of Civil Engineering Surveyors International Hydrographic Organisation (pending)
8. UCAS Code:	not applicable
9. Entrance requirements:	Normally a second class Honours degree in an appropriate subject (e.g. Civil Engineering, Computing Science, Geography, Earth Science, Mathematics, Physics) Mature applicants with industrial experience may be admitted to the PGC or PGD in the first instance <i>Please refer to the current graduate prospectus at: http://www.gla.ac.uk:443/studying/pg/prospectus/index.cfm</i>

¹ This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if full advantage is taken of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each course can be found in course handbooks and other programme documentation and online at <http://www.gla.ac.uk>

The accuracy of the information in this document is reviewed periodically by the University and may be checked by the Quality Assurance Agency for Higher Education.

10. Programme aims

The programme is intended to prepare those with qualifications in cognate disciplines for employment or further study in Geomatics, with particular emphasis on land and hydrographic surveying, and to meet the requirements for membership of appropriate professional bodies. The programme has been developed in close collaboration with industry to meet the global demand for professionals in this field. It is structured to allow a number of part-time routes to different qualifications.

Its primary aims are:

- To provide a sound knowledge, understanding of the theory, instrumentation, methods, and practice of Geomatics and Geospatial Information handling;
- To enhance students' conceptual, analytical and generic skills and to apply them to surveying and mapping tasks;
- To provide a vocational course which will enable participants to improve their career prospects and encourage their professional development;
- To produce graduates able to contribute to strategic decision making and the development of the profession.

More explicit aims are given for each individual course; overall aims for the PG Certificate and PG Diploma are similar, but more limited in scope.

11. Intended Learning Outcomes of Programme

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

Knowledge and Understanding

- Explain the fundamental theories and concepts that underpin Geomatics;
- Describe the equipment and methods used in Geomatics for a wide range of tasks;
- Discuss current research issues in Geomatics;
- Explain the needs of society for effective and accurate Geospatial Information

Skills and Other Attributes

Subject-specific/practical skills

- Select and use appropriate methods and equipment to solve problems in a wide range of situations relating to the capture, processing, management and presentation of Geospatial Information;
- Access and critically assess literature and other information on Geomatics;

Intellectual skills

- Analyse situations requiring Geomatics solutions and make recommendations;
- Assess alternative solutions to problems and make appropriate choices;
- Carry out selected research tasks in Geomatics with minimal supervision;

Transferable/key skills

- Plan projects and manage time effectively;
- Work independently or as part of a team to solve practical problems;
- Present outputs in appropriate ways, including verbally, written reports and graphically;
- Communicate effectively with both specialist and non-technical providers and users of Geospatial Information;

Use a wide range of IT, both generic and subject specific.

12. Assessment Methods

The programme uses a wide range of assessment methods with most courses using a number of different assessments. Each course is assessed separately using the appropriate methods for the learning outcomes as detailed in the individual course descriptions.

- Examinations are used to assess technical knowledge and understanding; as this is a key element of many first semester courses, the examinations at the end of that semester reflect the need for factual knowledge.
- Practical assessments are present in the majority of courses and focus on competence to carry out tasks and are often linked to reports which show ability to communicate effectively the results of tasks.
- As the programme progresses, assessment focuses more on reports and presentations, although for some courses examinations remain key elements.

In summary, progress is assessed at the end of Semester 1 for each course with examinations contributing approximately 50% overall. Progress at the end of Semester 2 includes about 30% examination. The final stage of the MSc programme is assessed by a substantial report on a major individual project.

13. Learning and Teaching Approaches

The programme uses a wide range of teaching and learning methods. Individual courses vary in approach, contact hours and assessment depending on the nature of the topics covered and the position in the programme.

In Semester 1 lectures and short, focused, practical sessions predominate in order to introduce the core factual knowledge and skills; this is supported by textbooks, direct reference to specific reference material (both academic and technical manuals) and by short written reports on activities.

In Semester 2 this approach continues in some courses, but there is increased reliance on investigation, self study, seminars and more in-depth analysis of topics. Subject specific skills are developed through more extended practical projects and research skills are developed. Students will consult a wider range of literature (both hard copy and electronic).

The majority of courses involve formal classroom contact, but in addition to tutor led practical exercises there is some use of e-learning where appropriate and opportunities will be taken to develop this further to allow greater flexibility in learning.

As subject specific practical skill is a key outcome of the programme, significant emphasis is given to building these skills in the first two semesters and consolidating them with a week long field course where students will complete and report on a survey project with minimal supervision.

Team work is an important feature of the subject and will be integral to many aspects of the course, although the majority of assessment will be of individual outputs to ensure students are fully engaged in the process.

14. Relevant QAA subject benchmark statements and other external or internal reference points:

There is no relevant benchmark.

The programme is accredited by the RICS (Geomatics Faculty) and the Institution of Civil Engineering Surveyors. Accreditation will be sought from the International Hydrographic Organisation.

The curriculum was informed by documentation from the International Marine Contractors Association and by significant input from the Scottish Geomatics industry.

15. Programme Structure and Features

The programme structure is intended to be suitable for both full-time study and flexible part-time study options. It is composed of courses worth a multiple of 10 Scotcat Credits at Level M (2 Scotcat Credits approx = 1 ECTS). Ten credits represents approximately 100 hours of student effort including contact hours, practical exercises, preparation, private study and assessment. Formal teaching, including lectures, scheduled practicals, tutorial and seminars typically constitutes about 15-25 hours (3-5 hours per week) in each course with the additional time being devoted to private study. Some courses are split into two 5-credit parts; both must be completed to obtain credit.

The PG Certificate programme normally extends over 1 semester (13 weeks), the PG Diploma over one academic session (32 weeks including 5 weeks vacation) and the MSc over 48 weeks, including 7 weeks vacation, or part-time equivalent.

All programmes start in mid-September. Formal teaching is normally limited to 3 days per week, but attendance may be required for practical classes on other days and full-time students are expected to devote 40-50 hours per week to their studies.

	Day 1	Day 2	Day 3
Week 0	Intro to programme	Intro to programme	
Semester 1A Weeks 1-5	Survey Fundamentals (10 credits)	Fundamentals of Geomatics I (5 credits) IT Applications & Terrain Modelling I (5 credits)	Principles of GIS (10 credits)
Week 6	Private study	Private study	Private study
Semester 1B Weeks 7-11	Survey Instrumentation & Methods (10 credits)	Fundamentals of Geomatics II (5 credits) IT Applications & Terrain Modelling II (5 credits)	Photogrammetry & RS (10 credits)
Week 12	Private study	Private study	Private study
Week 13	Exam	Exam	Exam
Semester 2A Weeks 14-18	Hydrographic Survey (10 credits)	Engineering Survey (10 credits)	Land Registration and LIS (10 credits)
Week 19	Private study	Private study	Private study
Semester 2B Weeks 20-24	Topics in Geomatics (10 credits) (<i>see below</i>)	Research & Professional issues (10 credits)	Geodesy & GNSS (10 credits)
Week E1	Field Course (0 credits)		
Week 25	Private study	Private study	Private study
Week 26	Exam	Exam	Exam
Weeks 27-42	MSc Project (60 credits)		

Semester 2 Topics in Geomatics – choose 2 of: (electives available may vary from year to year)

National Spatial Data Infrastructures Land Administration	Applications & research in Photogram & RS Applications & research in Engineering Surveying Applications & research in Hydrographic Surveying
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Brief Description of Courses

Fundamentals of Geomatics (I & II)

This course covers key underlying principles of geospatial data and its processing, including geodesy and essential mathematics & statistics.

- The size and shape of the Earth
- Plane Geometry & 2D coordinates; 2D coordinate transformations
- Datums and 3D coordinate systems
- Plane and Spherical Trigonometry
- Basic statistics and their application to geospatial data
- Map projection systems and their use
- VBA Programming (for coordinate and projection transformations)
- Vectors; Matrices; Solution of Equations
- Calculus; Principles and use of Least Squares
- Data quality
- Areas, volumes & conic sections

Principles of Land Survey

This course aims to introduce the basic principles, instrumentation and methods of land surveying.

- Basic survey concepts
- Horizontal and vertical control for surveying, including GPS networks & control
- Methods of detail survey
- Basic survey instrumentation – the total station; levels; GPS.
- Observation methods, booking methods, electronic recording, survey abstracts, data reduction
- Survey computations – bearing & distance, intersection, resection.

Principles of Geospatial Information Systems

This course introduces the nature and use of GIS.

- The nature & classification of geospatial phenomena and data
- Geospatial data models and data structures
- GIS operations and basic spatial analysis
- Designing and building geospatial databases
- Basic map design & visualisation
- GIS applications

Land Survey Instrumentation & Measurement

This course builds on the introduction in Survey Principles, covering the design & use of survey instrumentation, advanced computations and survey operations

- Total station design, calibration and user testing
- Traverse observation, computation and adjustment
- Design and use of scanning devices and other instrumentation
- Survey network adjustment
- Planning survey operations, including survey specifications
- Reporting on survey operations
- Products of survey operations

IT Applications and Terrain Modelling (I & II)

The first part of this course focuses on the aspects of Information Technology necessary to support

modern mapping operations; the second part covers the processing and presentation of 3 dimensional data relating to terrain and other surfaces.

IT Applications

- Introduction to IT systems and general purpose software
- Information coding systems, data storage and backup procedures
- Data communications and interfacing survey instrumentation
- Data formats used in surveying & mapping
- IT standards and metadata for Geospatial Information
- CAD

Terrain & Surface Modelling

- Surface sampling strategies and data sources
- Spatial interpolation methods
- Terrain representation and visualisation
- Applications of terrain models
- 3D GIS and solid modelling

Photogrammetry & Remote Sensing

The first part of this course examines the processes involved in the capture of geospatial data from aerial and space born platforms; the second part focuses on the use of these techniques in survey and mapping applications.

- Photogrammetric cameras and imaging platforms, recording media
- Air photo distortion and displacement
- Terrain height determination; Parallax equation
- Photo orientation; Collinearity equations
- Space resection and photo control, camera calibration
- Photogrammetric mapping project planning, aerotriangulation
- Digital photogrammetry and orthophoto production
- Engineering applications of photogrammetry;
- Convergence of photogrammetry, satellite remote sensing and LIDAR.
- Remote sensing imaging systems, data, sources
- Image enhancement, image analysis

Hydrographic Surveying

This course introduces the particular issues, equipment and methods involved in surveying at sea and supporting offshore engineering projects.

- The sea as a working environment, tides, currents, etc.
- Hydrographic charts
- Navigation and positioning techniques and accuracies
- Acoustic theory
- Hydrographic survey instrumentation
- Hydrographic data processing
- Applications

Engineering Surveying

This course covers the specific requirements and techniques involved in engineering site survey.

- Engineering survey geometry
- Setting out engineering projects
- Deformation monitoring
- Engineering applications and survey output requirements

Land Registration/Cadastral and LIS

In many parts of the World the determination and management of property boundaries and land registration is a key role for surveyors. This course covers the nature of boundaries and the development

and use of Land Information Systems.

- The nature of land and boundaries
- Adjudication, delimitation and demarcation of boundaries
- International (land, maritime, riverine) and property boundaries
- Land Registration & Cadastre; Scotland and international comparisons
- Survey and Mapping for Cadastre
- Land & Survey Law
- Land Information Systems; design and implementation
- VBA programming for Customising GIS/LIS
- Data quality and error propagation in GIS/LIS

Geodesy & GNSS

A more advanced level course in Geodesy & Satellite positioning systems, including mathematical & computational issues.

- Sphere, Spheroid & Ellipsoid
- Astronomical & Geodetic co-ordinate systems
- Terrestrial Reference Systems & Frames
- Geodetic transformations
- GNSS
- Geodetics & GNSS Networks
- Quality issues in GNSS
- Basic Geophysics

Research and Professional Issues in Geomatics

The research component focuses on the preparation of proposal for the MSc project. The nature of the profession and issues related to working in the profession are covered in the other component which will take the form of a series of talks from senior individuals from industry, including participation in the CPD programmes of the professional institutions.

Research methods

- Key research areas in Geomatics
- Library skills for researchers
- Assessing published information
- Preparing a research/project proposal
- Presentation skills

Professional Issues

- The nature of the Geomatics industry, professional qualifications and career paths
- The business of Geomatics
- Topical issues in Geomatics
- Attendance at RICS/ICES CPD meetings (this will be spread throughout the year)

Topics in Geomatics

The course gives students a chance to choose two topics of particular interest to them and to investigate these in greater depth. The range of topics may vary from year to year and will involve significant contribution from invited experts.

Likely topics (in 2007-8): National Spatial Data Infrastructures; Land Administration; Applications & research in Photogram & RS; Applications & research in Engineering Surveying; Applications & research in Hydrographic Surveying.

Programme characteristics

The first semester is an intensive introduction to the theory and practice of Surveying and Geospatial information handling. Emphasis is on factual knowledge and gaining key subject skills. Assessment is predominantly by short assessed practical exercises and examination.

Semester 2 expands on the core knowledge with more advanced and applied subjects, consideration of the subject and its relationship to society, and research skills. There is some choice in topics of study. Greater emphasis is given to independent investigation, seminar presentations and reports, with less emphasis on examination. There is also a 1 week field course which consolidates practical knowledge in an intensive week of survey planning, observation, data processing and presentation of results.

The MSc project may take one of three forms:

- an extended practical application task requiring extensive use of well know methods to produce a specified product;
- a development project where the main purpose is to design and implement a new approach to a well understood problem;
- a research oriented project where the main aim is to experimentation or investigation into a Geomatics topic.

Examination & Progress (there may be slight variations for part-time students)

To progress, candidates are required to achieve an overall D grade average in 60 credits at the end of the PG Certificate stage (Semester 1) with no course with a grade below E. If necessary resit examinations or coursework re-submissions will be organised early in Semester 2 to allow progress.

To progress to the MSc Project stage, candidates are required to achieve an overall C grade average in 120 credits at the end of the PG Diploma stage (Semester 2) with no course with a grade below E. If necessary resit examinations or coursework re-submissions will be organised early in the summer to completion of the PG Diploma.

Awards

The PG Certificate requires an overall average grade of D over the best 60 credits (normally Semester 1 courses, but other combinations with permission) with not less than 40 credits at Grade D or above.

The PG Diploma requires an overall average grade of D in 120 credits, with not less that 80 credits at Grade D or above.

The MSc requires an overall average grade of C (with no more than 45 credits at Grade E and none below Grade E) in all the taught courses (semester 1 & 2) and a Grade D or better in the MSc Project.

The PGC, PGD and MSc may be awarded with merit or distinction as specified in the UofG generic regulations for taught postgraduate programmes.

16. Additional relevant information

The Department has extensive IT facilities with both standard office software and specific software to support teaching of Geomatics, including: ArcGIS, AutoCad, MapInfo, n4ce, SocketSet; StarNet, etc. A suitable range of equipment is available including total stations, GPS, photogrammetric workstations, etc., and additional state-of-the-art equipment is hired for the field course. There are also hands-on demonstrations of the latest equipment by industry and equipment manufacturers.

The University Library maintains a wide range of reference material, including appropriate journals and a wide range of digital map data is available through services such as Digimap.

The programme is strongly supported by the professional institutions; participation is expected in the CPD programmes of these organisations. Students are encouraged to become student members of appropriate organisations and preparation for full membership of professional institutions will be discussed in the later stages of the programme.

There is a high demand for well qualified individuals in this field both in Scotland and globally. Visits will be arranged to offices of some companies or senior staff will give presentations about the activities and employment opportunities in their company.

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