MSc in Geoinformation Technology & Cartography

Mapping in a GIS Environment

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	Principles of Cartographic Design & Production (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	Visualisation & Map Use (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	GIS & Social Policy (5 cr) Topics in Geomatics I (5 credits)	Mapping Technology & Applications (10 credits)	Land Registration and LIS (10 credits)
Week 19	Private study	Private study	Private study
Semester 2B Weeks 20-24	NSDI (5 credits) Topics in Geomatics II (5 credits)	Research & Professional issues (10 credits)	Applied GIS (10 credits)
		GIS Research Conference (0 credits)	
Week 25	Private study	Private study	Private study
Week 26	Exam	Exam	Exam
Weeks 27-42	MSc Project (60 credits)		

Brief Description of Courses

Fundamentals of Geomatics I

This course covers key underlying principles of geospatial data and its processing, including geodesy and essential mathematics & statistics and an introduction to IT applications in Geomatics

- 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
- 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

Fundamentals of Geomatics II

Further mathematical principles and applications and an introduction to Digtial Terrain Modelling

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

Principles of Cartographic Design & Production

This course introduces the key issues in the design and production of maps.

- Cartography & geovisualisation
- Map design principles
- Colour
- Generalisation
- Names on maps
- Map production technology and methods
- Introduction to producing maps with Illustrator

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

Map use and visualisation
This course examines the design of maps in a variety of application areas and considers map use and user issues.

- Visual perception & map use
- Map evaluation & user issues
- Applied cartography
- Maps & the internet
- Applied map design with Illustrator

Photogrammetry & Remote Sensing
This course examines the processes involved in the capture of geospatial data from aerial and space born platforms; it also reviews the use of these techniques in survey and mapping applications.

- Photogrammetric cameras and imaging platforms, recording media
- Air photo distortion and displacment
- 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

Land Registration/Cadastre 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

Applied GIS
Population & statistical mapping

- The nature of the data – census & other surveys
- Mapping techniques
- Using MapInfo to investigate mapping techniques
- Population analysis

GIS virtual placement

- An e-learning module where the student is ‘employed’ by a virtual company to carry out a GIS analysis project

Internet & Mobile GIS

Web mapping

- Principles of web map servers and internet GIS
- How maps are created for distribution via the internet
- Formats, protocols and web-based application
- User interface design
- Design of maps for the internet

Mobile GIS

- Introduction to GPS
- Data communications
- Location Based Services (LBS)
- Design for small screens

Geopatial Data Infrastructures and Land Administration

GDI

- Geospatial data infrastructure principles & policies
- The UK National GDI – history & current policies
- Examples of non UK GDI

Land Administration

- the nature and importance of land ownership, land tenure and associated rights;
- the principles of cadastre and land registration;
- frameworks for land administration;
- the role of the Geomatician in land administration.

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/AGI CPD meetings (this will be spread throughout the year)

Topics in Geomatics (I & II)

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,. These will involve significant contribution from invited experts. Topics will vary from year to year, but indicative subjects include:

Atlas cartography; Public transport mapping; Applications in Photogrammetry; Map editing in ArcGIS; Remote Sensing for environmental monitoring; Research in Cartography.

MSc Project

The MSc project is an extended piece of work carried out largely independently over a period of 3-4 months. Students are encouraged to carry out projects in collaboration with industry, or in support of research projects within the Department of Geographical & Earth Science and other University department