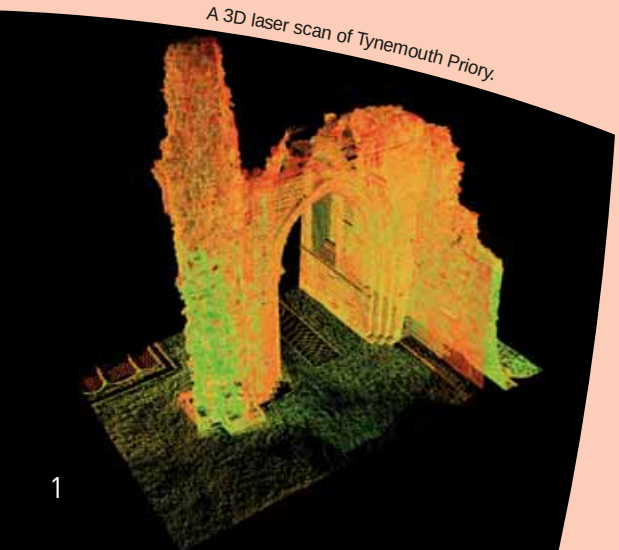
Newcastle University

Undergraduate Study

Geomatics

Geomatics

- How do satellite navigation systems work?
- How do we ensure construction projects match their design?
- How do we know the Earth's continents move?
- If we look at the Earth from space what can we see?
- How do we make maps of the land and sea?



A 3D laser scan of Tynemouth Priory.

What is geomatics?

Geomatics is the study of the land and sea using surveys, mapping and Geographic Information Systems (GIS) to build a highly accurate digital profile of our environment. This is then used to make informed decisions about the best places to build roads, bridges, buildings, offshore oil rigs and much more besides. Geomaticians also use satellite, laser and 3D technology to create the maps of tomorrow.

The questions asked here are just a sample of those investigated by geomaticians, and are explored within our specialist geomatics degrees. At Newcastle University we offer Single Honours degrees in Surveying and Mapping Science or Geographic Information Science.

Geomatics students visiting the 2012 Olympics to learn about the site's development.

Tell me more...

Geomatics is a broad and interesting subject area, and is taught at only a handful of institutions in the UK. We use a variety of techniques to obtain information about the positions and attributes of places and features including: field surveying; positioning from satellite systems such as Global Positioning System (GPS) for navigational purposes, mapping and collecting photographic imagery; and airborne and ground-based sensors. Geomatics is not just land based – techniques are also applied in the offshore environment to allow for surveying and mapping out at sea, and are relevant to a host of other features such as dams, industrial and engineering components and buildings.

Away from the field, we can interpret and measure images of the world around us, using methods of remote sensing and photogrammetry. Geomatics invariably uses computers to store, manage, analyse and present the data that has been collected. A variety of computing science methods is involved, from basic computer programming to the design and use of information systems. The presentation of maps using computers is part of contemporary cartography, but other techniques of computer graphics are also used including virtual reality and multimedia.

The use of GIS is widespread, from local authorities to commercial retailers, whilst the raw data collected in the field can be used for engineering surveying and environmental (including geophysical) purposes. Even legal matters, such as land registration, are of interest to the geomatician.

Accreditation

The Royal Institution of Chartered Surveyors (RICS) has accredited the extensive vocational training we offer. All our graduates receive exemption from the written examinations of the Geomatics Faculty of RICS. After two years' approved experience and evidence of professional competence, you can become a member of RICS. The Institution of Civil Engineering Surveyors (ICES) also validates our degree programmes.

www.rics.org.uk
www.ices.org.uk

Using GPS and remote sensing techniques to survey the impact of underground pipelines on crops.

Why study geomatics at Newcastle?

Excellent teaching and research: the National Student Survey (NSS) shows our student satisfaction levels are amongst the best in the country. Our staff are also actively involved in high-quality research – the 2008 Research Assessment Exercise (RAE) showed our research to be world leading and internationally excellent. Our research in turn feeds into the teaching of our undergraduate degrees.

First-class facilities: the quality of our computing and technical facilities is very high. We have a variety of field instrumentation, GPS positioning equipment, a wide range of photogrammetric and image-handling software and hardware, extensive computing facilities and all the software needed to perform computer-aided design, image processing, mapping, GIS analysis, network computation, desktop publishing, standard surveying and photogrammetric computations.

Friendly atmosphere: we are a relatively small subject area so staff and students get to know each other well, starting with an 'away weekend' at the beginning of the first term. Students have the chance to contribute to the running of our degrees through representation on the staff–student committee and board of studies. The School's student-run society, CEGSOC, also organises various social and course-related events throughout the year.

Links with employers: we have strong links with employers, many of whom come on campus to visit geomatics students during their studies. Some companies offer bursaries, as well as the opportunity to undertake summer placement work.

Overseas opportunities: it is possible for our students to spend a period of study abroad during the course of their degree as a result of our association with a number of overseas universities.

Students working on Google Earth in our specialist geomatics laboratory.

Teaching and assessment

Although we emphasise the integrated nature of all the subjects in geomatics, each module tends to address a specific area and is taught using varying proportions of fieldwork, lectures, laboratory sessions, seminars and visits. Practical work is obviously an important feature of our degrees. In order to successfully acquire the skills you need, you will use modern technology and contemporary spatial and spectral data-handling equipment.

Assessment is by a combination of course work and examinations at the end of each module. Course work is based both on practical work and independent investigative study. In addition, an independent research project forms part of each degree programme during Stage 3. Emphasis is placed on the development of personal and key skills, ensuring that students become proficient communicators, skilful IT professionals and efficient team workers.

Our degree programmes extend over three Stages, with each Stage corresponding to one academic year. The academic year is divided into two semesters, with an assessment period at the end of each.

> Perhaps the most important feature I've found whilst studying at Newcastle is the friendly atmosphere, especially with lecturers on my course who are always available to help.
>
> The facilities available for students here are amazing and it's not often that you can't find advice with any queries that you have. The library is comprehensive and the computing facilities are also second to none.
>
> David Alderson, recent graduate, Geographic Information Science BSc Honours

Students undertaking a control survey.

Stage 1 is common to both degrees. More specialised modules are completed in Stages 2 and 3, depending on which programme you are studying, although some modules are common to both degrees through all the Stages. For more information about what you will study at Stages 2 and 3, see pages 7 and 8 with descriptions of the nine broad themes on which modules are based.

Surveying and Mapping Science BSc Honours

UCAS code H244

In Stages 2 and 3 Surveying and Mapping Science students generally take modules which emphasise spatial data measurement, manipulation and analysis. Students with an interest in modern technology, mapping fieldwork and engineering are encouraged to follow this degree programme.

Geographic Information Science BSc Honours

UCAS code F862

In Stages 2 and 3 Geographic Information Science students generally take modules that emphasise spatial data modelling, management and presentation. Students with an interest in computing, mapping and geography and environmental management are encouraged to follow this degree programme.

Stage 1

Surveying (20) covers an introduction to land surveying and techniques of measurement in the field.

Field course (20) is a residential course putting into practice techniques learnt during the year.

An introduction to GIS (10) includes an examination of the data that appears on maps.

An introduction to GPS and its applications (10) looks at positioning using satellite technology and the Global Positioning System (GPS).

Photogrammetry and remote sensing (10) deals with measurement from aerial photographs and satellite images for mapping purposes.

Programming for engineers and scientists (10) introduces the role of computers including programming in Visual Basic.

Quantitative methods for geomatics (10) considers the basic mathematical constructs needed in geomatics.

CAD concepts (10) is a hands-on introduction to computer aided design.

Optional modules (20) are either taken in mathematics or, depending on previous qualifications and your background in mathematics, in another subject such as geography.

Students on the Stage 1 field course in the Lake District.

Stage 2

Surveying and Mapping Science

Digital methods for topographic and engineering surveying (10)

Offshore surveying (10)

Map projections and geodetic datums (10)

Survey mathematics (10)

Observation processing and analysis (10)

Photogrammetry and laser scanning I (10)

GPS theory and practice (10)

Remote sensing – data acquisition and processing (10)

Geographic information systems (10)

Software development for geomatics (10)

Law and land use (10)

Research methods (10)

Geographic Information Science

Geographic information systems (10)

Databases for GIS (10)

Mapping practices (10)

Digital methods for topographic and engineering surveying (10)

Map projections and geodetic datums (10)

Observation processing and analysis (10)

Photogrammetry and laser scanning I (10)

Remote sensing – data acquisition and processing (10)

Software development for geomatics (10)

Law and land use (10)

Research methods (10)

Optional module (10) chosen from geomatics modules

Stage 3

Surveying and Mapping Science

Individual research project (30)

Surveying and mapping field course (20)

Aspects of applied geomatics (10)

Professional practice (10)

Geohazards and deformation of the Earth (10)

Advanced geodesy (10)

Photogrammetry and laser scanning II (10)

Optional modules (20) chosen from geomatics or related subjects

Geographic Information Science

Individual research project (30)

GIS field course (20)

Aspects of applied geomatics (10)

Professional practice (10)

Advanced geoinformatics (20)

Remote sensing systems and applications (10)

Optional modules (20) chosen from geomatics or related subjects

Please note: at each Stage you complete modules to the value of 120 credits, and the credit value of each module is given in brackets. Modules are subject to additions and amendments on an annual basis.

Stage 2 and 3 modules are taken from nine broad themes, which are described below:

Surveying

Further surveying work is covered in **Digital methods for topographic and engineering surveying** and the **Surveying and mapping science field course**, which provide an understanding of how digital survey data flows from field measurement to the client's computer-aided design systems. Specialist survey and design activities, involving significant levels of practical exercises and fieldwork, are undertaken. **Offshore surveying** covers hydrographic survey and seabed mapping.

GIS

The impact of GIS is covered in a practical manner by the module **Geographic information systems**, which aims to give an in-depth understanding of, and competence in, a GIS software package such as ArcGIS or IDRISI. The **GIS field course** considers problem solving with implications of, and practical applications for, GIS technology. The importance of database technology to the GI scientist is covered in **Databases for GIS**, whilst the **Advanced geomatics** module examines the 'added value' which geographic information can generate.

Geodesy

Study in geodesy builds upon the introduction to GPS in Stage 1 and addresses **Map projections and geodetic datums**, giving a detailed view of the nature of the Earth as a reference frame. **GPS theory and practice** investigates the processing and further applications of global navigation satellite systems. **Advanced geodesy** considers the impact of ground motions on survey practice and their interpretation, while **Geohazards and the deformation of the Earth** concentrates on seismic and gravitational surveys of the Earth's crust and their relationship with positioning.

Information technology

The impact of information technology is covered in a number of modules in Stages 2 and 3. Building on Stage 1, specific application development is covered in **Software development for geomatics**, which also furthers knowledge of programming skills and the fundamentals of operating systems. **Advanced geoinformatics** addresses contemporary issues in geomatics computer applications. Further optional modules in computing science are available.

Using the GPS-cycle to map and monitor coastal erosion.

Image handling

This topic investigates further applications of photography and multispectral imagery. **Remote sensing – data acquisition and processing** introduces digital image processing, the nature of sensors which gather information about the Earth (including satellites, aircraft and ground-based sensors) and the spectral properties of the Earth's surface from visible to microwave wavelengths. **Remote sensing systems and applications** uses software packages to develop understanding of image processing and show practical uses of remotely sensed images. **Photogrammetry and laser scanning** in Stage 2 covers the principles of measurement from images and the instrumentation available whilst in Stage 3, it considers the applications of advanced image measurement and the nature of digital image handling.

Cartography

Cartography is examined more closely in **Mapping practices**, which discusses cartographic principles in compilation and design, and offers practical map-making opportunities. **Advanced geoinformatics** covers recent developments in cartographic visualisation and web mapping practice.

Research

Independent research work forms part of each degree. Students complete a 10-credit **Research methods** module in Stage 2 and a 30-credit **Individual research project** in Stage 3. These modules are compulsory for both degree programmes.

Mathematical support

Material for this area is covered in **Survey mathematics**, and **Observation processing and analysis** provides an in-depth understanding of inaccuracy in survey measurement.

Professional issues

Professional issues are of great importance and modules addressing these include **Law and land use**, examining the legal framework for land use, and **Professional practice**, which gives a geomatics perspective on professionalism, ethics, personnel and time management. **Aspects of applied geomatics** gives an overview of the broad spectrum of the discipline by bringing in outside speakers and organising study trips.

"Having fewer than 40 people on my course has meant that I have got to know my classmates very well, and the induction trip and field course were also a great opportunity to get to know everyone. As the group of teaching staff is also small it's nice that lecturers know everyone on a first name basis.

A lot of time is spent doing practical work and there can be some very challenging assignments, but I've found the lecturers are always happy to give extra help if you ask for it. As the School has a lot of the latest equipment and software, it's good to know you are using the very best in the industry."

Matt Goode, recent graduate, Surveying and Mapping Science BSc Honours

> There is no doubt in my mind that the broad-based nature of the degree in geomatics has been hugely beneficial in helping with my career development to date.
>
> James King, graduate, Surveying and Mapping Science BSc Honours

Careers

Geomatics involves using cutting-edge technology that will appeal to those who are looking for an exciting and professional future. As a geomatics graduate you will not only be highly proficient in a variety of geomatics skills but also have other attributes that are applicable to many professions. Numeracy, literacy, data handling, communication, computing and research skills will stand you in good stead whatever you decide to go into.

For graduates who remain in geomatics, indoors and outdoor activities are both essential and you are usually working as part of a team, developing your skills in communicating with other professionals in related disciplines. You will be highly proficient in data collection, analysis, management and visualisation, as well as having a sound basis in mathematics and science principles. Other graduates may look outside the sector, and consider alternative careers such as computing, management consultancy, finance, teaching or the armed forces.

Our employment record is excellent and virtually all our graduates find employment within six months of graduating. Our graduates work in a range of organisations – specialist land, air and offshore mapping companies, central and local government agencies, cartographic publishers, suppliers of computer-based mapping technology and GIS, utility companies, civil engineering contractors, oil exploration multinationals and geophysical consultants.

At Newcastle, we provide an extensive range of opportunities to all students through ncl+ to enable you to develop personal, employability and enterprise skills and to give you the edge in the employment market after you graduate. For more information about employment opportunities available see **www.ncl.ac.uk/undergraduate/careers**

Students working on specialist software packages in the dedicated geomatics laboratory.

Entrance requirements

We recognise that students will apply to our degree programmes with a range of qualifications. We consider each applicant on an individual basis, taking into account the information on your UCAS form including past academic performance and potential. The following information gives an indication of the type and level of entrance qualifications, but we encourage you to contact us to discuss your position if you require any further details or clarification.

A levels: BBB/BBC excluding General Studies. GCSE Mathematics (minimum grade B) is required if not offered at A or AS level.

Scottish qualifications: AAAB/ABBB at Higher Grade including Mathematics and preferably Geography. Combinations of Highers and Advanced Highers are accepted.

International Baccalaureate: Minimum 32 points. Standard Level Mathematics or Mathematical Studies required at grade 5 if not offered at Higher Level.

BTEC National Diploma: Overall DDM/DMM to include Mathematics level III at Distinction grade.

We welcome applications from students with equivalent qualifications, including Access to HE Diplomas and a full range of European and international qualifications. We are pleased to advise anyone interested with regard to choosing an appropriate preparatory course of study.

We are happy to accept deferred entry. Entrance requirements can vary from year to year, so you should check the University's website for up-to-date details.
www.ncl.ac.uk/ug/geomatics

Disabled students

We welcome applications from students with disabilities and this brochure is available in alternative formats from the Enquiries Service. Disability Support provides help and advice whilst you are at the University, and make every effort to provide a suitable learning environment for you. To discuss the facilities on campus and any specific requirements you may have, contact Disability Support at:

Disability Support
Telephone: (UK) 0191 222 7623
(International) +44 191 222 7623
Textphone: (UK) 0191 222 5545
(International) +44 191 222 5545
Fax: (UK) 0191 222 5539
(International) +44 191 5539
E-mail: disability.support@ncl.ac.uk
www.ncl.ac.uk/disability-support

International students

Your choice of university is an important step towards your future. You are not only choosing a programme to study, you are also choosing a place to live. Newcastle has everything you need for successful studies and enjoyable experiences. We welcome students from all over the world and are already home to around 2,500 international students from more than 100 different nations. Find out more at
www.ncl.ac.uk/international

Student finance (UK/EU)

For more information on tuition fees, bursaries and scholarships, please see
www.ncl.ac.uk/undergraduate/finance or contact the Enquiries Service for a copy of our *Guide to Student Finance*.

Further information

If you have any questions about these degree programmes please contact:

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To find out more about the University and its facilities, including accommodation, sports and social activities, and the city and surrounding area, you should consult the University's website or request an *Undergraduate Prospectus* from:
www.ncl.ac.uk/undergraduate

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(International) +44 191 222 5594
Enquire online at:
www.ncl.ac.uk/enquiries

Visiting the University

If you would like to visit the University before you apply, our Visit Days offer subject talks, an information fair and tours of the campus and accommodation. If we make you an offer, open days for your subject area give you the opportunity to talk to current students and members of staff. You can discuss the degree programmes as well as seeing the University and its facilities.
www.ncl.ac.uk/undergraduate/visit

We would like to thank the following for the use of their illustrative material: John Donoghue; staff and students from the School of Civil Engineering and Geosciences.

Details are correct at the time of printing (February 2009) but should be checked against the current edition of the *Undergraduate Prospectus* or on the University's website. Details contained in this brochure are for information and guidance purposes only.

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