NSCI7364

Geographic Information Science and Remote Sensing

Session 1, In person-scheduled-weekday, North Ryde 2022

School of Natural Sciences

Contents

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General Information

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Credit points
10

Prerequisites
Admission to MRes

Corequisites

Co-badged status
ENVS2364; ENVS6364

Unit description
This unit provides students with a comprehensive introduction to geospatial technologies, including geographic information systems (GIS), global positioning systems (GPS) and remote sensing. Students will learn core concepts and develop advanced technical skills in data acquisition and management, mapping and spatial sampling and analysis. Students are provided training using the latest commercially available geospatial software. This unit covers the application of geographic information science across a range of disciplines, including environmental science and management, physical and human geography, urban and environmental planning and biodiversity conservation.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at https://www.mq.edu.au/study/calendar-of-dates

Learning Outcomes

On successful completion of this unit, you will be able to:

ULO1: Perform operations using Geographic Information Systems (GIS) and Remote Sensing software

ULO2: Organise, analyse and interpret geographic or spatial information using a range of techniques

ULO3: Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence

ULO4: Communicate geographic/spatial analysis outputs using maps and written formats

ULO5: Apply standard Geographic Information Science concepts and techniques to a range of contexts

General Assessment Information

General Faculty Policy on assessment submission deadlines and late submissions:

Online quizzes, in-class activities, or scheduled tests and exam must be undertaken at the time indicated in the unit guide. Should these activities be missed due to illness or misadventure, students may apply for Special Consideration.

All other assessments must be submitted by **5:00 pm** on their due date. Should these assessments be missed due to illness or misadventure, students should apply for Special Consideration.

Assessments not submitted by the due date will receive a mark of zero **unless** late submissions are specifically allowed as indicated in the unit guide or on iLearn.

If late submissions are permitted as indicated in the unit guide or on iLearn a consistent penalty will be applied for late submissions as follows:

A 12-hour grace period will be given after which the following deductions will be applied to the awarded assessment mark: 12 to 24 hours late = 10% deduction; for each day thereafter, an additional 10% per day or part thereof will be applied until five days beyond the due date. After this time, a mark of zero (0) will be given. For example, an assessment worth 20% is due 5 pm on 1 January. Student A submits the assessment at 1 pm, 3 January. The assessment received a mark of 15/20. A 20% deduction is then applied to the mark of 15, resulting in the loss of three (3) marks. Student A is then awarded a final mark of 12/20.

Note: Late submissions will be accepted for all assessments in this unit with penalties.

Extensions will be granted in cases of documented illness or extenuating circumstances, and when applied for BEFORE the assessment deadline. Applications for assessment extensions are now to be applied for online via the student portal. Please follow the instructions outlined at https://students.mq.edu.au/study/my-study-program/special-consideration. Extension requests

received via email or after the due date will <u>not</u> be processed.

Please be aware that there is a <u>minimum</u> processing time of 2 working days for all extension requests. If you submit your request on the due date of the assessment item, we cannot guarantee that you will receive a response by the assessment deadline. Where possible, please factor this in when submitting your extension application.

Submission of assignments and progress tasks

All students are required to keep a backup of the submitted version of their assessments.

Assignments should be in a MS Word or PDF file format. All maps and tables associated with the assignment must be incorporated in the MS Word document or PDF.

Students are not permitted to email their assignments or submit them in a softcopy format. Assignments are to be submitted via the Turnitin/online link provided in iLearn by the date and time specified.

Return of marked assignments

Your assignments will be returned via iLearn within two teaching weeks of the submission, and will include written feedback.

Assessment Tasks

Name	Weighting	Hurdle	Due
Practical Assignment 1	15%	No	18/Mar/2022
Practical Assignment 2	25%	No	08/Apr/2022
Practical Assignment 3	30%	No	30/May/2022
Final Exam	30%	No	06-24/Jun/2022 (TBA)

Practical Assignment 1

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 10 hours
Due: **18/Mar/2022**
Weighting: **15%**

Getting started with GIS. This is a computer-based practical exercise.

On successful completion you will be able to:
- Perform operations using Geographic Information Systems (GIS) and Remote Sensing

software
- Organise, analyse and interpret geographic or spatial information using a range of techniques
- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence

Practical Assignment 2

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 20 hours
Due: **08/Apr/2022**
Weighting: **25%**

Computer-based practical exercise. A report is submitted at the end of the assignment.

On successful completion you will be able to:
- Perform operations using Geographic Information Systems (GIS) and Remote Sensing software
- Organise, analyse and interpret geographic or spatial information using a range of techniques
- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Communicate geographic/spatial analysis outputs using maps and written formats
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

Practical Assignment 3

Assessment Type [1]: Practice-based task
Indicative Time on Task [2]: 22 hours
Due: **30/May/2022**
Weighting: **30%**

Computer-based practical exercise.

On successful completion you will be able to:
- Perform operations using Geographic Information Systems (GIS) and Remote Sensing

software

- Organise, analyse and interpret geographic or spatial information using a range of techniques
- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Communicate geographic/spatial analysis outputs using maps and written formats
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

Final Exam

Assessment Type [1]: Examination
Indicative Time on Task [2]: 4 hours
Due: **06-24/Jun/2022 (TBA)**
Weighting: **30%**

Covers all material from lectures and practical classes.

On successful completion you will be able to:

- Perform operations using Geographic Information Systems (GIS) and Remote Sensing software
- Organise, analyse and interpret geographic or spatial information using a range of techniques
- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Communicate geographic/spatial analysis outputs using maps and written formats
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

[1] If you need help with your assignment, please contact:

- the academic teaching staff in your unit for guidance in understanding or completing this type of assessment
- the Writing Centre for academic skills support.

[2] Indicative time-on-task is an estimate of the time required for completion of the assessment task and is subject to individual variation

Delivery and Resources

NSCI7364 is an introductory course to Geographic Information Systems (GIS). It provides students with a comprehensive introduction to geospatial technologies, including GIS, Global Positioning Systems (GPS) and Remote Sensing. Students will learn core concepts and principles of GIS, and develop technical skills in data acquisition and management, mapping, spatial sampling and analysis. Students are trained using the latest commercial geospatial softwares.

NSCI7364 lectures cover a range of topics which are key to one becoming competent in Geographic Information Science. These include a background on how the shape of the earth impacts on mapping, also referred to as coordinate systems and map projections, creating and collecting GIS data, spatial analysis using different GIS data types, the art of map making, remote sensing and working with three-dimensional features or data. The practical classes are designed to expose students practice and apply standard GIS concepts and techniques to a range of disciplines, including environmental science and management, physical and human geography, urban planning, biodiversity conservation, archaeology, health, business, and marketing.

Delivery

This unit is offered in *weekday attendance* and *fully online* modes.

Off-shore students

Off-shore students **must** email the convenor as soon as possible to discuss study options.

COVID Information and on-campus classes

On-campus teaching continues to be scheduled for Session 1, 2022. Masks are compulsory for all classes in indoor spaces and social distancing will be implemented wherever possible. Students will also be required to sanitise surfaces before and after use.

Students are requested to minimise the risk of spreading COVID to themselves and others in accordance with the university and NSW Health guidelines: https://www.mq.edu.au/about/corona virus-faqs andhttps://www.nsw.gov.au/covid-19/stay-safe.

Any further requirements or changes to units in relation to COVID will be communicated to students via iLearn.

Lecture program and location

There is one 1 hour lecture per week. Please check lecture times at the Macquarie University timetables website (www.timetables.mq.edu.au). Lectures are recorded and posted on the iLearn via Echo360. Students are expected to attend lectures virtually/online via the links provided on the iLearn. Lecture recordings will also be made available on the iLearn.

Practical program and location

Weekday attendance: Students are enrolled to one 3 hour practical class per week. Please check practical times and rooms at the Macquarie University timetables website

(www.timetables.mq.e du.au). Practical class sizes are limited by the number of available computers. You must use the online enrolment system to change the time/day of your practical class. **Practical classes begin in Week 1.**

Fully online attendance: You must have a home computer with a Windows operating system (Windows 7 or above). Please note that ArcGIS software is NOT supported by Mac or Linux operating systems. Also, we don't provide IT support for installation to Mac or Linux platforms. A copy of the ArcGIS software will be provided to external students. You must install this software on your computer. Internal students may also request a copy of the software and license to install to their personal computers. ArcGIS can also be accessed remotely on Appstream platform. More information on accessing GIS software on Appstream platform is provided on the iLearn.

Requirements to complete this unit satisfactorily

1. Attend online lectures and face to face/online practical classes;

2. Complete all assignments and the final exam; and

3. Acquire a pass grade or above.

Grades for the unit as a whole will be awarded according to the following general criteria (course rubric):

	Developing	Functional	Proficient	Advanced
General description of the level of attainment	Has not yet reached the desired standard. Limited understanding of required concepts and knowledge. A **fail** grade (or under some circumstances a conceded pass) would be given	Has reached basic academic standards. Work has limited translation of concepts and procedures to new contexts unless aided. A **pass** grade would be awarded	Has completely reached the standards expected. Can work independently in new contexts, adapting procedures to meet the context. Demonstrates awareness of own limitations. A **credit** grade would be awarded.	Has gone beyond the expected standards. Exhibits high levels of independence and can use concepts to generate new ways of completing procedures. Can engage in critical reflection. A grade of **distinction** or **high distinction** would be awarded.

Resources

Technology used

This unit will use the online platform of Echo360 and iLearn, ArcGIS, Google Earth, MS Excel software, GPS, and online resources for the practical exercises. Other ESRI software and open source GIS software may also be used.

You will require access to a computer and broadband internet to complete this unit. The library computers and computer labs are available for casual use outside scheduled practical classes.

Internal students who have a home computer with a Windows operating system may obtain a copy of the ArcGIS software from the unit convenor. **The ArcGIS software is NOT supported by Mac or Linux operating systems.** It is not essential for weekday students to have ArcGIS

installed on their home computer as the computers in the computer labs are available for casual use outside scheduled practical classes. **However, students registered as fully online must have ArcGIS installed on their home computer.** We are also trialing the remote access of ArcGIS by external students via *Appstream*. More information will be provided regarding this service.

Unit web page

This unit's webpage will be available on iLearn. Information about how students can access iLearn can be found at: http://www.mq.edu.au/iLearn/student_info/index.htm

The iLearn page uses Macquarie University's standard interface and has links, access to lectures (as audio files through Echo360, and as downloadable PDF presentations) and practical instructions. Important announcements will be made through iLearn, so check the ENVS2364 page regularly.

Information about how to access lecture recordings through the Echo360 EchoCenter page in iLearn can be found at: http://mq.edu.au/iLearn/student_info/lecture_recordings.htm

Recommended texts/materials

Highly recommend a fast USB Flash Storage Drive (4GB is adequate) for GIS Practicals; if your computer supports USB3 then I would further suggest a USB3 storage drive as the GIS Lab PC's support USB3.

Access to required and recommended resources, plus past central exam papers, is available at the Macquarie Library website (https://www.mq.edu.au/about/campus-services-and-facilities/library/multi-search/multisearch).

GIS Desktop Software. The University has a site license for ESRI's ArcGIS (www.arcgis.com) which may be installed on a Windows PC with reasonable specs (i.e. 4GB RAM and 2.2 GHz CPU).

Chang, K. 2008. *Introduction to geographic information systems.* McGraw Hill, New York.

Jensen J. & Jensen R. (2012) Introductory Geographic Information Systems, Pearson Higher Ed.

Longley, P., Goodchild, et al. (2005) Geographical Information Systems and Science.

Burrough PA, McDonnell RA, and Lloyd C. 2015. *Principles of Geographic Information System*s. Oxford University Press, UK.

Huisman O, de By RA (Eds). *Principles of Geographic Information Systems: An Introductory Text Book*: Available online at:https://www.itc.nl/library/papers_2009/general/PrinciplesGIS.pdf

The Khan Academy has many short instructional videos on a range of topics; the statistics (Maths) and SQL (Computing, Programming) provide background learning relevant to GIS.

http://www.khanacademy.org

Unit Schedule

Week	Description	Practical
1	Introduction to Geographic Information Science: what is GIS, what is it used for?	Assignment 1
2	Types of GIS data: Vector and Raster data	Assignment 1
3	Planet Earth is not, in fact, perfectly round: Coordinate systems and map projections	Assignment 2
4	Spatial Analyses using Vector data	Assignment 2
5	Spatial Analyses using Raster data	Assignment 2
6	Capturing physical features on earth surface using GIS	Assignment 2
7	GIS applications and career in GIS	Assignment 2
	Semester Break	
8	Starting a GIS Project: Data Flow Diagrams, ModelBuilder & Spatial analyses with ArcGIS Pro	Assignment 3
9	Remote Sensing: Surface elevation and Terrain products, raster and TIN, 3D	Assignment 3
10	Remote Sensing of the Environment	Assignment 3
11	Application of GIS for environmental solutions	Assignment 3
12	Application of GIS for environmental solutions	Assignment 3
13	Unit summary	No practical

Policies and Procedures

Macquarie University policies and procedures are accessible from Policy Central (https://policies.mq.edu.au). Students should be aware of the following policies in particular with regard to Learning and Teaching:

- Academic Appeals Policy
- Academic Integrity Policy
- Academic Progression Policy
- Assessment Policy
- Fitness to Practice Procedure
- Assessment Procedure

- Complaints Resolution Procedure for Students and Members of the Public

- Special Consideration Policy

Students seeking more policy resources can visit Student Policies (https://students.mq.edu.au/support/study/policies). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

To find other policies relating to Teaching and Learning, visit Policy Central (https://policies.mq.edu.au) and use the search tool.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/admin/other-resources/student-conduct

Results

Results published on platform other than eStudent, (eg. iLearn, Coursera etc.) or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your student email address and will be made available in eStudent. For more information visit ask.mq.edu.au or if you are a Global MBA student contact globalmba.support@mq.edu.au

Academic Integrity

At Macquarie, we believe academic integrity – honesty, respect, trust, responsibility, fairness and courage – is at the core of learning, teaching and research. We recognise that meeting the expectations required to complete your assessments can be challenging. So, we offer you a range of resources and services to help you reach your potential, including free online writing and maths support, academic skills development and wellbeing consultations.

Student Support

Macquarie University provides a range of support services for students. For details, visit http://students.mq.edu.au/support/

The Writing Centre

The Writing Centre provides resources to develop your English language proficiency, academic writing, and communication skills.

- Workshops

- Chat with a WriteWISE peer writing leader

- Access StudyWISE

- Upload an assignment to Studiosity

- Complete the Academic Integrity Module

The Library provides online and face to face support to help you find and use relevant information resources.

- Subject and Research Guides
- Ask a Librarian

Student Services and Support

Macquarie University offers a range of Student Support Services including:

- IT Support
- Accessibility and disability support with study
- Mental health support
- Safety support to respond to bullying, harassment, sexual harassment and sexual assault
- Social support including information about finances, tenancy and legal issues

Student Enquiries

Got a question? Ask us via AskMQ, or contact Service Connect.

IT Help

For help with University computer systems and technology, visit http://www.mq.edu.au/about_us/offices_and_units/information_technology/help/.

When using the University's IT, you must adhere to the Acceptable Use of IT Resources Policy. The policy applies to all who connect to the MQ network including students.

Changes from Previous Offering

Course Changes as informed by Previous Student Feedback

Geo-scripting using R software in Weeks 11 & 12 has been replaced with case study on solving GIS problems.