



# ENVS808

## Introduction to Geographic Information Science for Postgraduates

S1 External 2018

*Dept of Environmental Sciences*

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#### **Disclaimer**

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.

## General Information

### Unit convenor and teaching staff

Lecturer

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### Credit points

4

### Prerequisites

Admission to MEnv or MSc or GradDipEnv or GradCertEnv or MEnvEd or MEnvMgt or MEnvPlan or MPlan or MEnvStud or MSusDev or MWldMgt or MMarScMgt or MInfoTech or GradDipSusDev or GradCertSusDev or GradCertSIA or GradDipSIA or MConsBiol or GradDipConsBiol or PGDipSc in Biodiversity Conservation

### Corequisites

### Co-badged status

### 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. ENV5808 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:

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

Perform basic operations using Geographic Information Systems (GIS) and remote sensing software

Organise, analyse and interpret Geographic Information using a range of techniques

Effectively communicate the outputs of geographic analysis in both map and written formats

Identify and apply appropriate Geographic Information Science concepts and techniques to a range of contexts

## Assessment Tasks

Name	Weighting	Hurdle	Due
<a href="#">Progress Task 1</a>	1%	No	9-March-2018
<a href="#">Assignment 1</a>	15%	No	6-Apr-2018
<a href="#">Assignment 2</a>	15%	No	11-May-2018
<a href="#">Assignment 3</a>	5%	No	4-May-2018
<a href="#">Progress Task 2</a>	2%	No	18-May-2018
<a href="#">Progress Task 3</a>	2%	No	25-May-2018
<a href="#">Assignment 4</a>	10%	No	8-June-2018
<a href="#">Quiz</a>	5%	No	8-June-2018
<a href="#">Final Exam</a>	45%	No	Check exam timetable

### Progress Task 1

Due: **9-March-2018**

Weighting: **1%**

## ESRI E-Learning: Getting Started with GIS

On successful completion you will be able to:

- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Identify and apply appropriate Geographic Information Science concepts and techniques to a range of contexts

## Assignment 1

Due: **6-Apr-2018**

Weighting: **15%**

Report on the week 2 – 4 Practical Exercise

On successful completion you will be able to:

- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Organise, analyse and interpret Geographic Information using a range of techniques
- Effectively communicate the outputs of geographic analysis in both map and written formats
- Identify and apply appropriate Geographic Information Science concepts and techniques to a range of contexts

## Assignment 2

Due: **11-May-2018**

Weighting: **15%**

Report on the Weeks 5 - 8 Practical Exercise

On successful completion you will be able to:

- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software

- Organise, analyse and interpret Geographic Information using a range of techniques
- Effectively communicate the outputs of geographic analysis in both map and written formats

## Assignment 3

Due: **4-May-2018**

Weighting: **5%**

1000 (max) word essay

On successful completion you will be able to:

- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Organise, analyse and interpret Geographic Information using a range of techniques
- Effectively communicate the outputs of geographic analysis in both map and written formats
- Identify and apply appropriate Geographic Information Science concepts and techniques to a range of contexts

## Progress Task 2

Due: **18-May-2018**

Weighting: **2%**

Progress task based on Week 9 Practical Exercise

On successful completion you will be able to:

- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Organise, analyse and interpret Geographic Information using a range of techniques
- Effectively communicate the outputs of geographic analysis in both map and written formats

## Progress Task 3

Due: **25-May-2018**

Weighting: **2%**

Progress task based on Week 10 Practical Exercise

On successful completion you will be able to:

- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Organise, analyse and interpret Geographic Information using a range of techniques
- Identify and apply appropriate Geographic Information Science concepts and techniques to a range of contexts

## Assignment 4

Due: **8-June-2018**

Weighting: **10%**

Report on the week 11-12 Practical Exercise

On successful completion you will be able to:

- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Organise, analyse and interpret Geographic Information using a range of techniques
- Identify and apply appropriate Geographic Information Science concepts and techniques to a range of contexts

## Quiz

Due: **8-June-2018**

Weighting: **5%**

Online quiz based on ALL lectures

On successful completion you will be able to:

- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Identify and apply appropriate Geographic Information Science concepts and techniques to a range of contexts

## Final Exam

Due: **Check exam timetable**

Weighting: **45%**

Final exam covering all aspects of the unit.

On successful completion you will be able to:

- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Organise, analyse and interpret Geographic Information using a range of techniques
- Effectively communicate the outputs of geographic analysis in both map and written formats
- Identify and apply appropriate Geographic Information Science concepts and techniques to a range of contexts

## Delivery and Resources

ENV5808/708 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 technical skills in data acquisition and management, mapping and spatial sampling and analysis. Students are provided training using the latest commercially available geospatial software.

ENV5808/708's 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 and urban planning and biodiversity conservation.

### Delivery

This unit is offered both internally and externally.

### **Lecture program and location**

There is one 1 hour lecture per week. Please check lecture times and rooms at the Macquarie University timetables website ([www.timetables.mq.edu.au](http://www.timetables.mq.edu.au)). Lectures are recorded and posted to iLearn via Echo360. Internal students are expected to attend lectures *in person*; external students can access lectures through iLearn.

### ***Practical program and location***

There is three 3 hour practical class per week. Please check practical times and rooms at the Macquarie University timetables website ([www.timetables.mq.edu.au](http://www.timetables.mq.edu.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. Practicals begin in Week 1.

If you would like to use your own computers, they must have Windows 7 or above, Vista or XP operating system (the ArcGIS software is NOT supported by Mac or Linux operating systems.). A copy of the ArcGIS software will be sent to all external students. You must install this software on your computer.

### ***Workload***

ENV57/808 earns 4 credit points towards your degree. You are expected to invest at least 9 hours of study per week on average over the semester. This includes your lectures and practical exercises (4 hours per week), assignments and the final exam.

### ***Submission of assignments***

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 link provided in iLearn by 5PM on the date specified.

### ***How do I request an extension?***

Extensions must be requested by email from the unit convenor prior to the assignment's due date (except in exceptional circumstances), and supported by appropriate documentation (e.g. a medical certificate).

Extensions will only be granted in writing (by email) at the discretion of the unit convenor. Otherwise, automatic penalties will apply. Assignments that are handed in late without an extension or exceptional circumstances will not be marked if they are submitted more than 7 days after the due date. If submitted within 7 days, marks will be deducted for lateness at the rate of 5% of the possible mark per day.

### ***Return of marked assignments***

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

### ***Requirements to complete this unit satisfactory***

1. Attend lecture and practical classes (internal students);
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
<b>General description of the level of attainment</b>	Has not yet reached the desired standard. Limited understanding of required concepts and knowledge.  A <b>fail</b> 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 <b>pass</b> 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 <b>credit</b> 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 <b>distinction</b> or <b>high distinction</b> would be awarded.

## Resources

### *Technology used*

This unit will use the online platform of Echo360 and iLearn, and ArcGIS software, Google Earth and MS Excel software, GPS's, and Lynda.com online tutorials for the practical exercises.

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 internal 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, external students must have ArcGIS installed on their home computer.**

### *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](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 ENV5808 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](http://mq.edu.au/iLearn/student_info/lecture_recordings.htm)

### *Recommended texts/materials*

Chang, K. 2008. *Introduction to geographic information systems*. McGraw Hill, New York. [Available at Macquarie University Library].

Burrough PA, McDonnell RA, and Lloyd C. 2015. *Principles of Geographic Information Systems*.

Oxford University Press, UK. . [Available at Macquarie University Library].

Huisman O and 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](https://www.itc.nl/library/papers_2009/general/PrinciplesGIS.pdf)

## Unit Schedule

Week	Lecturer	Lecture date	Lecture	Practical	Assessment	Assessment due date
1	Maina&Andrew	27-Feb	Introduction to Geographic Information Science: what is GIS, what is it used for?, career pathways in GIS and learning GIS at Macquarie.	Getting Started with GIS, Data Formats, Software	Progress task 1	9-Mar-2018
2	Maina&Michael	6-Mar	Planet Earth is not, in fact, perfectly round: Coordinate systems and map projections	Methods for analyzing non-spatial data	Assignment 1	6-Apr-2018
3	Maina	13-Mar	Types of GIS data: Vector Data	Geoprocessing methods		
4	Maina	20-Mar	Capturing physical features on earth surface using GIS	Geoprocessing methods		
5	Maina	27-Mar	The art of map making	Data Capture: Georeferencing and Digitising	Assignment 2	11-May-2018
6	Maina	3-Apr	Types of GIS data: Raster Data	Raster Analysis		
7	Maina	10-Apr	Career in Spatial Information Science: current trends	Preparation and Presentation of Maps	Assignment 3	4-May-2018
		<b>17-Apr</b>	<b>SESSION 1 BREAK</b>			
8	Maina	1-May	GIS on the Web	Cartography		
9	Maina	8-May	Remote Sensing: Surface elevation and Terrain products, raster and TIN, 3D	Use Google Maps, Google Drive, Bing Maps, and other web technologies to analyze, map, and share GIS data	Progress Task 2	18-May-2018
10	Maina	15-May	Remote Sensing of Environment	Classifying Imagery Using ArcGIS	Progress Task 3	25-May-2018
11	Maina	22-May	Geo-scripting: coding GIS tasks using Python and R scripting languages	Using R for GIS	Assignment 4	8-June-2018
12	Maina	29-May	Starting a GIS Project: Data Flow Diagrams & ModelBuilder	Using R for GIS		
13	Maina	5-Jun	Unit summary: End of semester Exams; careers in GIS & SIS at Macquarie	No practical	Quiz	8-June-2017

## Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>). 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](#)
- [Grade Appeal Policy](#)
- [Complaint Management Procedure for Students and Members of the Public](#)
- [Special Consideration Policy](#) (**Note:** *The Special Consideration Policy is effective from 4 December 2017 and replaces the Disruption to Studies Policy.*)

Undergraduate students seeking more policy resources can visit the [Student Policy Gateway](https://students.mq.edu.au/support/study/student-policy-gateway) (<https://students.mq.edu.au/support/study/student-policy-gateway>). It is your one-stop-shop for the key policies you need to know about throughout your undergraduate student journey.

If you would like to see all the policies relevant to Learning and Teaching visit [Policy Central](https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central) (<https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-central>).

## Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: <https://students.mq.edu.au/study/getting-started/student-conduct>

## Results

Results shown in *iLearn*, 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](http://ask.mq.edu.au).

## Student Support

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

## Learning Skills

Learning Skills ([mq.edu.au/learningskills](http://mq.edu.au/learningskills)) provides academic writing resources and study

strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

## Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

## Student Enquiries

For all student enquiries, visit Student Connect at [ask.mq.edu.au](http://ask.mq.edu.au)

## IT Help

For help with University computer systems and technology, visit [http://www.mq.edu.au/about\\_us/offices\\_and\\_units/information\\_technology/help/](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.

## Graduate Capabilities

### PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

#### Learning outcomes

- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Organise, analyse and interpret Geographic Information using a range of techniques
- Effectively communicate the outputs of geographic analysis in both map and written formats

### PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

## Learning outcomes

- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Organise, analyse and interpret Geographic Information using a range of techniques
- Identify and apply appropriate Geographic Information Science concepts and techniques to a range of contexts

## Assessment tasks

- Progress Task 1
- Assignment 1
- Assignment 2
- Assignment 3
- Progress Task 2
- Progress Task 3
- Assignment 4
- Quiz
- Final Exam

## PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

## Learning outcomes

- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Organise, analyse and interpret Geographic Information using a range of techniques
- Effectively communicate the outputs of geographic analysis in both map and written formats
- Identify and apply appropriate Geographic Information Science concepts and techniques to a range of contexts

## Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3
- Progress Task 3
- Assignment 4
- Quiz
- Final Exam

## PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

## Learning outcomes

- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Perform basic operations using Geographic Information Systems (GIS) and remote sensing software
- Organise, analyse and interpret Geographic Information using a range of techniques
- Identify and apply appropriate Geographic Information Science concepts and techniques to a range of contexts

## Assessment tasks

- Assignment 1
- Assignment 2
- Assignment 3
- Progress Task 3
- Assignment 4
- Quiz
- Final Exam

## PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual

formats.

This graduate capability is supported by:

## Learning outcome

- Effectively communicate the outputs of geographic analysis in both map and written formats

## Assessment tasks

- Assignment 2
- Progress Task 2
- Progress Task 3
- Assignment 4
- Quiz
- Final Exam

## Changes from Previous Offering

1. Introduction of progress tasks as part of the assessments and practical exercise
2. Geoscripting practicals are now assessed
3. A focus on SIS career relative to SIS offerings

## Changes since First Published

Date	Description
24/02/2018	Updated Assignment 3 description and lecture dates on the unit schedule table
21/02/2018	Updated the recommended reading texts/materials based on new info from the library