# ENVS808

## Introduction to Geographic Information Science for Postgraduates

S1 Day 2019

*Dept of Environmental Sciences*

## Contents

# General Information

Unit convenor and teaching staff
Lecturer
Joseph Maina Mbui
joseph.mbui@mq.edu.au
Contact via Email
Level 4 12 Wallys Walk, #405
Email to schedule an appointment, available after each lecture

Lecturer
Michael Chang
michael.chang@mq.edu.au
Contact via Email
Level 4 12 Wallys Walk #406
Email to schedule an appointment

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 MScInnovation

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. ENVS808 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:

Perform basic 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 the outputs of geographic/spatial analysis in both map and written formats

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

# Assessment Tasks

| Name | Weighting | Hurdle | Due |
|---|---|---|---|
| Progress Task 1 | 1% | No | 08-Mar-2019 |
| Progress Task 2 | 1% | No | 15-Mar-2019 |
| Assignment 1 | 20% | No | 5-Apr-2019 |
| Quiz 1 | 5% | No | 12-Apr-2019 |
| Assignment 2 | 15% | No | 10-May-2019 |
| Progress Task 3 | 1% | No | 17-May-2019 |
| Progress Task 4 | 1% | No | 31-May-2019 |
| Progress Task 5 | 1% | No | 31-May-2019 |
| Quiz 2 | 5% | No | 7-June-2019 |
| Final Exam | 50% | No | Check the exam timetable |

## Progress Task 1

Due: **08-Mar-2019**
Weighting: **1%**

Progress Task based on Week 1 practical exercise '*Introduction to ArcGIS*'

On successful completion you will be able to:

- Perform basic operations using Geographic Information Systems (GIS) and Remote Sensing software
- Identify and define key concepts and principles of Geographic Information Science, including scale, projections, interactions and interdependence
- Communicate the outputs of geographic/spatial analysis in both map and written formats

## Progress Task 2

Due: **15-Mar-2019**
Weighting: **1%**

'*Mastering Coordinate Systems'* - Progress Task based on Week 2 Lecture

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

## Assignment 1

Due: **5-Apr-2019**
Weighting: **20%**

Report on Week 2 - 5 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 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 the outputs of geographic/spatial analysis in both map and written formats
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

## Quiz 1

Due: **12-Apr-2019**
Weighting: **5%**

A short quiz on weeks 1-7 lectures

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 or spatial information using a range of techniques

## Assignment 2

Due: **10-May-2019**
Weighting: **15%**

Report on the week 6 - 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 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 the outputs of geographic/spatial analysis in both map and written formats
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

## Progress Task 3

Due: **17-May-2019**
Weighting: **1%**

Progress task on Remote Sensing

On successful completion you will be able to:

- Organise, analyse and interpret geographic or spatial information using a range of techniques
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

## Progress Task 4

Due: **31-May-2019**
Weighting: **1%**

Progress Task based on Spatial R

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 or spatial information using a range of techniques
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

## Progress Task 5

Due: **31-May-2019**
Weighting: **1%**

Progress Task based on Lecture on Application of remote Sensing to Land Use/Cover Change

On successful completion you will be able to:

- Organise, analyse and interpret geographic or spatial information using a range of techniques
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

## Quiz 2

Due: **7-June-2019**
Weighting: **5%**

A short quiz on weeks 8-12 lectures

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 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 the outputs of geographic/spatial analysis in both map and written formats
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

## Final Exam

Due: **Check the exam timetable**
Weighting: **50%**

Final Exam

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 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 the outputs of geographic/spatial analysis in both map and written formats
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

# Delivery and Resources

ENVS808 is an introductory Geographic Information Systems (GIS) course for post-graduates. 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 software's.

ENVS808 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 reffered 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 biodioversity 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). Lectures are recorded and posted to iLearn via Echo360. Internal students are expected to attend lectures *in person*; external students can access lectures recordings through the iLearn.

***Practical program and location***

Internal students: Stuidents 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.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.

External students: 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 could also request a copy of the software and license to install to their personal computers

***Workload***

ENVS808 earns 3 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 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 link provided in iLearn by 5PM on the date specified or as advised by the convener on the iLearn.

***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 |
|---|---|---|---|---|
| **General description of the level of attainment** | Has not yet reached the desired standard. Limited understanding of required concepts and knowledge.<br><br>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.<br><br>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.<br><br>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.<br><br>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 resouyrces such as Lynda.com 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

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 ENVS808 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*

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, 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

# Unit Schedule

| Week | Lecturer | Lecture date | Lecture | Practical | Assessment | Assessment due date |
|---|---|---|---|---|---|---|
| 1 | Maina&Andrew | 25-Feb | Introduction to Geographic Information Science: what is GIS, what is it used for, career pathways in GIS and learning GIS at Macquarie. | An Introduction to ArcGIS (Progress Task 1) | Progress Task 1 | 8-Mar-2019 |
| 2 | Maina | 4-March | Planet Earth is not, in fact, perfectly round: Coordinate systems and map projections | Methods for analyzing non-spatial data (Assignment 1) | ProgressTask 2 | 15-Mar-2019 |
| 3 | Maina | 11-Mar | Types of GIS data: Vector Data | Geoprocessing methods (Assignment 1 cont'd) | Assignment 1 | 5-Apr-2019 |
| 4 | Maina | 18-Mar | The art of map making | Geoprocessing methods (Assignment 1 cont'd) | Assignment 1 | 5-Apr-2019 |
| 5 | Maina | 25-Mar | Capturing physical features on earth surface using GIS | Geoprocessing methods (Assignment 1 cont'd) | Assignment 1 | 5-Apr-2019 |
| 6 | Maina | 1-Apr | Types of GIS data: Raster Data | Data Capture | Assignment 2 | 10-May-2019 |
| 7 | Guest lecture | 8-Apr | Career in general and in Spatial Information Science | Georeferencing and Digitising | Quiz 1<br>Assignment 2 | Quiz:12-Apr-2019<br>A2:10-May-2019 |
| | | | **13-28 April: SESSION 1 BREAK** | | | |
| 8 | Maina | 29-Apr | Starting a GIS Project: Data Flow Diagrams & ModelBuilder, ArcGIS Pro | Raster Analysis | Assignment 2 | 10-May-2019 |
| 9 | Maina | 6-May | Remote Sensing: Surface elevation and Terrain products, raster and TIN, 3D | Preparation and Presentation of Maps | Assignment 2 | 10-May-2019 |
| 10 | Maina | 13-May | Remote Sensing of Environment | Remote Sensing Progress Task | Progress Task 3 | 17-May-2019 |

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|---|---|---|---|---|---|---|
| 11 | Maina | 20-May | Geo-scripting: coding GIS tasks using Python and R scripting languages | Using R for GIS | Progress Task 4 | 31-May-2019 |
| 12 | Maina | 27-May | Remote Sensing Applied to detecting Land Use/Cover Change | Land use/Land cover Progress Task | Progress Task 5 | 31-May-2019 |
| 13 | Maina | 3-Jun | Unit summary: End of semester Exams; careers in GIS & SIS at Macquarie | No practical | Quiz 2 | 7-Jun-2019 |

# 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). 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). 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).

## 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 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

## 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) 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

If you are a Global MBA student contact globalmba.support@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/.

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

- Organise, analyse and interpret geographic or spatial information using a range of techniques
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

## Assessment tasks

- Assignment 1
- Quiz 1
- Assignment 2
- Progress Task 3
- Progress Task 4
- Progress Task 5
- Quiz 2
- Final Exam

# 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 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 the outputs of geographic/spatial analysis in both map and written formats
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

## Assessment tasks

- Progress Task 1
- Progress Task 2
- Assignment 1

- Quiz 1
- Assignment 2
- Progress Task 3
- Progress Task 4
- Progress Task 5
- Quiz 2
- 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

- Perform basic 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
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

### Assessment tasks

- Progress Task 1
- Progress Task 2
- Assignment 1
- Quiz 1
- Assignment 2
- Progress Task 3
- Progress Task 4
- Progress Task 5
- Quiz 2
- 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

- 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 the outputs of geographic/spatial analysis in both map and written formats
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

## Assessment tasks

- Progress Task 1
- Progress Task 2
- Assignment 1
- Quiz 1
- Assignment 2
- Progress Task 3
- Progress Task 4
- Progress Task 5
- Quiz 2
- 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 outcomes

- Perform basic 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 the outputs of geographic/spatial analysis in both map and written formats
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

## Assessment tasks

- Progress Task 1
- Progress Task 2
- Assignment 1
- Quiz 1
- Assignment 2
- Progress Task 3
- Progress Task 4
- Progress Task 5
- Quiz 2
- Final Exam

# PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

## Learning outcomes

- Communicate the outputs of geographic/spatial analysis in both map and written formats
- Apply standard Geographic Information Science concepts and techniques to a range of contexts

## Assessment tasks

- Progress Task 1
- Assignment 1
- Assignment 2
- Progress Task 3

- Progress Task 4
- Progress Task 5
- Quiz 2
- Final Exam

# Changes from Previous Offering

1. Introduced new assessments as progress tasks
2. Geo-scripting practicals in R are now assessed
3. Introduced career in SIS and in general
4. New guest lecture on applied remote sensing