ENVS853

Environmental Applications of GIS and Remote Sensing

S2 Day 2018

Dept of Environmental Sciences

Contents

General Information

Unit convenor and teaching staff
Lecturer / Convenor
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by appointment

Credit points
4

Prerequisites
GEOS801 or GEOS810 or ENVE810 or ENV808 or ENVS808

Corequisites

Co-badged status
ENVS753

Unit description
This unit builds on the basic GIS skills introduced in ENVS808 and includes advanced GIS concepts and principles of remote sensing. Topics include: analysis of landscape and environmental variables, GIS modelling, geostatistics, remote sensing techniques and a range of case studies. Practical sessions include techniques for spatial data collection, data management, modelling, terrain products generation, and image processing. This unit is designed to provide students with skills that enhance their educational experience and work-readiness in the field of spatial information science. The GIS software used is ArcGIS. Students enrolling in this unit must have access to a computer with the Windows operating system. Mac or Linux system will not be supported.

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:

1. Understand a wide range of principles underlying GIS raster analyses
2. Be competent in applying GIS modelling techniques
3. Be able to effectively communicate information derived using spatial analyses

4. Understand remotely sensed data acquired from a range of sensors
5. Be competent in applying a wide range of techniques for RS data to provide information about the environment
6. Have insights into current applications of GIS and RS in Australia and worldwide

General Assessment Information

If you receive special consideration for the final exam, a supplementary exam will be scheduled in the week of December 17-21 2018. By making a special consideration application for the final exam you are declaring yourself available for a resit during the supplementary examination period and will not be eligible for a second special consideration approval based on pre-existing commitments. Please ensure you are familiar with the policy prior to submitting an application. Approved applicants will receive an individual notification one week prior to the exam with the exact date and time of their supplementary examination.

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1 - GIS Modelling	20%	No	Week 5
Assignment 2 - Review Report	15%	No	Week 8
Assignment 3 - Remote Sensing	5%	No	Week 10
Assignment 4 - Project Design	15%	No	Week 12
Online Quiz	5%	No	Week 13
Exam	40%	No	Check exam timetable

Assignment 1 - GIS Modelling

Due: **Week 5**
Weighting: **20%**

This assessment is based on the practical work in weeks 2-4.

On successful completion you will be able to:

- 1. Understand a wide range of principles underlying GIS raster analyses
- 2. Be competent in applying GIS modelling techniques
- 3. Be able to effectively communicate information derived using spatial analyses
- 6. Have insights into current applications of GIS and RS in Australia and worldwide

Assignment 2 - Review Report

Due: **Week 8**
Weighting: **15%**

This assignment requires students to write a review report on the specified remote sensing missions.

On successful completion you will be able to:

- 3. Be able to effectively communicate information derived using spatial analyses
- 4. Understand remotely sensed data acquired from a range of sensors
- 6. Have insights into current applications of GIS and RS in Australia and worldwide

Assignment 3 - Remote Sensing

Due: **Week 10**
Weighting: **5%**

Vegetation index time series analysis

On successful completion you will be able to:

- 4. Understand remotely sensed data acquired from a range of sensors
- 5. Be competent in applying a wide range of techniques for RS data to provide information about the environment
- 6. Have insights into current applications of GIS and RS in Australia and worldwide

Assignment 4 - Project Design

Due: **Week 12**
Weighting: **15%**

Group work - project design and presentation

On successful completion you will be able to:

- 1. Understand a wide range of principles underlying GIS raster analyses
- 2. Be competent in applying GIS modelling techniques
- 3. Be able to effectively communicate information derived using spatial analyses
- 4. Understand remotely sensed data acquired from a range of sensors
- 5. Be competent in applying a wide range of techniques for RS data to provide information about the environment
- 6. Have insights into current applications of GIS and RS in Australia and worldwide

Online Quiz

Due: **Week 13**
Weighting: **5%**

Multiple choices covering the topics in week 1-12.

On successful completion you will be able to:

- 2. Be competent in applying GIS modelling techniques
- 4. Understand remotely sensed data acquired from a range of sensors
- 5. Be competent in applying a wide range of techniques for RS data to provide information about the environment

Exam

Due: **Check exam timetable**
Weighting: **40%**

Final exam covering all aspects of the unit.

On successful completion you will be able to:

- 2. Be competent in applying GIS modelling techniques
- 3. Be able to effectively communicate information derived using spatial analyses
- 4. Understand remotely sensed data acquired from a range of sensors
- 5. Be competent in applying a wide range of techniques for RS data to provide information about the environment

Delivery and Resources

Delivery

Lecture program and location

1. There is one lecture per week. Please check lecture time and location at the Macquarie University Timetables website: https://timetables.mq.edu.au
2. External students can listen to recorded lectures via Echo360. Link will be available via iLearn page.

Practical program

1. There is one three-hour practical class from **weeks 1 to 12** for internal students. Please check prac time and location at the Macquarie University Timetables website: https://timetables.mq.edu.au
2. Students who have a home computer with **Windows** operating system (e.g. 7, 8, 10)

may obtain a copy of the ArcGIS software, to enable extra work at home. This is not essential to complete the unit, as the computers in the computer lab are available for casual use outside formal practical classes.

Practical work for external students

1. There is **NO** on-campus session for this unit.
2. To complete the practical work, external students must have at home a computer with **Windows** operating system. External students are provided with a copy of the ArcGIS software to use while studying this unit (details will be announced on iLearn).
3. ***External students without a computer running Windows system should discontinue their enrolment in the unit***. ArcGIS can only be installed on Windows operating systems.
4. The remote sensing software, ENVI, will be accessible via iLab; a take-home copy of ERDAS Imagine will be provided to the external students.

Requirements to complete this unit satisfactory

- Acquire a **pass grade** or above.

Recommended Textbooks

1. There are no prescribed texts for this unit. However there is recommended reading associated with lectures from texts, published papers and internet sites. See below for recommended texts.
2. All teaching materials (including practical notes) are made available on iLearn webpage.
3. Recommended texts: The following books are available in the MQ library.

- Burrough PA and McDonnell RA (1998) *Principles of geographical information systems*. Oxford Univeristy Press: Oxford. (G70.212.B87/1998)
- Chang K-T (2006) *Introduction to Geographic Information Systems*. McGraw-Hill: New York. (G70.212.C4735 2006)
- Jensen J.R. (2016) *Introductory Digital Image Processing: A Remote Sensing Perspective*. Prentice Hall: Upper Saddle River, NJ. (G70.4 .J46 2016)
- Lillesand, et.al.(2008) Remote sensing and image interpretation. 6th ed., Hoboken, NJ : John Wiley & Sons (G70.4 .L54 2008)

Unit Webpage and Technology Used

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 iLearn page regularly.

Technology used

This unit will use iLearn, ArcGIS, Exelis ENVI, and Hexagon ERDAS Imagine software for the teaching and practical exercises.

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

Students who have a home computer with a Windows 7 or higher 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.

Unit Schedule

Week	Lecture
1	Introduction to the unit
2	GIS modelling - part 1
3	GIS modelling - part 2
4	GIS modelling - part 3
5	GIS modelling - part 4
6	Interpolation
7	Introduction to remote sensing
Break	
8	Fieldwork - Sydney Olympic Park Mangrove Die-back
9	Remote sensing sensors and platforms

10	Optical remote sensing
11	Active remote sensing - part 1
12	Active remote sensing - part 2
13	Unit summary

* The order of lecture topics may change slightly depending on guest lecturer's availability.

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 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.

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

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

- 1. Understand a wide range of principles underlying GIS raster analyses
- 2. Be competent in applying GIS modelling techniques
- 3. Be able to effectively communicate information derived using spatial analyses
- 5. Be competent in applying a wide range of techniques for RS data to provide

information about the environment

- 6. Have insights into current applications of GIS and RS in Australia and worldwide

Assessment tasks

- Assignment 1 - GIS Modelling
- Assignment 2 - Review Report
- Assignment 3 - Remote Sensing
- Assignment 4 - Project Design
- Online Quiz
- 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

- 1. Understand a wide range of principles underlying GIS raster analyses
- 2. Be competent in applying GIS modelling techniques
- 3. Be able to effectively communicate information derived using spatial analyses
- 4. Understand remotely sensed data acquired from a range of sensors
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Assessment tasks

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- Assignment 4 - Project Design
- Online Quiz
- 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

- 1. Understand a wide range of principles underlying GIS raster analyses
- 2. Be competent in applying GIS modelling techniques
- 5. Be competent in applying a wide range of techniques for RS data to provide information about the environment
- 6. Have insights into current applications of GIS and RS in Australia and worldwide

Assessment tasks

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- Assignment 3 - Remote Sensing
- Assignment 4 - Project Design
- Online Quiz
- 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

- 1. Understand a wide range of principles underlying GIS raster analyses
- 2. Be competent in applying GIS modelling techniques
- 4. Understand remotely sensed data acquired from a range of sensors
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- Assignment 4 - Project Design

- Online Quiz
- 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

- 1. Understand a wide range of principles underlying GIS raster analyses
- 3. Be able to effectively communicate information derived using spatial analyses

Assessment tasks

- Assignment 1 - GIS Modelling
- Assignment 2 - Review Report
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- Exam

Changes from Previous Offering

- New lecture and practical topics have been introduced.
- A review report is introduced as one of the assessment tasks.
- The weightings of assessments have been adjusted according to their difficulties and effort required.