ENVS383

Environmental Analysis Using Remote Sensing and GIS

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
3

Prerequisites
(39cp at 100 level or above) including (ENV264 or ENVS264 or GEOS264)

Corequisites

Co-badged status

Unit description
This unit provides students with an understanding of advanced spatial information science (SIS) procedures, and experience in the implementation of geographic information systems (GIS) and remote sensing (RS) in environmental fields. The unit covers modelling landforms and other environmental variables in GIS, an introduction to geostatistics, and a range of case studies from areas including catchment hydrology, climate variables, natural hazards and vegetation mapping. It also demonstrates advanced RS techniques to derive spatial information on land cover and land cover change, and the latest satellite programs. 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	10%	No	Week 10
Assignment 4 - Project Design	15%	No	Week 12
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
- 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 3 - Remote Sensing

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

Vegetation index time series analysis

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
- 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:

- 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

Exam

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

Final exam covering all aspects of the unit.

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
- 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

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	Guest lecture
Break	
8	Introduction to remote sensing
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

Creative and Innovative

Our graduates will also be capable of creative thinking and of creating knowledge. They will be imaginative and open to experience and capable of innovation at work and in the community. We want them to be engaged in applying their critical, creative thinking.

This graduate capability is supported by:

Learning outcome

- 5. Be competent in applying a wide range of techniques for RS data to provide information about the environment

Assessment tasks

- Assignment 2 - Review Report
- Assignment 4 - Project Design
- Exam

Capable of Professional and Personal Judgement and Initiative

We want our graduates to have emotional intelligence and sound interpersonal skills and to demonstrate discernment and common sense in their professional and personal judgement. They will exercise initiative as needed. They will be capable of risk assessment, and be able to handle ambiguity and complexity, enabling them to be adaptable in diverse and changing environments.

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

- 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
- Exam

Commitment to Continuous Learning

Our graduates will have enquiring minds and a literate curiosity which will lead them to pursue knowledge for its own sake. They will continue to pursue learning in their careers and as they participate in the world. They will be capable of reflecting on their experiences and relationships with others and the environment, learning from them, and growing - personally, professionally and socially.

This graduate capability is supported by:

Learning outcomes

- 2. Be competent in applying GIS modelling techniques
- 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

Assessment tasks

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

Discipline Specific Knowledge and Skills

Our graduates will take with them the intellectual development, depth and breadth of knowledge, scholarly understanding, and specific subject content in their chosen fields to make them competent and confident in their subject or profession. They will be able to demonstrate, where relevant, professional technical competence and meet professional standards. They will be able to articulate the structure of knowledge of their discipline, be able to adapt discipline-specific knowledge to novel situations, and be able to contribute from their discipline to inter-disciplinary solutions to problems.

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
- 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
- Exam

Critical, Analytical and Integrative Thinking

We want our graduates to be capable of reasoning, questioning and analysing, and to integrate and synthesise learning and knowledge from a range of sources and environments; to be able to critique constraints, assumptions and limitations; to be able to think independently and systemically in relation to scholarly activity, in the workplace, and in the world. We want them to have a level of scientific and information technology literacy.

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
- 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

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- Assignment 3 - Remote Sensing
- Assignment 4 - Project Design
- Exam

Problem Solving and Research Capability

Our graduates should be capable of researching; of analysing, and interpreting and assessing data and information in various forms; of drawing connections across fields of knowledge; and they should be able to relate their knowledge to complex situations at work or in the world, in order to diagnose and solve problems. We want them to have the confidence to take the initiative in doing so, within an awareness of their own limitations.

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

- Assignment 1 - GIS Modelling
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- Assignment 4 - Project Design
- Exam

Effective Communication

We want to develop in our students the ability to communicate and convey their views in forms effective with different audiences. We want our graduates to take with them the capability to read, listen, question, gather and evaluate information resources in a variety of formats, assess, write clearly, speak effectively, and to use visual communication and communication technologies as appropriate.

This graduate capability is supported by:

Learning outcomes

- 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

Assessment tasks

- Assignment 1 - GIS Modelling

- Assignment 2 - Review Report
- Assignment 3 - Remote Sensing
- Assignment 4 - Project Design
- Exam

Engaged and Ethical Local and Global citizens

As local citizens our graduates will be aware of indigenous perspectives and of the nation's historical context. They will be engaged with the challenges of contemporary society and with knowledge and ideas. We want our graduates to have respect for diversity, to be open-minded, sensitive to others and inclusive, and to be open to other cultures and perspectives: they should have a level of cultural literacy. Our graduates should be aware of disadvantage and social justice, and be willing to participate to help create a wiser and better society.

This graduate capability is supported by:

Assessment task

- Assignment 4 - Project Design

Socially and Environmentally Active and Responsible

We want our graduates to be aware of and have respect for self and others; to be able to work with others as a leader and a team player; to have a sense of connectedness with others and country; and to have a sense of mutual obligation. Our graduates should be informed and active participants in moving society towards sustainability.

This graduate capability is supported by:

Learning outcomes

- 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

Assessment tasks

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