



ENVE383

Environmental Analysis Using Remote Sensing and GIS

S2 Day 2014

Dept of Environment & Geography

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Disclaimer

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General Information

Unit convenor and teaching staff

Unit Convenor

Michael Chang

michael.chang@mq.edu.au

Contact via michael.chang@mq.edu.au

Credit points

3

Prerequisites

ENV264(P) or GEOS264(P)

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 is divided into three modules. Module one includes 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. Module two covers more advanced RS techniques to derive spatial information on land cover and land cover change, and the latest satellite programs. Module three deals with implementation issues and includes other material to equip students for success in a career in spatial information science. Practical sessions cover techniques for data preparation and spatial analysis and culminate in a project in an area nominated by the student.

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:

Understand a wide range of principles underlying GIS analyses

Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data

Be able to effectively communicate information derived using spatial analyses

Understand remotely sensed data from a range of sensors

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

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

Understand some concepts and issues relevant to the implementation of SIS in a workplace

General Assessment Information

SUBMISSION OF ASSIGNMENTS

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

Assignment reports are to be submitted electronically, either in MS Word or PDF format, via the submission links provided on iLearn page.

Assignments are to be submitted by 11:59 AM on the dates specified.

Late Submission Penalty

No extensions will be granted without a medical certificate or similar documentation. A penalty of 5% per day will be deducted from the total mark of the assessment task that is handed in late without an extension.

Special Consideration

The University recognises that students may experience disruptions that adversely affect their academic performance in assessment activities. The Disruption to Studies Notification must be completed and submitted online through www.ask.mq.edu.au within five (5) working days of the commencement of the disruption. **Disruption to Studies Policy** can be found at: http://students.mq.edu.au/student_admin/exams/disruption_to_studies/

Assessment Tasks

Name	Weighting	Due
GIS data sources	10%	Week 3, Thur 21 Aug, 11:59 am
GIS modelling project	15%	Week 6, Thur 11 Sept, 11:59 am
Major project	20%	Week 11, Thur 30 Oct, 11:59 am

Name	Weighting	Due
<u>Remote sensing project</u>	15%	week 13, Thur 13 Nov, 11:59 am
<u>Progress Tasks</u>	5%	check details on iLearn
<u>Final examination</u>	35%	Exam Period

GIS data sources

Due: **Week 3, Thur 21 Aug, 11:59 am**

Weighting: **10%**

Assessment Task 1: This assessment task asks students to search and list web based Australian GIS data sources.

On successful completion you will be able to:

- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data
- Have insights into current applications of GIS and RS in Australia and worldwide
- Understand some concepts and issues relevant to the implementation of SIS in a workplace

GIS modelling project

Due: **Week 6, Thur 11 Sept, 11:59 am**

Weighting: **15%**

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

On successful completion you will be able to:

- Understand a wide range of principles underlying GIS analyses
- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data
- Be able to effectively communicate information derived using spatial analyses
- Have insights into current applications of GIS and RS in Australia and worldwide
- Understand some concepts and issues relevant to the implementation of SIS in a workplace

Major project

Due: **Week 11, Thur 30 Oct, 11:59 am**

Weighting: **20%**

Assessment Task 3: This major project enables students to gain experience working with spatial data and GIS/RS procedures using a case study. The methodologies, results, discussions and conclusions will be presented in a project report.

On successful completion you will be able to:

- Understand a wide range of principles underlying GIS analyses
- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data
- Be able to effectively communicate information derived using spatial analyses
- Have insights into current applications of GIS and RS in Australia and worldwide
- Understand some concepts and issues relevant to the implementation of SIS in a workplace

Remote sensing project

Due: **week 13, Thur 13 Nov, 11:59 am**

Weighting: **15%**

This assessment is based on the practical work in weeks 11-12. They increase your ability to develop accurate spatial information, by introducing new analytical techniques for spatial data in raster format and RS imagery.

On successful completion you will be able to:

- Understand remotely sensed data from a range of sensors
- Be competent in applying a wide range of techniques for RS data to provide information about the environment
- Have insights into current applications of GIS and RS in Australia and worldwide
- Understand some concepts and issues relevant to the implementation of SIS in a workplace

Progress Tasks

Due: **check details on iLearn**

Weighting: **5%**

Progress tasks with practical work: To encourage students to build their GIS and RS analytical skills throughout the semester, marks are awarded for meeting progress targets in practical classes.

On successful completion you will be able to:

- Understand a wide range of principles underlying GIS analyses

- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data

Final examination

Due: **Exam Period**

Weighting: **35%**

The exam will be a two-hour paper covering all aspects of the unit.

Students are encouraged to refer to past examination papers when preparing for their final examination.

You are expected to present yourself for examination at the time designated in the University Examination Timetable. The timetable will be available in draft form approximately 8 weeks before the commencement of the examinations and in final form approximately 4 weeks before the commencement of the examinations.

On successful completion you will be able to:

- Understand a wide range of principles underlying GIS analyses
- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data
- Be able to effectively communicate information derived using spatial analyses
- Understand remotely sensed data from a range of sensors
- Be competent in applying a wide range of techniques for RS data to provide information about the environment
- Understand some concepts and issues relevant to the implementation of SIS in a workplace

Delivery and Resources

CLASSES

Delivery

Day and external

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 2 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 the Windows XP, Vista, Windows 7 or 8 operating system 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. Two practical sessions require the use of specialist remote sensing software, ENVI.

REQUIREMENTS TO COMPLETE THIS UNIT SATISFACTORY

- Attend **ALL** lecture and practical sessions (internal students);
- Check announcement and discussion threads on iLearn page at least once a week.
- Acquire a pass grade or above of the total grade of all assessments.

REQUIRED AND RECOMMENDED TEXTS AND/OR MATERIALS

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. (1996) *Introductory Digital Image Processing: A Remote Sensing Perspective*. Prentice Hall: Upper Saddle River, NJ. (G70.4.J46/1996)

UNIT WEBPAGE AND TECHNOLOGY USED AND REQUIRED

Unit web page

The iLearn web page for this unit is at <http://ilearn.mq.edu.au/>

Technology used

The unit will use iLearn and Echo360 for assisting learning; and ArcGIS and ENVI software for practical work.

For practical work, students must have at home a computer with the Windows XP, Vista, Windows 7 or 8 operating system. The ArcGIS software does **NOT** support Mac, or Linux system.

ArcGIS education license is available for students to install this software on their home computers. The license is, however, strictly limited to one copy per student.

Unit Schedule

Week	Lecture	Practical	Assessment Task Due
1	ENVE383 Overview Recap on basic GIS analysis	No prac	
2	GIS modelling	Raster Modelling: Data Conversion and Standardisation	
3	GIS modelling	Raster Modelling: Hydrological Modelling	Assignment 1
4	Classification & regression	Raster Modelling: Multi-criteria Evaluation	
5	Processing raster data	Assignment2 Work	
6	Interpolation	Interpolation	Assignment 2
7	ArcGIS geodatabase	ArcGIS geodatabase	
8	Introduction to remote sensing (RS)	Project work	
9	Measurement of reflected radiation	Project work	
10	Remote sensing sensors	Project work	

11	Applications of RS – optical	ENVI: Working with RS imagery	Assignment 3 - Major project
12	Applications of RS – radar	ENVI: Classification and change detection	
13	Unit summary	No prac	Assignment 4

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of 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/support/student_conduct/

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://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use Policy](#). The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

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

- Understand a wide range of principles underlying GIS analyses
- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data
- Be able to effectively communicate information derived using spatial analyses
- Understand remotely sensed data from a range of sensors
- Be competent in applying a wide range of techniques for RS data to provide information about the environment
- Have insights into current applications of GIS and RS in Australia and worldwide
- Understand some concepts and issues relevant to the implementation of GIS in a workplace

Assessment tasks

- GIS data sources
- GIS modelling project
- Major project

- Remote sensing project
- Progress Tasks
- Final examination

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

- Understand a wide range of principles underlying GIS analyses
- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data
- Understand remotely sensed data from a range of sensors
- Be competent in applying a wide range of techniques for RS data to provide information about the environment
- Have insights into current applications of GIS and RS in Australia and worldwide
- Understand some concepts and issues relevant to the implementation of SIS in a workplace

Assessment tasks

- GIS data sources
- GIS modelling project
- Major project
- Remote sensing project
- Progress Tasks
- Final examination

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

- Understand a wide range of principles underlying GIS analyses
- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data
- Understand remotely sensed data from a range of sensors
- Be competent in applying a wide range of techniques for RS data to provide information about the environment
- Have insights into current applications of GIS and RS in Australia and worldwide
- Understand some concepts and issues relevant to the implementation of SIS in a workplace

Assessment tasks

- GIS data sources
- GIS modelling project
- Major project
- Remote sensing project
- Progress Tasks
- Final examination

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

- Understand a wide range of principles underlying GIS analyses
- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data
- Understand remotely sensed data from a range of sensors
- Be competent in applying a wide range of techniques for RS data to provide information about the environment
- Have insights into current applications of GIS and RS in Australia and worldwide
- Understand some concepts and issues relevant to the implementation of SIS in a

workplace

Assessment tasks

- GIS modelling project
- Major project
- Remote sensing project
- Final examination

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

- Understand a wide range of principles underlying GIS analyses
- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data
- Be able to effectively communicate information derived using spatial analyses
- Understand remotely sensed data from a range of sensors
- Be competent in applying a wide range of techniques for RS data to provide information about the environment
- Have insights into current applications of GIS and RS in Australia and worldwide
- Understand some concepts and issues relevant to the implementation of SIS in a workplace

Assessment tasks

- GIS data sources
- GIS modelling project
- Major project

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 outcomes

- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data
- Be competent in applying a wide range of techniques for RS data to provide information about the environment
- Have insights into current applications of GIS and RS in Australia and worldwide
- Understand some concepts and issues relevant to the implementation of SIS in a workplace

Assessment task

- GIS modelling project

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

- Be able to effectively communicate information derived using spatial analyses
- Understand some concepts and issues relevant to the implementation of SIS in a workplace

Assessment tasks

- GIS modelling project
- Major project
- Final examination

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:

Learning outcomes

- Be competent in applying a wide range of techniques for RS data to provide information about the environment
- Have insights into current applications of GIS and RS in Australia and worldwide

Assessment tasks

- GIS modelling project
- Remote sensing project

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

- Be competent in applying a wide range of GIS techniques and procedures to analyse the spatial characteristics of data
- Understand remotely sensed data from a range of sensors
- Have insights into current applications of GIS and RS in Australia and worldwide

Assessment tasks

- GIS modelling project
- Major project
- Remote sensing project

Changes from Previous Offering

The lecture topic on "Vector spatial analysis and patterns" in 2013 is replaced by "Processing Raster Data". The case study used in the major project has been modified.

Changes since First Published

Date	Description
16/01/2014	The Prerequisites and Corequisites were updated.