ENVS383

Environmental Analysis Using Remote Sensing and GIS

S2 External 2019

Dept of Environmental Sciences

Contents

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General Information

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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:

Demonstrate knowledge of the principles underlying GIS raster analyses

Be competent in applying GIS modelling techniques

Effectively communicate information derived using spatial analyses

Evaluate remotely sensed data acquired from a range of sensors

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

Describe and critique 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 by the faculty. 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
1. Review Report	10%	No	Week 4
2. Remote Sensing Project	30%	No	Week 6 & 8
3. Bushfire Risk GIS Modelling	20%	No	Week 12
Exam	40%	No	Check exam timetable

1. Review Report

Due: **Week 4**
Weighting: **10%**

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

On successful completion you will be able to:
- Demonstrate knowledge of the principles underlying GIS raster analyses
- Evaluate remotely sensed data acquired from a range of sensors

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

2. Remote Sensing Project

Due: **Week 6 & 8**
Weighting: **30%**

Group work - project design (10%) and presentation (20%)

On successful completion you will be able to:
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- Effectively communicate information derived using spatial analyses
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3. Bushfire Risk GIS Modelling

Due: **Week 12**
Weighting: **20%**

This assessment is based on the practical work in weeks 8-12.

On successful completion you will be able to:
- Demonstrate knowledge of the principles underlying GIS raster analyses
- Be competent in applying GIS modelling techniques
- Effectively communicate information derived using spatial analyses
- Be competent in applying a wide range of techniques for RS data to provide information about the environment
- Describe and critique 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:

- Demonstrate knowledge of the principles underlying GIS raster analyses
- Be competent in applying GIS modelling techniques
- Effectively communicate information derived using spatial analyses
- Evaluate remotely sensed data acquired from a range of sensors
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- Describe and critique 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 may be provided to the external students if applicable.

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	Introduction to Remote Sensing
3	Vegetation Indices
4	Classifications
5	LiDAR
6	Radar (Microwave RS)
7	Radar (Microwave RS)
Break	
8	GIS Modelling for Bushfire Risk Analysis
9	GIS Modelling for Bushfire Risk Analysis
10	GIS Modelling for Bushfire Risk Analysis
11	The future of Earth Observations
12	RS applications for fire monitoring
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 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

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

Assessment tasks

- 2. Remote Sensing Project
- 3. Bushfire Risk GIS Modelling
- 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

- Demonstrate knowledge of the principles underlying GIS raster analyses
- Be competent in applying GIS modelling techniques
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- Be competent in applying a wide range of techniques for RS data to provide information

about the environment

- Describe and critique current applications of GIS and RS in Australia and worldwide

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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

- Demonstrate knowledge of the principles underlying GIS raster analyses
- Be competent in applying GIS modelling techniques
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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

- Demonstrate knowledge of the principles underlying GIS raster analyses

- Be competent in applying GIS modelling techniques

- Effectively communicate information derived using spatial analyses

- Evaluate remotely sensed data acquired from a range of sensors

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

- Describe and critique current applications of GIS and RS in Australia and worldwide

Assessment tasks

- 1. Review Report

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- 3. Bushfire Risk GIS Modelling

- 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

- Demonstrate knowledge of the principles underlying GIS raster analyses

- Be competent in applying GIS modelling techniques

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Assessment tasks

- 1. Review Report

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- 3. Bushfire Risk GIS Modelling

- 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

- Demonstrate knowledge of the principles underlying GIS raster analyses
- Be competent in applying GIS modelling techniques
- Effectively communicate information derived using spatial analyses
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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

- Demonstrate knowledge of the principles underlying GIS raster analyses
- Effectively communicate information derived using spatial analyses

Assessment tasks

- 1. Review Report
- 2. Remote Sensing Project
- 3. Bushfire Risk GIS Modelling
- 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:

Learning outcome

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

Assessment tasks

- 1. Review Report
- 2. Remote Sensing Project
- 3. Bushfire Risk GIS Modelling

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 outcome

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

Assessment tasks

- 1. Review Report
- 2. Remote Sensing Project
- 3. Bushfire Risk GIS Modelling

Changes since First Published

Date	Description
31/ 07/ 2019	The learning outcomes and assessments have been updated and approved for the Unit Guide (Internal). This is for the update of the Unit Guide ENVS383 (External)