ENVS853

Environmental Applications of GIS and Remote Sensing

S2 External 2019

Dept of Environmental Sciences

Contents

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General Information

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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:

Apply appropriate GIS raster analyses to derive useful information for making informed decisions

Design and implement a suitable model for environmental applications using remotely sensed data

Communicate geographic information effectively using maps, reports and presentations

Understand the advantages and limitations of spatial analyses and remote sensing systems

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	25%	No	Week 6 & 8
Online Quiz	10%	No	Week 7
3. GIS Fire Risk Modelling	15%	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 the specified remote sensing missions/applications.

On successful completion you will be able to:

- Apply appropriate GIS raster analyses to derive useful information for making informed decisions
- Communicate geographic information effectively using maps, reports and presentations
- Understand the advantages and limitations of spatial analyses and remote sensing systems

2. Remote Sensing Project

Due: **Week 6 & 8**
Weighting: **25%**

Remote Sensing Group Project: Design (10%) and Presentation of the Results (15%)

On successful completion you will be able to:

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Online Quiz

Due: **Week 7**
Weighting: **10%**

Multiple choices covering the topics in weeks 1-7.

On successful completion you will be able to:

- Understand the advantages and limitations of spatial analyses and remote sensing systems

3. GIS Fire Risk Modelling

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

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

On successful completion you will be able to:

- Apply appropriate GIS raster analyses to derive useful information for making informed decisions

- Design and implement a suitable model for environmental applications using remotely sensed data
- Communicate geographic information effectively using maps, reports and presentations
- Understand the advantages and limitations of spatial analyses and remote sensing systems

Exam

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

Final exam covering all aspects of the unit.

On successful completion you will be able to:

- Design and implement a suitable model for environmental applications using remotely sensed data
- Communicate geographic information effectively using maps, reports and presentations
- Understand the advantages and limitations of spatial analyses and remote sensing systems

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) Remote Sensing
7	Radar (Microwave) Remote Sensing
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.m q.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policy-centr al). 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 (htt ps://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 (http s://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/p olicy-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://stu dents.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

- Apply appropriate GIS raster analyses to derive useful information for making informed decisions
- Design and implement a suitable model for environmental applications using remotely sensed data
- Communicate geographic information effectively using maps, reports and presentations
- Understand the advantages and limitations of spatial analyses and remote sensing systems

Assessment tasks

- 1. Review Report
- 2. Remote Sensing Project

- Online Quiz
- 3. GIS Fire Risk Modelling
- 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

- Apply appropriate GIS raster analyses to derive useful information for making informed decisions
- Design and implement a suitable model for environmental applications using remotely sensed data
- Communicate geographic information effectively using maps, reports and presentations
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Assessment tasks

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- 3. GIS Fire Risk Modelling
- 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

- Apply appropriate GIS raster analyses to derive useful information for making informed decisions
- Design and implement a suitable model for environmental applications using remotely sensed data

- Understand the advantages and limitations of spatial analyses and remote sensing systems

Assessment tasks

- 1. Review Report
- 2. Remote Sensing Project
- Online Quiz
- 3. GIS Fire Risk Modelling
- 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

- Apply appropriate GIS raster analyses to derive useful information for making informed decisions
- Design and implement a suitable model for environmental applications using remotely sensed data
- Communicate geographic information effectively using maps, reports and presentations
- Understand the advantages and limitations of spatial analyses and remote sensing systems

Assessment tasks

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

- Apply appropriate GIS raster analyses to derive useful information for making informed decisions
- Design and implement a suitable model for environmental applications using remotely sensed data
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Assessment tasks

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

- Communicate geographic information effectively using maps, reports and presentations

Assessment tasks

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

Changes from Previous Offering

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 (External)