ENVS753

Environmental Applications of GIS and Remote Sensing

S2 Day 2017

Dept of Environmental Sciences

Contents

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General Information

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Credit points
4

Prerequisites
Admission to MRes and permission by special approval

Corequisites

Co-badged status

Unit description
This unit builds on basic GIS skills 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

Submission of assignments

All students are required to keep a backup of the submitted version of their assessments. Assignments should be in a MS Word or PDF file format. All maps, figures and tables associated with the assignment must be incorporated in the same MS Word document or PDF. Assignments are to be submitted via the link (Turnitin) provided on iLearn by the deadline specified.

Return of marked assignments

Your assignments will be returned via iLearn within two teaching weeks of the submission, and will include written feedback.

Requirements to complete this unit satisfactory

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

Assessment Tasks

Name	Weighting	Hurdle	Due
Assignment 1 - GIS Data Search	5%	No	Week 3
Assignment 2 - GIS Modelling	20%	No	Week 6
Assignment 3 - Review Report	20%	No	Week 11
Progress Tasks	5%	No	TBC
Quiz	10%	No	Week 12
Exam	40%	No	Check exam timetable

Assignment 1 - GIS Data Search

Due: **Week 3**
Weighting: **5%**

This assessment task asks students to search and list web based sources of Australian GIS

data.

On successful completion you will be able to:

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

Assignment 2 - GIS Modelling

Due: **Week 6**
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

Assignment 3 - Review Report

Due: **Week 11**
Weighting: **20%**

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

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

Progress Tasks

Due: **TBC**
Weighting: **5%**

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

On successful completion you will be able to:

- 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

Quiz

Due: **Week 12**
Weighting: **10%**

Online quizzes

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

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 the **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.

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*. 4th Ed. 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.

Information about how to access lecture recordings through the Echo360 EchoCenter page in iLearn can be found at: http://mq.edu.au/iLearn/student_info/lecture_recordings.htm

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 ENVS753
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 | Overview |

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

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_2016.html

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

Complaint Management Procedure for Students and Members of the Public http://www.mq.edu.au/policy/docs/complaint_management/procedure.html

Disruption to Studies Policy (in effect until Dec 4th, 2017): http://www.mq.edu.au/policy/docs/disruption_studies/policy.html

Special Consideration Policy (in effect from Dec 4th, 2017): https://staff.mq.edu.au/work/strategy-planning-and-governance/university-policies-and-procedures/policies/special-consideration

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/

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

- 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 2 - GIS Modelling

- Assignment 3 - Review Report

- 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
- 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 Data Search
- Assignment 2 - GIS Modelling
- Assignment 3 - Review Report
- Progress Tasks
- 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
- 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 2 - GIS Modelling
- Progress Tasks
- 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
- 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 Data Search
- Assignment 2 - GIS Modelling
- Assignment 3 - Review Report

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 outcome

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

Assessment tasks

- Assignment 2 - GIS Modelling

- Assignment 3 - Review Report
- 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

- 3. Be able to effectively communicate information derived using spatial analyses

Changes from Previous Offering

There is a major change of the structure of ENVE853 in 2015.

From this year, there are approximately 50% of the topics on GIS modellings and raster analysis, and another 50% on remote sensing and its applications.

Assessments and their weightings have also been modified accordingly.