# ENVS708

**Geographic Information Science**

S1 External 2016

*Dept of Environmental Sciences*

## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Information</td>
<td>2</td>
</tr>
<tr>
<td>Learning Outcomes</td>
<td>3</td>
</tr>
<tr>
<td>Assessment Tasks</td>
<td>3</td>
</tr>
<tr>
<td>Delivery and Resources</td>
<td>6</td>
</tr>
<tr>
<td>Unit Schedule</td>
<td>8</td>
</tr>
<tr>
<td>Policies and Procedures</td>
<td>9</td>
</tr>
<tr>
<td>Graduate Capabilities</td>
<td>10</td>
</tr>
<tr>
<td>Changes from Previous Offering</td>
<td>13</td>
</tr>
</tbody>
</table>

---

**Disclaimer**

Macquarie University has taken all reasonable measures to ensure the information in this publication is accurate and up-to-date. However, the information may change or become out-dated as a result of change in University policies, procedures or rules. The University reserves the right to make changes to any information in this publication without notice. Users of this publication are advised to check the website version of this publication [or the relevant faculty or department] before acting on any information in this publication.
General Information

Unit convenor and teaching staff
Lecturer
Joseph Maina Mbui
joseph.mbui@mq.edu.au
Contact via Email
Level 2 AHH building
Email to schedule an appointment

Lecturer
Michael Chang
michael.chang@mq.edu.au
Contact via Email
Level 2 AHH building
Email to schedule an appointment

Credit points
4

Prerequisites
Admission to MRes

Corequisites

Co-badged status

Unit description
This unit provides students with a comprehensive introduction to geospatial technologies, including geographic information systems (GIS), global positioning systems (GPS) and remote sensing. Students will learn core concepts and develop advanced technical skills in data acquisition and management, mapping and spatial sampling and analysis. Students are provided training using the latest commercially available geospatial software. This unit covers the application of geographic information science across a range of disciplines, including environmental science and management, physical and human geography and urban and environmental planning.

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:

- Identify and define key concepts and principles of geographic information science, including scale, projections, interactions and interdependence
- Perform basic operations using geographic information systems (GIS) and remote sensing software
- Organise, analyse and interpret geographic information using a range of techniques
- Effectively communicate the outputs of geographic analysis in both map and written formats
- Identify and apply appropriate geographic information science concepts and techniques to a range of contexts

Assessment Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Weighting</th>
<th>Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assignment 1</td>
<td>5%</td>
<td>March 18 2016</td>
</tr>
<tr>
<td>Assignment 2</td>
<td>10%</td>
<td>April 8 2016</td>
</tr>
<tr>
<td>Assignment 3</td>
<td>17%</td>
<td>April 29 2016</td>
</tr>
<tr>
<td>Assignment 4</td>
<td>13%</td>
<td>May 27 2016</td>
</tr>
<tr>
<td>Quiz</td>
<td>10%</td>
<td>April 8 and June 10 2016</td>
</tr>
<tr>
<td>Final Exam</td>
<td>45%</td>
<td>Check exam timetable</td>
</tr>
</tbody>
</table>

Assignment 1
Due: March 18 2016
Weighting: 5%

Report on the week 2 – 3 practical exercises using the ESRI ‘Virtual Campus’.

On successful completion you will be able to:
- Identify and define key concepts and principles of geographic information science, including scale, projections, interactions and interdependence
- Perform basic operations using geographic information systems (GIS) and remote sensing software
• Identify and apply appropriate geographic information science concepts and techniques to a range of contexts

Assignment 2
Due: April 8 2016
Weighting: 10%
Report on GIS essay topic.

On successful completion you will be able to:
• Identify and define key concepts and principles of geographic information science, including scale, projections, interactions and interdependence
• Perform basic operations using geographic information systems (GIS) and remote sensing software
• Organise, analyse and interpret geographic information using a range of techniques
• Effectively communicate the outputs of geographic analysis in both map and written formats
• Identify and apply appropriate geographic information science concepts and techniques to a range of contexts

Assignment 3
Due: April 29 2016
Weighting: 17%
Report on the week 4 - 7 practical exercises on attribute tables, queries and geoprocessing.

On successful completion you will be able to:
• Identify and define key concepts and principles of geographic information science, including scale, projections, interactions and interdependence
• Perform basic operations using geographic information systems (GIS) and remote sensing software
• Organise, analyse and interpret geographic information using a range of techniques
• Effectively communicate the outputs of geographic analysis in both map and written formats
• Identify and apply appropriate geographic information science concepts and techniques to a range of contexts

Assignment 4
Due: May 27 2016
Weighting: 13%

Report on the week 8 - 11 practical exercises on data capture, raster analysis and advanced mapping.

On successful completion you will be able to:
  • Identify and define key concepts and principles of geographic information science, including scale, projections, interactions and interdependence
  • Perform basic operations using geographic information systems (GIS) and remote sensing software
  • Organise, analyse and interpret geographic information using a range of techniques
  • Effectively communicate the outputs of geographic analysis in both map and written formats
  • Identify and apply appropriate geographic information science concepts and techniques to a range of contexts

Quiz
Due: April 8 and June 10 2016
Weighting: 10%

Two short quizzes on lecture topics.

On successful completion you will be able to:
  • Identify and define key concepts and principles of geographic information science, including scale, projections, interactions and interdependence

Final Exam
Due: Check exam timetable
Weighting: 45%

Final exam covering all aspects of the unit.

On successful completion you will be able to:
  • Identify and define key concepts and principles of geographic information science, including scale, projections, interactions and interdependence
  • Effectively communicate the outputs of geographic analysis in both map and written formats
  • Identify and apply appropriate geographic information science concepts and techniques to a range of contexts
Delivery and Resources

ENVS708 provides students with a comprehensive introduction to geospatial technologies, including geographic information systems (GIS), global positioning systems (GPS) and remote sensing. Students will learn core concepts and develop technical skills in data acquisition and management, mapping and spatial sampling and analysis. Students are provided training using the latest commercially available geospatial software.

ENVS708’s lectures cover a range of topics to introduce you to geographic information science, including: coordinate systems and map projections, how to create your own digital data, spatial analysis with vector and raster data, cartography (map making), remote sensing and 3D analysis. The practical classes apply standard geographic information science concepts and techniques to a range of disciplines, including environmental science and management, physical and human geography and urban planning.

Delivery

This unit is offered both internally and externally.

Lecture program and location

There is one 1 hour lecture per week. Please check lecture times and rooms at the Macquarie University timetables website (www.timetables.mq.edu.au). Lectures are recorded and posted to iLearn via Echo360. Internal students are expected to attend lectures in person; external students can access lectures through iLearn.

Practical program and location

Internal students: There is one 3 hour practical class per week. Please check practical times and rooms at the Macquarie University timetables website (www.timetables.mq.edu.au). Practical class sizes are limited by the number of available computers. You must use the online enrolment system to change the time/day of your practical class. Practicals begin in Week 2.

External students: You must have a home computer with a Windows 7 or above, Vista or XP operating system (the ArcGIS software is NOT supported by Mac or Linux operating systems.). A copy of the ArcGIS software will be sent to all external students. You must install this software on your computer.

Workload

ENVS708 earns 4 credit points towards your degree. You are expected to invest at least 9 hours of study per week on average over the semester. This includes your lectures and practical exercises (4 hours per week), assignments and the final exam.

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 and tables associated with the assignment must be incorporated in the MS Word document or PDF.

Students are not permitted to email their assignments or submit them in a softcopy format.
Assignments are to be submitted via the Turnitin link provided in iLearn by 5PM on the date specified.

**How do I request an extension?**

Extensions must be requested by email from the unit convenor prior to the assignment's due date (except in exceptional circumstances), and supported by appropriate documentation (e.g. a medical certificate).

Extensions will only be granted in writing (by email) at the discretion of the unit convenor. Otherwise, automatic penalties will apply. Assignments that are handed in late without an extension or exceptional circumstances will not be marked if they are submitted more than 7 days after the due date. If submitted within 7 days, marks will be deducted for lateness at the rate of 5% of the possible mark per day.

**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**

1. Attend lecture and practical classes (internal students);
2. Complete all assignments and the final exam; and
3. Acquire a pass grade or above.

Grades for the unit as a whole will be awarded according to the following general criteria (course rubric).

<table>
<thead>
<tr>
<th></th>
<th>Developing</th>
<th>Functional</th>
<th>Proficient</th>
<th>Advanced</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td>Has not yet reached the desired standard.</td>
<td>Has reached basic academic standards.</td>
<td>Has completely reached the standards expected.</td>
<td>Has gone beyond the expected standards.</td>
</tr>
<tr>
<td><strong>description</strong></td>
<td>Limited understanding of required concepts and knowledge.</td>
<td>Work has limited translation of concepts and procedures to new contexts unless aided.</td>
<td>Can work independently in new contexts, adapting procedures to meet the context. Demonstrates awareness of own limitations.</td>
<td>Exhibits high levels of independence and can use concepts to generate new ways of completing procedures. Can engage in critical reflection.</td>
</tr>
<tr>
<td><strong>of the level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>of attainment</strong></td>
<td>A fail grade (or under some circumstances a conceded pass) would be given</td>
<td>A pass grade would be awarded</td>
<td>A credit grade would be awarded</td>
<td>A grade of distinction or high distinction would be awarded</td>
</tr>
</tbody>
</table>

**Resources**

**Technology used**

This unit will use Echo360 and iLearn, and ArcGIS, Google Earth and MS Excel software, and GPS for the practical exercises.

You will require access to a computer and broadband internet to complete this unit. The library computers and computer labs are available for casual use outside scheduled practical classes.
Internal students who have a home computer with a Windows 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. However, external students must have ArcGIS installed on their home computer.

**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](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 ENVS708 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](http://mq.edu.au/iLearn/student_info/lecture_recordings.htm)

**Required and recommended texts/materials**


### Unit Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture Topic</th>
<th>Lecturer</th>
<th>Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to ENVS808/708</td>
<td>J Maina</td>
<td>No practical</td>
</tr>
<tr>
<td>2</td>
<td>Getting started with GIS</td>
<td>J Maina</td>
<td>ESRI Virtual Campus</td>
</tr>
<tr>
<td>3</td>
<td>Coordinate systems and map projections</td>
<td>J Maina</td>
<td>ESRI Virtual Campus</td>
</tr>
<tr>
<td>4</td>
<td>Spatial analysis with vector data, data flow diagrams</td>
<td>J Maina</td>
<td>GIS Techniques for Deriving Spatial Information 1</td>
</tr>
<tr>
<td>5</td>
<td>How to make a map</td>
<td>J Maina</td>
<td>GIS Techniques for Deriving Spatial Information 2</td>
</tr>
<tr>
<td>6</td>
<td>Online GIS</td>
<td>J Maina</td>
<td>GIS Techniques for Deriving Spatial Information 3</td>
</tr>
<tr>
<td></td>
<td><strong>SESSION 1 BREAK</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>GIS applications and careers in GIS</td>
<td>J Maina</td>
<td>GIS Techniques for Deriving Spatial Information 4</td>
</tr>
<tr>
<td>8</td>
<td>Creating digital data</td>
<td>J Maina</td>
<td>Data capture and GPS</td>
</tr>
<tr>
<td>9</td>
<td>Spatial analysis with raster data</td>
<td>J Maina</td>
<td>Raster analysis</td>
</tr>
<tr>
<td>10</td>
<td>3D GIS (Terrain)</td>
<td>Chang</td>
<td>Data Capture - Georeferencing and Digitising</td>
</tr>
<tr>
<td>11</td>
<td>Remote sensing 1</td>
<td>Chang</td>
<td>Preparation and Presentation of Maps</td>
</tr>
</tbody>
</table>
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:


Grading Policy prior to Session 2 2016 [http://mq.edu.au/policy/docs/grading/policy.html]


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/]

Unit guide ENVS708 Geographic Information Science

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture Topic</th>
<th>Lecturer</th>
<th>Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Remote sensing 2</td>
<td>Chang</td>
<td>Remote sensing and advanced mapping</td>
</tr>
<tr>
<td>13</td>
<td>Summary</td>
<td>J Maina</td>
<td>No practical</td>
</tr>
</tbody>
</table>
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
- Perform basic operations using geographic information systems (GIS) and remote sensing software
- Organise, analyse and interpret geographic information using a range of techniques
- Identify and apply appropriate geographic information science concepts and techniques to a range of contexts

Assessment task
- Assignment 4
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**

- Identify and define key concepts and principles of geographic information science, including scale, projections, interactions and interdependence
- Perform basic operations using geographic information systems (GIS) and remote sensing software
- Organise, analyse and interpret geographic information using a range of techniques
- Identify and apply appropriate geographic information science concepts and techniques to a range of contexts

**Assessment tasks**

- Assignment 1
- Assignment 2
- Assignment 3
- Assignment 4
- Quiz
- Final 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**

- Identify and define key concepts and principles of geographic information science, including scale, projections, interactions and interdependence
- Perform basic operations using geographic information systems (GIS) and remote sensing software
- Organise, analyse and interpret geographic information using a range of techniques
- Identify and apply appropriate geographic information science concepts and techniques
to a range of contexts

**Assessment tasks**

- Assignment 2
- Assignment 3
- Assignment 4
- Quiz
- Final 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**

- Identify and define key concepts and principles of geographic information science, including scale, projections, interactions and interdependence
- Perform basic operations using geographic information systems (GIS) and remote sensing software
- Organise, analyse and interpret geographic information using a range of techniques
- Identify and apply appropriate geographic information science concepts and techniques to a range of contexts

**Assessment tasks**

- Assignment 2
- Assignment 3
- Assignment 4
- Final 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 outcome

• Effectively communicate the outputs of geographic analysis in both map and written formats

Assessment task

• Assignment 4

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:

Assessment tasks

• Assignment 2
• Assignment 3

Changes from Previous Offering

The unit has a new convenor, Dr. Joseph Maina Mbui. Some content has been removed in 2016 due to two Public Holidays.