

GEOS6161: Spatial Science

Online

Trimester 1 - 2024



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

Course Description Due to rapid growth of easily accessible high-quality spatial data, Geographic Information Systems (GIS) are widely used by private sector, government agencies and research organisations to assist with resource and environmental management decision making. This course provides students with an introduction to spatial science and its applications in land and water management, climate science, geoscience, biodiversity studies, planning and social research. The aims of this course are to introduce the principles and theories of GIS and remote sensing and develop practical skills in obtaining, interpreting, analysing and developing spatial datasets. The practical component is implemented through a series of computer laboratories that use real world examples from the earth, environmental and life sciences.

Academic Progress Requirements Nil

Assumed Knowledge Students taking this course must be reasonably experienced using computers and know how to use Microsoft Windows and Microsoft Office (Word and Excel), understand file paths and folder structures, know how to save and back up work.

Contact Hours

Online Lecture
Online
2 hour(s) per week(s) for 12 week(s) starting Week 1

Practical
Online
2 hour(s) per week(s) for 12 week(s) starting Week 1

Unit Weighting Workload 10
Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

COURSE OUTLINE

CONTACTS

Course Coordinator	Online Dr Kendall Mollison Kendall.Mollison@newcastle.edu.au Consultation: Email
Teaching Staff	Other teaching staff will be advised on the course Canvas site.
School Office	School of Environmental and Life Sciences Room C228 Chemistry Building Callaghan Science-SELS@newcastle.edu.au +61 2 4921 5080 9am-5pm (Mon-Fri)

SYLLABUS

Course Content	<ul style="list-style-type: none">• Principles of GIS• Data input, processing and manipulation• Querying datasets and spatial modelling• Principles of aerial photography and satellite remote sensing• Sensor types and platforms• Digital image processing• Application in the earth, environmental and life sciences
Course Learning Outcomes	<p>On successful completion of this course, students will be able to:</p> <ol style="list-style-type: none">1. Interpret and explain the principles of geographic information systems (GIS) and formulate a workflow for solving a spatial problem.2. Interpret and explain the principles of remote sensing and digital image processing techniques.3. Apply a range of remote sensing and GIS techniques to evaluate and solve spatial problems in the earth, environmental and life sciences.4. Use image processing and GIS software.
Course Materials	<p>Lecture Materials:</p> <ul style="list-style-type: none">- Provided on Canvas <p>Recommended Reading:</p> <ul style="list-style-type: none">- Provided on Canvas <p>Multi-Media Resource:</p> <ul style="list-style-type: none">- Provided on Canvas

SCHEDULE

Week	Week Begins	Topic	Learning Activity	Assessment Due
1	29 Jan	Introduction to Spatial Science	Learning Module 1 Computer Practical 1 - Installing and navigating QGIS	
2	5 Feb	Spatial data structure, georeferencing and projections	Learning Module 2 Computer Practical 2 - Exploring spatial data in QGIS	
3	12 Feb	Vector and raster data	Learning Module 3 Computer Practical 3 - Vector data, display, and analysis	Quiz 1
4	19 Feb	Spatial analysis tools and spatial statistics	Learning Module 4 Computer Practical 4 - Raster data, display, and analysis	Quiz 2
5	26 Feb	Data visualisation and map making essentials	Learning Module 5 Computer Practical 5 - Data classification and map making	Quiz 3
6	4 Mar	The remote sensing process	Learning Module 6 Computer Practical 6 - Data interoperability and interpolation	Quiz 4
7	11 Mar	Satellites and sensors	Learning Module 7 Computer Practical 7 - Introduction to remote sensing in QGIS	
8	18 Mar	Image pre-processing and enhancement	Learning Module 8 Computer Practical 8 - Digital image enhancement and band ratios	Written Assignment
9	25 Mar	Image classification	Learning Module 9 Computer Practical 9 - Satellite image classification	Quiz 5
10	1 Apr	Change detection and timeseries analysis	Learning Module 10 Computer Practical 10 - Major assignment preparation: Generating the normalised burn ratio	Quiz 6
11	8 Apr	Scientific report writing and your major assignment	Learning Module 11 Computer Practical 11 - Major assignment help session	Quiz 7
12	15 Apr	The future of spatial science	Learning Module 12 Computer Practical 12 - Major assignment help session	Quiz 8
Examination Period				Major Assignment

ASSESSMENTS

This course has 3 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Short essay responses	Friday 5 pm Week 8	Individual	30%	1, 2
2	Written assessment based on laboratory exercises	Friday 5 pm Week 13	Individual	40%	3, 4
3	Online quizzes based on lecture material and lab exercises	See Schedule for Quizzes	Individual	30%	1, 2, 3, 4

Late Submissions The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Short essay responses

Assessment Type Written Assignment
Purpose The written assignment is designed to test the individual student's knowledge of the theoretical component of the course material and their ability to describe, analyse and hypothesise from this material.
Description Series of short answer questions students will research about GIS and Remote sensing theory.
Weighting 30%
Due Date Friday 5 pm Week 8
Submission Method Online
 Submission through Canvas
Assessment Criteria A rubric is provided on Canvas
Return Method Online
Feedback Provided Online - Within two weeks of submission. Individual feedback on assessment.

Assessment 2 - Written assessment based on laboratory exercises

Assessment Type Tutorial / Laboratory Exercises
Purpose The written assignment meets the course objectives of knowledge acquisition and demonstrated assimilation of data, upon reflection and analysis, to produce articulate and concise documents which convey evidence-based understanding of the concepts and topics.
Description Major report on spatial analysis of USA Camp fire.
Weighting 40%
Due Date Friday 5 pm Week 13
Submission Method Online
 Submission through Canvas TurnItIn
Assessment Criteria A rubric is provided on Canvas
Return Method Online
Feedback Provided Online - Within two weeks of submission. Individual feedback on assessment.

Assessment 3 - Online quizzes based on lecture material and lab exercises

Assessment Type Quiz
Purpose The purpose and benefit of the quizzes is to provide students with regular feedback on student learning. These tests highlight areas of concern and may stimulate discussion with tutors and lecturers. In addition to understanding the theory, GIS and Remote Sensing requires development of practical skills and these exercises will assess whether or not this has been satisfactorily achieved.
Description 8 online quizzes accessed through Canvas.

Weighting	30%
Due Date	See Schedule for Quizzes
Submission Method	Online
Assessment Criteria	See Quiz information
Return Method	Online
Feedback Provided	Online - Feedback automatically provided once quiz is submitted. Correct answer and explanation given.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.
- Email: Students will receive communications via their student email account.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)

As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the [Oral Examination \(viva\) Procedure](#). In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the [Student Conduct Rule](#).

Academic Misconduct

All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to <https://policies.newcastle.edu.au/document/view-current.php?id=35>.

**Adverse
Circumstances**

The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where:

1. the assessment item is a major assessment item; or
2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;
3. you are requesting a change of placement; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at:

<https://policies.newcastle.edu.au/document/view-current.php?id=236>

**Important Policy
Information**

The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures

at <https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures> that support a safe and respectful environment at the University.

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.

© 2024 The University of Newcastle, Australia