GMAT3220

Geospatial Information Systems

Term 1, 2023

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Badal Pokharel	b.pokharel@unsw.edu.au	Thursday and Friday	CE508	xxxx258

School Contact Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

Course Details

Units of Credit 6

Summary of the Course

An overview of the components of Geographic Information Systems (GIS). Database management in the context of spatial data. Data acquisition techniques including overviews of digitising, scanning, field survey and remote sensing. Data conversion process, visualisation of geospatial data, cartography, colour and 3D views. Concepts and definitions of spatial information systems, coordinate systems, mapping and spatial issues, data structures including vector, raster and surface modelling. Inputting both spatial and attribute data to the GIS. Transformation of data between coordinate systems, re-projection of map coordinates. GPS-based image registration. Editing data and creating topologically clean data. Tagging spatial data with attributes, linking spatial data to attribute databases. Use of basic analysis functions: spatial selection, attribute selection, making reports of spatial and attribute data, interfacing to the system using a high level language. Use of the World Wide Web to disseminate information.

Course Aims

This course aims to provide the practical training in order for the student to work effectively and critically with GIS. Concepts and definitions of spatial information systems, coordinate systems, mapping and spatial issues, data structures including vector, raster and surface modeling. Inputting both spatial and attribute data to the GIS. Transformation of data between coordinate systems, re-projection of map coordinates. GPS-based image registration. Geo-databases. Editing data and creating topologically clean data. Tagging spatial data with attributes, linking spatial data to attribute databases. Use of basic analysis functions: spatial selection, attribute selection, making reports of spatial and attribute data, interfacing to the system using a high level language. Use of the World Wide Web to disseminate information.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Develop simple data models for use in many GIS applications.	PE1.1, PE2.1, PE2.3
2. Understand the concepts and definitions of spatial systems, coordinate systems, mapping and spatial issues with maps, data structures including vector, raster and surface modelling	PE1.2, PE1.6, PE2.3
3. Be capable to build geo-databases and analyse spatial data	PE1.4, PE2.2, PE3.3
4. Design a Web-based GIS	PE1.5, PE2.4, PE3.3

Teaching Strategies

It is estimated that about 80% of all information has a "spatial component". Geographic Information Systems (GIS) is a way of managing, analysing, visualising and delivering spatial information to engineers, other professionals, clients and the community. The use of GIS is now ubiquitous in many infrastructure provision and service delivery fields, such as planning, construction, mining, environment,

transport, disaster response, security, health, etc. Students will learn the foundations of geoinformation management, gaining proficiency in the use of the basic GIS software tool, setting up a functioning GIS, and executing some basic spatial query operations are important outcomes.

This course is based on a 2-hour lecture plus 3-hour lab per week. Lectures are designed to teach generic algorithms and fundamental theories. Lab exercises are to learn basic GIS techniques and gain experience with practical applications.

Additional Course Information

Approaches to learning in the course are given in the following:

Private Study	• Review lecture material and textbook • Do set problems and assignments • Join Moodle discussions of problems • Reflect on class problems and assignments • Download materials from Moodle • Keep up with notices and find out marks via Moodle
Lectures	• Find out what you must learn • See methods that are not in the textbook • Follow worked examples • Hear announcements on course changes
Workshops	• Be guided by Demonstrators • Practice solving set problems • Ask questions
Assessments	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving
Laboratory Work	• Hands-on work, to set studies in context

Assessment

Late submission will get 5% deduction of the assignment mark for each day late.

Students who perform poorly in the on-site lab assessments and homework assignments are recommended to discuss progress with the lecturer during the semester. Homework assignments will be briefed to you in the middle of lectures without prior notice, hence attendance in lectures is essential.

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Homework	16%	5 pm Wednesday, a week after	1, 2, 3, 4
2. On-site lab work	20%	5pm Friday, the same week	1, 2, 3, 4
3. Major Assignment	20%	21/04/2023 05:00 PM	1, 2, 3, 4
4. Final Exam	44%		1, 2, 3, 4

Assessment 1: Homework

Start date: 11 am Thursaday, each week
Submission notes: A word document with your answers to the homework questions should be submitted via Moodle.
Due date: 5 pm Wednesday, a week after

This is homework assignment consisting of a few questions about the lecture.

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Additional details

Assessment of homework (4 points per week for 8 weeks) will be based on the following criteria:

- *No answers* *0 point*
- *Partial or incorrect answers* *1-3 points*
- *Complete and correct answers* *4 points*

Assessment 2: On-site lab work

Start date: 2 pm Friday, each week
Submission notes: A lab report including your answers to the lab questions should be submitted to lab demonstrator/lecturer.
Due date: 5pm Friday, the same week

This is on-site lab work on a weekly basis. Detailed step-by-step instructions will be provided.

Workshop on each lab exercise will be provided.

Additional details

Assessment of on-site lab work (5 points per week for 8 weeks) will be based on the following criteria:

- *No output* *0 point*
- *Partial output* *1-2 points*
- *Full output but with incorrect results* *3-4 points*
- *Complete and correct results* *5 points*

Assessment 3: Major Assignment

Start date: 02/03/2023 09:00 AM
Submission notes: An electronic copy of individual report in Microsoft Word format, and a zip file of data, maps and reference documents, etc. that you produced or obtained during the course of the assignment, but do not include the data given to you from the lecturer, should be submitted via Moodle.
Due date: 21/04/2023 05:00 PM

The purpose of this Assignment is to analyze a GIS data input problem and produce a display of the results using ArcGIS.

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Additional details

Assessment of major assignment report (40 points) will be based on the following criteria:

- Written presentation max. 10 points
- Review of other work max. 10 points
- Quality of project work max. 10 points
- Results, Interpretation & conclusions max. 10 points

Assessment 4: Final Exam

Assessment length: 2 hours

Centrally managed final exam.

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Additional details

A mark of at least 36 points out of the total 88 points in the final exam is required before the class work is included in the final mark.

Attendance Requirements

For courses with Workshops and/or Labs, attendance for those classes is a necessary part of the course. You must **attend at least 80% of the workshop/lab** in which you are enrolled for the duration of the session.

Course Schedule

View class timetable

Timetable

Date	Type	Content
Week 1: 13 February - 17 February	Lecture	Introduction to the course & Introduction to GIS
	Tut-Lab	Introduction to ArcGIS: ArcMap, ArcCatalog, ArcToolbox
Week 2: 20 February - 24 February	Lecture	Map Projections
	Tut-Lab	Map Projections
Week 3: 27 February - 3 March	Fieldwork	***GMAT3150 field survey camp. No lecture, no tut□lab for GMAT3220.***
Week 4: 6 March - 10 March	Lecture	Vector and Raster
	Tut-Lab	Vector and Raster
Week 5: 13 March - 17 March	Lecture	Data acquisition
	Tut-Lab	Image Registration
Week 6: 20 March - 24 March	Lecture	Non-teaching week.
	Tut-Lab	Non-teaching week.
Week 7: 27 March - 31 March	Lecture	Spatial interpolation
	Tut-Lab	Spatial interpolation
Week 8: 3 April - 7 April	Lecture	Database
	Tut-Lab	Table relationship queries
Week 9: 10 April - 14 April	Lecture	Surface modelling
	Tut-Lab	Surface modelling and topographical interpretation
Week 10: 17 April - 21 April	Lecture	Spatial Analysis
	Tut-Lab	Spatial Analysis

	Assessment	Major Assignment: An electronic copy of individual report in Microsoft Word format, and a zip file of data, maps and reference documents, etc. that you produced or obtained during the course of the assignment, but do not include the data given to you from the lecturer, should be submitted via Moodle.

Resources

Prescribed Resources

Kang-tsung Chang, Introduction to Geographic Information Systems, 9th Ed., the McGraw-Hill Companies

Recommended Resources

Maribeth Price, Mastering ArcGIS, 6th Ed., the McGraw-Hill Companies

Course Evaluation and Development

There are two forums, namely GIS Forum and ArcGIS Forum, available on Moodle so that students can post their questions. The lecturer will respond to the questions on an ad-hoc basis.

Laboratory Workshop Information

A student copy of ArcGIS Pro will be distributed to students. They need to download and install the s/w on their PC or laptop by themselves.

Submission of Assessment Tasks

Please refer to the Moodle page of the course for further guidance on assessment submission.

UNSW has a standard late submission penalty of:

- 5% per day, for all assessments where a penalty applies, capped at five days (120 hours), after which a student cannot submit an assessment, and no permitted variation.

Academic Honesty and Plagiarism

Beware! An assignment that includes plagiarised material will receive a 0% Fail, and students who plagiarise may fail the course. Students who plagiarise are also liable to disciplinary action, including exclusion from enrolment.

Plagiarism is the use of another person's work or ideas as if they were your own. When it is necessary or desirable to use other people's material you should adequately acknowledge whose words or ideas they are and where you found them (giving the complete reference details, including page number(s)). The Learning Centre provides further information on what constitutes Plagiarism at:

https://student.unsw.edu.au/plagiarism

Academic Information

Final Examinations:

Final Exams in T1 2023 will be held on campus between the 28th of April and the11th of May, and Supplementary Exams between the 22nd of May and the 26th of May. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

ACADEMIC ADVICE

- Key Staff to Contact for Academic Advice (log in with your zID and password): https://intranet.civeng.unsw.edu.au/key-staff-to-contact-during-your-studies-at-unsw
- Key UNSW Dates - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.
- CVEN Student Intranet (log in with your zID and password): https://intranet.civeng.unsw.edu.au/student-intranet
- Student Life at CVEN, including Student Societies: https://www.unsw.edu.au/engineering/civil-and-environmental-engineering/student-life
- Special Consideration: https://student.unsw.edu.au/special-consideration
- General and Program-Specific Questions: The Nucleus: Student Hub
- Book an Academic Advising session: https://unswengacademicadvising.as.me/schedule.php

Disclaimer

This course outline sets out description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle should be consulted for the up to date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

Mike Gal.

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	✓
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	✓
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in professional and lay domains	
PE3.3 Creative, innovative and pro-active demeanour	✓
PE3.4 Professional use and management of information	
PE3.5 Orderly management of self, and professional conduct	
PE3.6 Effective team membership and team leadership	