School of Civil and Environmental Engineering

Term 1, 2020

GMAT3220 Geospatial Information Systems

COURSE DETAILS

Units of Credit	**6**	
Contact hours	6 hours per week	
Class	Tuesday 9:00 – 11:00 (Wk 1-2, 4-10)	Ainsworth 202
Workshop	Thursday 11:00 – 12:00 (Wk 1-2, 4-10)	CE G1
Laboratory	Friday 11:00 – 14:00 (Wk 1-2, 4-7, 9-10)	CE 201
	Tuesday 11:00 – 14:00 (Wk 11)	CE 201
Course Coordinator and Lecturer	Samsung Lim email: s.lim@unsw.edu.au office: CE 411 phone x54505	

INFORMATION ABOUT THE COURSE

GMAT3220 aims to provide fundamental Geospatial Information System (GIS) knowledge and skills. GIS is a multidisciplinary field built out of knowledge from geography, cartography, computer science and mathematics. The basics of cartography, spatial analysis and computer programming will be covered in the classroom to help students build up the foundation of GIS. Study of spatial representation, georeferencing, data accuracy, data models, data structures and data processing are necessary for students to investigate further the advanced areas of GIS in their future career. More advanced topics will be discussed in GMAT4220 where generic algorithms, fundamental theories and techniques, and practical applications of GIS will be studied.

HANDBOOK DESCRIPTION

See link to virtual handbook

https://www.handbook.unsw.edu.au/undergraduate/courses/2020/gmat3220

OBJECTIVES

This course aims to provide the practical training that needs to be understood to work effectively and critically with GIS, and provides an environment that fosters the following attributes:

- the skills involved in scholarly enquiry: Significant – data analysis skills
- an in-depth engagement with relevant disciplinary knowledge in its interdisciplinary context: Significant – understanding coordinate systems and datums
- the capacity for analytical and critical thinking and for creative problem solving: Significant – in the term project
- the ability to engage in independent and reflective learning: Some – in the lab exercises

- the skills to locate, evaluate and use relevant information (Information Literacy): Some – in preparing for the term project
- the capacity for enterprise, initiative and creativity: Some – in the term project
- an appreciation of and respect for, diversity: Some – while working in groups in the lab
- a capacity to contribute to, and work within, the international community: Some – in many cases the study area of the term project is international
- the skills required for collaborative and multidisciplinary work: Some – while working in groups in the lab
- an appreciation of, and a responsiveness to, change: Some
- a respect for ethical practice and social responsibility: Some

TEACHING STRATEGIES

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

EXPECTED LEARNING OUTCOMES

By the end of this session students should be able to develop simple data models for use in many GIS applications. Learning outcomes include 1) an understanding of the concepts and definitions of spatial systems, coordinate systems, mapping and spatial issues with maps, data structures including vector, raster and surface modelling, 2) capability to build geo-databases and analyse spatial data, 3) ability to design a Web-based GIS.

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

Learning Outcome		**EA Stage 1 Competencies**
1.	Understand the concepts and definitions of geospatial systems.	*PE1.1, PE2.1, PE2.3*
2.	Understand mapping and spatial issues with maps.	*PE1.2, PE1.6, PE2.3*
3.	Understand data structures including vector, raster and surface modelling.	*PE1.3, PE2.1, PE2.3*

4.	Capable of building geo-databases and analyse spatial data.	*PE1.4, PE2.2, PE3.3*
5.	Have an ability to design a Web-based GIS.	*PE1.5, PE2.4, PE3.3*

For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

COURSE PROGRAM

A table of lectures and workshops or practical class topics for each week, indicating the name of lecturer involved (where multiple lecturers teaching in course), online activities, such as discussion forums, and relevant readings from textbook and other reference material identified for the course.

TERM 1 2020

Date	Lecture & workshop	Lab	Assignment
17/02/2020 (Week 1)	Introduction to the course & Introduction to GIS	Introduction to ArcGIS: ArcMap, ArcCatalog, ArcToolbox	
24/02/2020 (Week 2)	Coordinate Systems and Map Projections	Map Projections	Map Projections
02/03/2020 (Week 3)	***GMAT3150 field survey camp at Berry Sport and Rec Centre*** ***Non-teaching week for GMAT3220***		
09/03/2020 (Week 4)	Vector Data Model	Vector Data Model	Vector Data Model
16/03/2020 (Week 5)	Raster Data Model	Raster Data Model	Raster Data Model
23/03/2020 (Week 6)	GIS Data Acquisition	Image Registration	GIS Data Acquisition
30/03/2020 (Week 7)	Spatial Data Accuracy and Quality	Digitise, Edit & Clean	Data Accuracy
06/04/2020 (Week 8)	Attribute Data Management and Database	***No Lab*** ***Good Friday***	Database
13/04/2020 (Week 9)	Surface Modelling	Surface Modelling and Topographic Representation	Surface Modelling
20/04/2020 (Week 10)	Spatial Analysis	Spatial Analysis	Spatial Analysis
27/04/2020 (Week 11)	***No Lecture & No Workshop***	Tables, Relationships and Queries	

ASSESSMENT

Below is the proposed assessment structure for GMAT3220.

Course	Assessment Item	Description	Weight of final Grade	Max possible mark
GMAT3220	Lab Assignment	8 Weekly Assignments	20%	40
GMAT3220	Homework	8 weekly homework	20%	40
GMAT3220	Major Assignment	Major Assignment	25%	50
GMAT3220	Final Exam	Final Exam	35%	70

Assessment for the course comprises:

- 8 weekly on-site lab work 20% Weeks 2, 4-7, 9-11
- 8 weekly homework 20% Due 11am Thursday in Weeks 4-11
- Major assignment on GIS application 25% Due 4pm Friday Week 11
- Final exam 35% Will be formally arranged by Exams

The final grade for this course will normally be based on the sum of the scores from each of the assessment tasks. The final exam is worth 35% of the final mark. The class work is worth 65% of the final mark. A mark of at least 20 points out of the total 70 points in the final exam is required before the class work is included in the final mark.

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.

Details of each assessment component, the marks assigned to it, the criteria by which marks will be assigned, and the dates of submission are set out below.

Assessment criteria

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

- No answers 0 point
- Partial or incorrect answers 1-4 points
- Complete and correct answers 5 points

Assessment of major assignment report (50 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 max. 10 points
- Interpretation & conclusions max. 10 points

Marking criteria for the assignment report

The approach used in marking is based on Biggs' (2003) Structure of the Observed Learning Outcome (SOLO) taxonomy (Table 1). There is also a set of words that describe the grades and marks (Table 2).

Reading these tables should aid your understanding of what the lecturer is looking for in your report in relation to the specific marking criteria.

Table 1. Biggs' SOLO taxonomy. This is a hierarchical taxonomy, listed from lowest to highest level. Achieving a higher level implies exceeding the lower levels. There is also no direct translation between grades and SOLO levels, as it depends on the level of the course and the nature of the assignment.

Level	*Verb examples*
Prestructural	Misses the point
Unistructural	Identify, do simple procedure
Multistructural	Enumerate, describe, list, combine, do algorithms
Relational	Compare/contrast, explain causes, analyse, relate, apply
Extended abstract	Theorise, generalise, hypothesise, reflect

Table 2. Grade and mark interpretation

Grade	*Mark*	*Description*
High Distinction	85+	Work of exceptional quality showing clear understanding of the subject matter and appreciation of issues; well formulated; arguments sustained; maps and diagrams where relevant; relevant literature referenced; marked evidence of creative ability; solid intellectual work.
Distinction	75-84	Work of very high quality showing strong grasp of subject matter and appreciation of dominant issues, though not necessarily of the finer points; arguments clearly developed; relevant literature referenced; evidence of creative ability; solid intellectual work.
Credit	65-74	Work of solid quality showing competent understanding of subject matter and appreciation of main issues, though possibly with some lapses and inadequacies; arguments clearly developed and supported by references, though possibly with minor red herrings and loose ends; some evidence of creative ability; well prepared and presented.
Pass	50-64	Adequate answers; reasonably relevant and accurate. Sufficient to merit a bare pass to safe pass mark.
Fail	<50	

Supplementary Examinations for Term 1 2020 will be held on Monday 25th May – Friday 29th May (inclusive) should you be required to sit one. You are required to be available during these dates. Please do not to make any personal or travel arrangements during this period.

PENALTIES

Late submission will get 10% deduction of the assignment mark for each day late – up to a maximum of seven days. After seven days, the assignment will receive zero.

ASSESSMENT OVERVIEW

Item	Length	Weighting	Learning outcomes assessed	Assessment Criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
1. Lab exercises	45 hours	20%	GIS skills	Basic GIS techniques and practical applications	Weeks 2, 4-7, 9-11. Show the results to the lab supervisor	After 7 days	Immediately
2. Homework assignment	40 hours	20%	Spatial analysis	Theory, critical thinking and problem solving	Stapled report due 11am Thursday in Weeks 4-11.	After 7 days	After 2 weeks
3. Major assignment	40-60 hours	25%	Spatial analysis	Writing skills, analytical and laboratory work	Electronic copy report due 4pm Friday Week 11	After 7 days	After 3 weeks
4. Final exam	2 hours	35%	GIS knowledge and skills	Theory, concepts, definitions, and components of GIS	Centrally managed	Centrally managed	

RELEVANT RESOURCES

Textbook:

- Kang-tsung Chang, Introduction to Geographic Information Systems, 7th Ed., the McGraw-Hill Companies

Reference:

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

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

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

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 ADVICE

(Formerly known as Common School Information)

For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations: student.unsw.edu.au/special-consideration
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC.

Refer to Academic Advice on the School website available at:

https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex 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
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (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