GMAT 9600 PRINCIPLES OF REMOTE SENSING

COURSE DETAILS		
Units of Credit	6	
Contact hours	3 hours per week	
Class	Wed 6:00 - 9:00 pm	online

Course Coordinator and Lecturer	Professor Linlin Ge	
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Lecturer	Other lecture's name	
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	phone	

INFORMATION ABOUT THE COURSE

This course will focus on the theory and physics of remote sensing. Various remote sensing techniques such as optical and radar are discussed throughout the course.

This course can be taken in parallel with another postgraduate course GMAT9606 Microwave Remote Sensing.

Remote sensing is one of the most important spatial information systems which can efficiently gather information essential for decision making. This course is included to enable students to develop particular communications skills that will enhance their practice as a geo-spatial specialist and surveyor. It reflects my position that their practice within the field will require advanced levels of communication to enable ongoing development of cost-effective mapping and planning for a sustainable environment.

On the other hand, GPS and other ground survey techniques play very important roles in georeferencing remote sensing imagery and validating remote sensing results. Therefore, GMAT9600 has close relationship to courses such as

• GMAT9606 Microwave Remote Sensing,

- GMAT3500 Remote Sensing and Photogrammetry
- CVEN4800 Satellite Remote Sensing and Applications
- GMAT3200 Geospatial Information Techniques and Applications, and
- GMAT4900 Principles of GNSS Positioning.

HANDBOOK DESCRIPTION

See link to virtual handbook:

https://www.handbook.unsw.edu.au/undergraduate/courses/2020/gmat9600/

OBJECTIVES

This course will enable students to explore and gain further understanding of remote sensing for earth observation through the investigation of satellite remote sensing data with a direct emphasis of their application to real world situations in the field of mapping and environmental monitoring.

The course will address the following programme attributes:

- An in-depth engagement with the relevant disciplinary knowledge in its inter-disciplinary context
- Capacity for analytical and critical thinking and for creative problem solving
- Ability to engage independent and reflective learning
- Information literacy
- Skills for collaborative and multi-disciplinary work
- A respect for ethical practice and social responsibility
- Skills for effective communication

TEACHING STRATEGIES

A variety of teaching activities will be conducted to maximize teaching and learning outcomes, including:

- lectures are delivered as interactively as possible using PPT slides and animations.
- **quizzes are scheduled almost weekly to enhance learning.**
- workshops are used to supplement lectures with further details and to assist students from non spatial information background.
- lab exercises are used to give students the opportunity to apply remote sensing theory to real data.
- assignments are included to reinforce learning.

Students are strongly encouraged to attend all lectures and prepare for class discussions on selected topics.

Below are some suggested approaches to learning in the course.

Private Study	• Preview lecture material and textbook
	• 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

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

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

Learning Outcome		EA Stage 1 Competencies
1.	Investigate remote sensing options for identified applications,	*PE1.1, PE1.2, PE1.3, PE1.4, PE3.4*
2.	Apply theory to the implementation of the chosen option,	*PE1.5, PE2.1, PE2.3, PE3.3, PE3.5*
3.	Appreciate the complementary nature between remote sensing, GIS and surveying,	*PE1.3, PE1.4, PE1.5*
4.	Undertake basic data analysis, and	*PE1.2, PE2.2*
5.	Create digital maps.	*PE2.2, PE3.2, PE3.4*

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

Term 3 2020

Date	Lecture Content	Demonstration/ lab Content
14/09/2020 (Week 1)	Introduction to Course; Introduction to Earth Observation/Remote Sensing	
21/09/2020 (Week 2)	Electromagnetic Radiation – Definition & Physics	Lab demonstration: DInSAR data analysis
28/09/2020 (Week 3)	Spectral Reflectance and Atmospheric Attenuation	
06/10/2020 (Week 4)	Radar Background and Surface Interaction; Interferometric Synthetic Aperture Radar	
12/10/2020 (Week 5)	Electro-optical Sensors (1)	Assignment / lab 1 – radar application
19/10/2020 (Week 6)	*Flexibility week for all courses (non-teaching)*	
26/10/2020 (Week 7)	Electro-optical Sensors (2)	
02/11/2020 (Week 8)	Thermal Infrared Sensing	Assignment / lab 2 – optical application
09/11/2020 (Week 9)	Laser Scanning, Remote Sensing & GIS	
16/11/2020 (Week 10)	Revision, course summary	

ASSESSMENT

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 task	Length	Weight	Due date
Quizzes	Various	20%	As instructed
Lab exercise	2 hours	10%	5pm Monday Week 4
Assignment 1 – radar application	2 weeks	20%	5pm Monday Week 7
Assignment 2 – optical application	2 weeks	20%	5pm Monday Week 10
Final Exam	2 hours	30%	In the formal exam period

Assessment Criteria: *The course learning outcomes include a significant level of technical learning, calculations, and engineering understanding of problems. These outcomes can be effectively and ideally assessed in an exam environment that can reflect the students'*

understanding of concepts, and the students' abilities to make decisions and solve problems within limited time. The final exam will be held under close book conditions. You need to score at least 40% in the final exam to be able to pass the course.

Students who perform poorly in the quizzes and lab assignments are recommended to discuss progress with the lecturer during the term. Note: The lecturer reserves the right to adjust the final scores by scaling if agreed by the Head of School.

Supplementary Examinations for Term 3 2020 will be held on Monday 11th January – Friday 15th January 2021 (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

All assignments or practical reports are compulsory parts of the course and must be handed in by the due date. A mark of zero will be given for any submission which violates this rule. OR **The marks for late submissions will be reduced as follows:** -20% (of the maximum mark) for up to 24 hours after the scheduled submission time, then -10% (of the maximum mark) for each additional 24 hour period late. (For example, a student submitting a report/assignment 4 days late has his/her mark reduced by 4 if the maximum mark of the submission is 10.) Any late submission must be made before solutions are issued to the class.

If a student is unable to submit on time due to illness or other legitimate reason, then a brief written explanation must be given to the lecturer for consideration as soon as is feasible. In some cases the lecturer may grant an extension to the submission date provided he has been contacted before the due date.

Further assessment may be granted in this course at the lecturer's discretion. If further assessment is granted then performance in workshops may be considered as well as an oral exam including use of a computer.

If students attend less than 80% of their possible classes they may be refused final assessment.

RELEVANT RESOURCES

The course will be mainly based on PDF files of Powerpoint lecture slides available at the course Moodle site.

The material will be uploaded week by week.

The following are recommended reading materials:

1. CCRS website: http://www.nrcan.gc.ca/node/9363
2. "Principles of Remote Sensing", Paul J. Curran. London; New York : Longman, 1985.
3. "Physical Principles of Remote Sensing", William.G. Rees. Cambridge, U.K.; New York, NY : Cambridge University Press, 2001.
4. The UNSW Library website: http://info.library.unsw.edu.au/web/services/services.html

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