GMAT9600

Principles of Remote Sensing

Term 3, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Linlin Ge	l.ge@unsw.edu.au			+61293854177

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

Remote sensing techniques are powerful tools for spatial data acquisition and this course will describe the history, challenges and developments in remote sensing. Topics covered include definition and physics of basic electromagnetic radiation propertises, energy-matter relationships, spectral signatures of surfaces and the atmosphere, the reduction of atmospheric effects, sensor concepts (including film and electro-optical sensors), an introduction to data processing and enhancement (including image interpretation procedures). Satellite missions such as Landsat, SPOT, and ERS will be briefly introduced, as well as future remote sensing satellite constellations. The variety of satellite and airborne platforms, and the greater access to imagery, now make it possible to use remote sensing to address a wide range of applications. The diverse and ever-growing applications will be reviewed.

Course Aims

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.

Course Learning Outcomes

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 and surveying	PE1.3, PE1.4, PE1.5
4. Undertake basic data analysis	PE1.2, PE2.2
5. Create digital maps	PE2.2, PE3.2, PE3.4

Teaching Strategies

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.

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.
- tutorials 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.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Quizzes	20%	Not Applicable	1, 2, 3
2. Lab demonstration	10%	Week 4	2, 3, 4
3. Assignment 1 - radar application	20%	Week 7	3, 4, 5
4. Assignment 2 - optical application	20%	Week 10	3, 4, 5
5. Final Exam	30%	Not Applicable	1, 2, 3

Assessment 1: Quizzes

Online quizzes are released almost weekly to reinforce understanding of topics covered in the lectures. This encourages a good learning habit of timely revisons. Timely feedback will be provided as well.

Assessment 2: Lab demonstration

Due date: Week 4

This lab demonstration is based on the powerful DInSAR technique. Students will be asked to answer a few questions at the end of the demo.

Assessment 3: Assignment 1 - radar application

Due date: Week 7

This lab based on radar remote sensing data collected during a major flood event. Students have the wonderful opportunity to process the data and compare radar with other techniques.

Assessment 4: Assignment 2 - optical application

Due date: Week 10

This lab is based on satellite optical remote sesing data collected during the 2009 Victorian bushfire. Students will have hands-on experience in applying multi-spectral band combination technique in critical applications such as bushfire monitoring.

Assessment 5: Final Exam

It will be held in the final exam period. The exam will consist of three sections, namely, multiple choices, short statements, and quantitative questions, to assess students' understanding of the course.

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

View class timetable

Timetable

Date	Type	Content
O-Week: 5 September - 9 September		
Week 1: 12 September - 16 September	Lecture	Introduction to Course; Introduction to Earth Observation/Remote Sensing
Week 2: 19 September - 23 September	Blended	Lecture - Electromagnetic Radiation – Definition & Physics Lab - Lab demonstration: DInSAR data analysis
Week 3: 26 September - 30 September	Lecture	Spectral Reflectance and Atmospheric Attenuation
Week 4: 3 October - 7 October	Lecture	Radar Background and Surface Interaction; Interferometric Synthetic Aperture Radar
	Assessment	Lab demonstration
Week 5: 10 October - 14 October	Blended	Lecture - Electro-optical Sensors (1) Lab - Assignment / lab – radar application
Week 6: 17 October - 21 October	Fieldwork	No teaching activities
Week 7: 24 October - 28 October	Lecture	Electro-optical Sensors (2)
	Assessment	Assignment 1 - radar application
Week 8: 31 October - 4 November	Blended	Lecture - Thermal Infrared Sensing Lab - Assignment / lab – optical application
Week 9: 7 November - 11 November	Lecture	Laser Scanning, Remote Sensing & GIS
Week 10: 14 November - 18 November	Lecture	Revision, course summary
	Assessment	Assignment 2 - optical application

Resources

Prescribed 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

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 T3 2022 will be held online between 25th November - 8th December 2022 inclusive, and supplementary exams between 9th - 13th January 2023 inclusive. 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://app.acuityscheduling.com/schedule.php?owner=19024765

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	