GMAT3500

Remote Sensing and Photogrammetry

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

Introduction to the geometric and spectral properties of remotely sensed (satellite, aerial or terrestrial) images of the Earth's surface or objects. Description of analogue and digital images - photography, electro-optical and microwave systems. The physics of visible, infrared and microwave remotely sensed imagery, including atmospheric effects. Image geometry - central projection, scan and microwave systems. The principles of stereovision. Inner orientation of central projection, collinearity equations and deviations from collinearity. Exterior orientation of sensor systems. Object geometry from overlapping images, for block photography for aerial and close range applications. Digital photogrammetric workstations and their functions. Photogrammetric project planning. Image interpretation.

Course Aims

To explore and gain further understanding of remote sensing for Earth Observation through the investigation of satellite remote sensing data, as well as digital photographic imaging and scanning technologies, with a direct emphasis on their application to mapping and environmental monitoring.

To present the principles of processing aerial and satellite frame and push-broom based digital images, as well as close range frame images for determining accurate metric details of extracted objects or Earth features for input into digital mapping, GIS databases and analyses, and for close range applications.

To present the basic principles of acquisition and processing of Lidar data for the determination of DEMs and other information extraction.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Investigate remote sensing and photogrammetric 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, photogrammetry 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

A variety of teaching activities will be conducted to maximise 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-surveying/non-geospatial 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.

Remote Sensing and Photogrammetry are amongst the most important Geospatial technologies for data acqusition, mapping and analysis in support of a broad range of traditional mapping and new geoinformation applications.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Quizzes	25%	Not Applicable	1, 2, 3
2. Lab Assignment 1 - Optical remote sensing	10%	Week 4	1, 2, 3, 4, 5
3. Lab Assignment 2 - Radar remote sensing	10%	Week 7	1, 2, 3, 4, 5
4. Lab Assignment 3- Photogrammetry	10%	Week 10	1, 2, 3, 4, 5
5. Final exam	45%	Exam Period	1, 2, 3, 4, 5

Assessment 1: Quizzes

Online quizzes almost weekly

Assessment 2: Lab Assignment 1 - Optical remote sensing

Due date: Week 4

Optical satellite imagery from several satellites are used in the lab assignment to study the 2009 Victorian Bushfires

Assessment 3: Lab Assignment 2 - Radar remote sensing

Due date: Week 7

Satellite radar imagery, aerial optical images and other spatial data are used in the lab assignment to study the 2011 Queensland Flood

Assessment 4: Lab Assignment 3- Photogrammetry

Due date: Week 10

Students learning how to use 3D photogrammetric software such as Pix4D using sample data sets supplied. They also apply such skills in processing and analyse close range photogrammetry data they collect in the field.

Assessment 5: Final exam

Due date: Exam Period

Final exam questions are set to test students' understanding of the contents across all topics covered in 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 Remote Sensing; Electromagnetic Radiation – Definition & Physics
Week 2: 19 September - 23 September	Blended	Lecture - Spectral Reflectance and Atmospheric Attenuation Lab - ***optical remote sensing***
Week 3: 26 September - 30 September	Lecture	Electro-optical Sensors
Week 4: 3 October - 7 October	Lecture	Thermal Infrared Sensing
	Assessment	Lab Assignment 1 - Optical remote sensing
Week 5: 10 October - 14 October	Blended	Lecture - radar remote sensing Lab - ***radar remote sensing***
Week 6: 17 October - 21 October	Fieldwork	No teaching activities (UNSW Flexibility Week)
Week 7: 24 October - 28 October	Lecture	Introduction to photogrammetry; Foundations of photogrammetry
	Assessment	Lab Assignment 2 - Radar remote sensing
Week 8: 31 October - 4 November	Blended	Lecture - Close range photogrammetry; Aerial photogrammetry Lab - ***photogrammetry***
Week 9: 7 November - 11 November	Lecture	UAV photogrammetry; Space-borne photogrammetry

Week 10: 14 November - 18 November	Lecture	Laser Scanning, Remote Sensing, Photogrammetry & GIS; *Revision, course summary*
	Assessment	Lab Assignment 3- Photogrammetry

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. “Introduction to modern photogrammetry”, Mikhail E., J. Bethel, and J.C. McGlone, Wiley, 2001.
5. “Elements of photogrammetry”, Paul R. Wolf, McGraw-Hill, 1983.
6. 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	