



Australia's  
Global  
University

School of Civil and Environmental  
Term 3, 2020

# GMAT3500 REMOTE SENSING AND PHOTOGRAMMETRY

## COURSE DETAILS

<b>Units of Credit</b>	6	
<b>Contact hours</b>	5 hours per week	
<b>Lecture</b>	Tue 10:00AM - 12:00PM	online
	Wed 09:00AM - 11:00AM	online
<b>Lab/Workshop</b>	Wed 11:00AM - 12:00PM	Civil Engineering 201
<b>Course Coordinator and Lecturer</b>	Professor Linlin Ge email: l.ge@unsw.edu.au office: Civil Engineering 414 phone: 9385 4177	
<b>Lecturer</b>	Other lecture's name email: office: phone	

## INFORMATION ABOUT THE COURSE

This is a standalone course but it can also be taken in connection with a few undergraduate and postgraduate courses, such as

- CVEN4800 Satellite Remote Sensing and Applications, and
- GMAT9606 Microwave Remote Sensing.

## HANDBOOK DESCRIPTION

See link to virtual handbook:

<https://www.handbook.unsw.edu.au/undergraduate/courses/2019/gmat3500/>

## OBJECTIVES

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

This course will address several 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 and photogrammetry 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.

Suggested approaches to learning in the course include:

<b>Private Study</b>	<ul style="list-style-type: none"> <li>• Preview lecture material and textbook</li> <li>• Review lecture material and textbook</li> <li>• Do set problems and assignments</li> <li>• Join Moodle discussions of problems</li> <li>• Reflect on class problems and assignments</li> <li>• Download materials from Moodle</li> <li>• Keep up with notices and find out marks via Moodle</li> </ul>
<b>Lectures</b>	<ul style="list-style-type: none"> <li>• Find out what you must learn</li> <li>• See methods that are not in the textbook</li> <li>• Follow worked examples</li> <li>• Hear announcements on course changes</li> </ul>
<b>Workshops</b>	<ul style="list-style-type: none"> <li>• Be guided by Demonstrators</li> <li>• Practice solving set problems</li> <li>• Ask questions</li> </ul>
<b>Assessments</b>	<ul style="list-style-type: none"> <li>• Demonstrate your knowledge and skills</li> <li>• Demonstrate higher understanding and problem solving</li> </ul>
<b>Laboratory Work</b>	<ul style="list-style-type: none"> <li>• Hands-on work, to set studies in context</li> </ul>



## 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 and photogrammetric options for identified applications,	<i>PE1.1, PE1.2, PE1.3, PE1.4, PE3.4</i>
2. Apply theory to the implementation of the chosen option,	<i>PE1.5, PE2.1, PE2.3, PE3.3, PE3.5</i>
3. Appreciate the complementary nature between remote sensing, photogrammetry and surveying,	<i>PE1.3, PE1.4, PE1.5</i>
4. Undertake basic data analysis, and	<i>PE1.2, PE2.2</i>
5. Create digital maps.	<i>PE2.2, PE3.2, PE3.4</i>

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

<b>COURSE PROGRAM</b>
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**Term 3 2020**

<b>Date</b>	<b>Tue 10:00AM - 12:00PM</b>	<b>Wed 09:00AM - 11:00AM</b>	<b>Wed 11:00AM - 12:00PM</b>
14/09/2020 (Week 1)	Introduction to Course; Introduction to Remote Sensing;	Electromagnetic Radiation – Definition & Physics (1)	Coordinated peer learning
21/09/2020 (Week 2)	Electromagnetic Radiation – Definition & Physics (2)	Spectral Reflectance and Atmospheric Attenuation (1)	<b>Lab assignment 1 - optical remote sensing</b>
28/09/2020 (Week 3)	Spectral Reflectance and Atmospheric Attenuation (2)	Electro-optical Sensors (1)	Coordinated peer learning
06/10/2020 (Week 4)	Electro-optical Sensors (2)	Thermal Infrared Sensing	Coordinated peer learning
12/10/2020 (Week 5)	Radar Background and Surface Interaction	Interferometric Synthetic Aperture Radar	<b>Lab assignment 2 - radar remote sensing</b>
19/10/2020 (Week 6)	<b>Flexibility week for all courses (non-teaching)</b>		
26/10/2020 (Week 7)	Introduction to photogrammetry	Foundations of photogrammetry	Coordinated peer learning
02/11/2020 (Week 8)	Close range photogrammetry	Aerial photogrammetry	<b>Lab assignment 3 - photogrammetry</b>
09/11/2020 (Week 9)	UAV photogrammetry	Space-borne photogrammetry	Coordinated peer learning
16/11/2020 (Week 10)	Laser Scanning, Remote Sensing, Photogrammetry & GIS	Revision, course summary	Coordinated peer learning

## 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
<b>Quizzes</b>	<b>Various</b>	<b>25%</b>	<b>As instructed</b>
<b>Lab assignment 1 – optical remote sensing</b>	<b>2 hours</b>	<b>10%</b>	<b>5 pm Monday Week 4</b>
<b>Lab assignment 2 – radar remote sensing</b>	<b>2 hours</b>	<b>10%</b>	<b>5 pm Monday Week 7</b>
<b>Lab assignment 3 - photogrammetry</b>	<b>2 hours</b>	<b>10%</b>	<b>5 pm Monday Week 10</b>
<b>Final Exam</b>	<b>2 hours</b>	<b>45%</b>	<b>In the formal exam period</b>

**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 11<sup>th</sup> January – Friday 15<sup>th</sup> 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. "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>

## **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](https://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

	<b>Program Intended Learning Outcomes</b>
<b>PE1: Knowledge and Skill Base</b>	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
<b>PE2: Engineering Application Ability</b>	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
<b>PE3: Professional and Personal Attributes</b>	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