



## UNSW Course Outline

# GMAT3100 Surveying Applications and Design - 2024

Published on the 13 Feb 2024

## General Course Information

**Course Code :** GMAT3100

**Year :** 2024

**Term :** Term 1

**Teaching Period :** T1

**Is a multi-term course? :** No

**Faculty :** Faculty of Engineering

**Academic Unit :** School of Civil and Environmental Engineering

**Delivery Mode :** In Person

**Delivery Format :** Standard

**Delivery Location :** Kensington

**Campus :** Sydney

**Study Level :** Undergraduate

**Units of Credit :** 6

### Useful Links

[Handbook Class Timetable](#)

## Course Details & Outcomes

### Course Description

This course introduces the student to a wide variety of surveying applications undertaken as part of engineering projects. Selected topics of specialist survey applications will be dealt with using lectures, guest speakers and technology demonstrations. Topics will be selected from the

following: mining surveying (including azimuth transfer, north-seeking gyro theodolites, plumbing of shafts and high structures), industrial surveying, tunnel surveying, hydrographic surveying, alignments, monitoring of deformations and settlement of terrain, structures and machines, design of precise engineering networks, project surveying methodology and advanced least squares analysis.

## Course Aims

To broaden and deepen the knowledge of surveying instrumentation, to discuss equipment used in related areas of measurement, and to introduce students to specialised surveying techniques relevant to engineering and certain surveying sub-disciplines. A broad range of surveying instrumentation will be covered in this course.

The aim of this subject is to cover several topics and methods that are specialist skills of a consultant surveyor - not commonplace skills. But it does **not** aim to give the student a vast knowledge of all them. It is not expected that every graduate will need to know all of the particular topics covered, or necessarily work in these sub-discipline areas on graduation. However, some graduates will need to know some of the topic areas in great detail, and may spend a considerable part of their career in one of the fields introduced in this course. Moreover, even if students do not work in the specific topic areas dealt with in the course, the educational process and underlying knowledge may valuably be applied to other surveys.

# Course Learning Outcomes

Course Learning Outcomes
CL01 : Design survey methods, including choice of instruments, analysis and error prevention, for: industrial (e.g. indoor) surveys, high rise construction, mining, tunnelling and deformation monitoring of buildings, bridges and dams.
CL02 : Use surveying instruments in a variety of applications and analyse aspects of deformation surveys, including datum and free net problems.
CL03 : Interpret problems from client instructions and design solutions to surveying problems with the level of creativity and innovation appropriate to the complexity of the challenge.
CL04 : Design and execute Surveying and Geospatial measurements and data analysis for surveying projects using least squares adjustment software.
CL05 : Demonstrate the characteristics of effective teamwork and professional conduct and apply organisational and interpersonal strategies
CL06 : Review professional journal and conference publications and present findings.

Course Learning Outcomes	Assessment Item
CL01 : Design survey methods, including choice of instruments, analysis and error prevention, for: industrial (e.g. indoor) surveys, high rise construction, mining, tunnelling and deformation monitoring of buildings, bridges and dams.	<ul style="list-style-type: none"> <li>• Mid-session test</li> <li>• Assignments</li> <li>• Problem Based Learning - Moodle Quizzes</li> <li>• Final Exam</li> </ul>
CL02 : Use surveying instruments in a variety of applications and analyse aspects of deformation surveys, including datum and free net problems.	<ul style="list-style-type: none"> <li>• Mid-session test</li> <li>• Assignments</li> <li>• Problem Based Learning - Moodle Quizzes</li> <li>• Final Exam</li> </ul>
CL03 : Interpret problems from client instructions and design solutions to surveying problems with the level of creativity and innovation appropriate to the complexity of the challenge.	
CL04 : Design and execute Surveying and Geospatial measurements and data analysis for surveying projects using least squares adjustment software.	
CL05 : Demonstrate the characteristics of effective teamwork and professional conduct and apply organisational and interpersonal strategies	
CL06 : Review professional journal and conference publications and present findings.	

# Learning and Teaching Technologies

Moodle - Learning Management System | Blackboard Collaborate

## Additional Course Information

This course introduces the student to a wide variety of surveying applications undertaken as part of engineering projects. Selected topics of specialist survey applications will be dealt with using lectures, guest speakers and technology demonstrations. Topics will be selected from the following: mining surveying (including azimuth transfer, north-seeking gyro theodolites, plumbing of shafts and high structures), industrial surveying, tunnel surveying, hydrographic surveying, alignments, monitoring of deformations and settlement of terrain, structures and machines, design of precise engineering networks, project surveying methodology and advanced least squares analysis. This course builds on previous surveying courses in years 1 and 2, specifically GMAT1110, GMAT2120 and GMAT2550.

Attendance and attention at classes is strongly recommended, but it will not be sufficient to learn the topics to the level required. There will be a lot of reading required in this course. Previous students who did not do enough reading or did not attempt the supplied lab questions have been surprised to get very low marks. At UNSW, the normal workload expectations of a student are about 150 hours for a 6 UoC course, including class contact hours, preparation and time spent on all assessable work.

If you want some help with goal and time management, motivation, work and study management, or well-being then I suggest you visit <http://www.thefridge.org.au/>. It might give you some new or useful ideas.

## Assessments

### Assessment Structure

Assessment Item	Weight	Relevant Dates
Mid-session test Assessment Format: Individual	25%	
Assignments Assessment Format: Individual	20%	
Problem Based Learning - Moodle Quizzes Assessment Format: Individual	10%	
Final Exam Assessment Format: Individual	45%	

# Assessment Details

## Mid-session test

### Assessment Overview

Conventional test, but students can use computers. Individual feedback is given by the lecturer.  
Small class.

### Course Learning Outcomes

- CL01 : Design survey methods, including choice of instruments, analysis and error prevention, for: industrial (e.g. indoor) surveys, high rise construction, mining, tunnelling and deformation monitoring of buildings, bridges and dams.
- CL02 : Use surveying instruments in a variety of applications and analyse aspects of deformation surveys, including datum and free net problems.

### Detailed Assessment Description

Because university processes are so rigid, as a NEW course coordinator I was unable to change the assessment in the university system. Therefore students if you are reading this, please know that the mid-session test is worth 15% NOT 25%. You can blame the university administration for NOT being agile enough to keep up with the impositions imposed on their staff.

### Assessment Length

TBD

### Assignment submission Turnitin type

This is not a Turnitin assignment

## Assignments

### Assessment Overview

1) This assignment requires study of an international survey conference paper (eg FIG or IAG) or journal or survey project reports in a technical publication. Students select one of the papers that relates to the topics in GMAT3100. No two students use the same material. Each student gives a 5 minute ppt or similar presentation to the class. The presentation should be a clear and concise summary of the base material and reveal an understanding of the topic. Students are informally given feedback by the peers. 2) High Precision Survey and Design. 14% Requires group fieldwork and analysis. A separate document describes the assignment in detail. The assignment changes each year. Standard process - reports marked with comments.

### Course Learning Outcomes

- CL01 : Design survey methods, including choice of instruments, analysis and error prevention,

for: industrial (e.g. indoor) surveys, high rise construction, mining, tunnelling and deformation monitoring of buildings, bridges and dams.

- CLO2 : Use surveying instruments in a variety of applications and analyse aspects of deformation surveys, including datum and free net problems.

#### **Detailed Assessment Description**

Again, due to sluggish university administration overheads, the assessment for this task is actually 30% NOT 20% as stated.

#### **Assignment submission Turnitin type**

This is not a Turnitin assignment

### **Problem Based Learning - Moodle Quizzes**

#### **Assessment Overview**

Weekly quizzes managed through Moodle. Feedback built into the quizzes, and consultation with teacher. Audit system requires students to show their workings to the course coordinator during session. Students who perform poorly in the quizzes and workshops are recommended to discuss progress with the lecturer during the semester.

#### **Course Learning Outcomes**

- CLO1 : Design survey methods, including choice of instruments, analysis and error prevention, for: industrial (e.g. indoor) surveys, high rise construction, mining, tunnelling and deformation monitoring of buildings, bridges and dams.
- CLO2 : Use surveying instruments in a variety of applications and analyse aspects of deformation surveys, including datum and free net problems.

#### **Detailed Assessment Description**

NOTE: due to rigid university administration, as a NEW course coordinator I was not able to change the assessment to 20%. The 10% listed is wrong.

#### **Assignment submission Turnitin type**

This is not a Turnitin assignment

### **Final Exam**

#### **Assessment Overview**

Final exam in a computer lab. Students may use software to solve some questions, and type answers. Students are invited to visit the lecturer after the examination period for individual feedback. Small class.

### Course Learning Outcomes

- CL01 : Design survey methods, including choice of instruments, analysis and error prevention, for: industrial (e.g. indoor) surveys, high rise construction, mining, tunnelling and deformation monitoring of buildings, bridges and dams.
- CL02 : Use surveying instruments in a variety of applications and analyse aspects of deformation surveys, including datum and free net problems.

### Detailed Assessment Description

ALERT: The final exam is worth 35% NOT 45%. This listing is wrong due to rigid university administrative procedures.

### Assessment Length

2 hours

### Assignment submission Turnitin type

This is not a Turnitin assignment

## **General Assessment Information**

Past exam papers will be provided on the class Moodle site.

Any changes to the above assessment details will be notified in class and on the class Moodle site. After each test each student will be given individual and detailed feedback on their test or exam paper soon after it has been marked by contacting the course convenor. Further details of assessment and exam rooms will be given in classes, if in doubt contact the lecturer.

There might be some calculation based questions in the exams but most of the questions will seek to find whether you have learned some of the main facts and information, whether you understand the important aspects of the type of surveying covered in the question, and whether you can describe how you would apply the knowledge.

Some of the questions in the tests will require you to propose a solution for a non-routine survey problem that a new client might bring to a consultant surveyor. The highest marks will go to those who can propose a good method, justify it well, and communicate their proposed solution to a client clearly and reliably. Pass marks will go to those who can present a reasonable problem solution and a reasonable justification for their proposal. Note that some questions in the assessment tasks in this course have more than one correct answer and different surveyors might propose a variety of valid solutions. In such cases your answers should include justifications for your methods, you do not need to try to find or guess what the examiners own personal opinion or solution might be.

Further details will be given, and discussed in class, about the type of questions that might be in the exams and which parts (topics and expected outcomes) of the course are related to the exam. The exams are set by the course convenor and reviewed by another staff member of the school.

Late submissions will be penalised at the rate of 5% per day after the due time and date have expired.

### Grading Basis

Standard

## Course Schedule

### Attendance Requirements

For courses with Workshops and/or Labs, attendance for those classes is a necessary part of the course. You must attend at least 80% of the workshop/lab in which you are enrolled for the duration of the session.

### General Schedule Information

The proposed schedule of classes will be supplied as a one page table in a separate file on the class Moodle. If there are changes to the proposed table, they will be updated on the class Moodle site and discussed in class.

## Course Resources

### Prescribed Resources

- There is no textbook.
- FIXIT software is provided on Moodle.
- The PowerPoint lecture slides are available for download as pdf files the course Moodle website. Monitor the site during session because it will be updated regularly. Additional materials are also provided on Moodle.
- This course has a lot of reading material available on the class web site and elsewhere. You are advised to find some of the material that interests you the most and study it, for the other material skim through it at a level that you know what is there and where to find it if you need it later. The objectives of this course are to introduce you to several different types of specialist consulting surveying, not to make you an expert in all the topics. So the assessment tasks will NOT seek to find if you have read and memorised it all. The assessment tasks will seek to find if you have read some of the material and studied (by reflection) some of the topics in some depth.



# Recommended Resources

## Reference Books

The relative importance of class notes and reference books, and purchase details will be discussed in class.

CASPARY W (2000) Concepts of Network and Deformation Analysis, Monograph No. 11, 3rd impression, School of Geomatic Engineering, UNSW

HARVEY BR (2016) Practical Least Squares and Statistics for Surveyors, Monograph No. 13, 3rd ed., UNSW.

OGAJA CA (2011) Geomatics Engineering: a practical guide to project design. CRC Press ISBN 978-1-4398-1743-8

RÜEGER JM (2003) Electronic Surveying Instruments Monograph 18, School of Surveying and Spatial Information Systems, UNSW A free copy will be supplied to all students in this course in 2015.

RÜEGER JM (1996) Project Surveying, Lecture Notes, Papers, Tutorials and other Material, School of Geomatic Engineering, UNSW, Jan 2001, 332 + x pages Out of print but new versions of parts of it are on class web site.

RÜEGER JM (1996) Electronic Distance Measurement - An Introduction, 4th ed., Springer-Verlag, Berlin-Heidelberg-New York, <http://www.springer.com/earth+sciences+and+geography/geophysics/book/978-3-540-61159-2>

UREN J and PRICE WF Surveying for Engineers, 6th Edition or later

VOSSelman G and MAAS H-G (2010) Airborne and Terrestrial Laser Scanning Whittles ISBN 978-1904445-87-6

## Course Evaluation and Development

Previous students' feedback in the end of term myExperience surveys rated this course very highly.

In our lectures in 2023 the quantity of words in PowerPoint slides will be reduced and the amount of student activity, thinking, talking, and interaction will be increased to try to make class

attendance more worthwhile. In this course in recent years we have placed more emphasis on problem solving skills and application to real case studies from consulting surveying. Some of our classes will include PBL (problem based learning) and it is suggested that students spend more of their own time doing additional problem solving. The lecturer is available outside class time to help with questions.

## Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Craig Roberts		CE412	02 9385 4464 (MS Teams)	Available in my office or by email whenever I am not in class or meeting.	No	Yes

## Other Useful Information

### Academic Information

#### I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's [Special Consideration page](#).

#### II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and policies. In particular, students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)

- [Equitable Learning Services](#)

### III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

### IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: <https://www.unsw.edu.au/engineering/student-life/student-resources/program-design>.

*Note: This course outline sets out the 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 or your primary learning management system (LMS) 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/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.*

### Academic Honesty and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: [student.unsw.edu.au/plagiarism](http://student.unsw.edu.au/plagiarism). The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

[www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf](http://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)

## **Submission of Assessment Tasks**

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

## **Faculty-specific 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)

## School-specific Information

### Final Examinations

Final Exams in T1 2024 will be held on campus between the 26th April and 9th May, and Supplementary Exams between the 20th - 24th May 2024. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

## School Contact Information

For assistance with enrolment, class registration, progression checks and other administrative matters, please see [the Nucleus: Student Hub](#). They are located inside the Library – first right as you enter the main library entrance. You can also contact them via <http://unsw.to/webforms> or reserve a place in the face-to-face queue using the UniVerse app.

For course administration matters, please contact the Course Coordinator.

Questions about this course should normally be asked during the scheduled class so that everyone can benefit from the answer and discussion.