GMAT1110 - SURVEYING AND GIS

Semester 2, 2016

Never Stand Still | Faculty of Engineering | School of Civil and Environmental Engineering

COURSE DETAILS

Units of Credit	6 UoC	
Contact hours	5 hours per week	
Class	Monday, 2:00 – 4:00	Civ Eng 101
Workshop	Thursday, 2:00 – 4:00 Thursday, 4:00 – 6:00	Civ Eng G8/Fieldwork Civ Eng G8/Field work
Course Coordinator and Lecturer	Dr Craig Roberts email: c.roberts@unsw.edu.au office: CE412 phone: 9385 4464	
Lecturer	A/Prof Linlin Ge email: l.ge@unsw.edu.au office: CE704 phone: 9385 4177	
Lecturer	Rod Eckels (external lecturer) email: r.eckels@unsw.edu.au office: off campus	

INFORMATION ABOUT THE COURSE

This course is fundamental to all other subsequent GMAT courses and for Surveying or GIS students. It will form the basis for all of the GMAT second year courses which will extend the concepts presented. It is an elective course for Civil and Environmental Engineering students and an elective for all students in the Faculty of Engineering. It is an elective for Construction and Building Management students from the Faculty of the Built Environment (FBE). FBE students are reminded that trigonometry will be assumed knowledge.

HANDBOOK DESCRIPTION

See link to virtual handbook:

www.handbook.unsw.edu.au/undergraduate/courses/2016/GMAT1110.html

OBJECTIVES

The aim of this course is to provide a broad overview of the surveying and geospatial engineering industry. The student is exposed to the fundamentals of basic plane surveying such as levelling, angle measurement, distance measurement, field recording of measurements, coordinate and reference systems, terrain representation, satellite techniques for surveying (GPS/GNSS) and applications of these techniques to solve some real world problems. The theory presented in lectures will be reinforced with field practicals, workshop exercises and quizzes. Geographical information systems (GIS) software is introduced and combined with GPS data captured by the student. Satellite remote sensing techniques and cartography for mapping is also presented.

List of 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

Three main aspects of teaching will be offered in this course: lectures, workshops and field practicals (labs).

The lectures introduce the course material and are supported by relevant chapters from the reference book for this course (Uren and Price, 5th Ed). All notes can be accessed from the class website on Moodle. Lectures are also available in podcast form via Echo360 and accessible on the Moodle site. It is highly recommended that the student attend all lectures. I will ask questions in the lectures to stimulate debate, deepen your understanding of the topics and to give you some idea of how to apply the theory to real world situations. I encourage student questions and engagement in my lectures. A lot of reading outside of lectures using reference material (see below) is expected.

Workshops (formerly known as tutorials) will support the lectures. Workshop questions can be accessed from the class website. This course is computational in nature and it is very important that the student practice all of the workshop problems prior to the workshop sessions. Lecturers will assume that all students attending have attempted the problems. The problems are very similar in nature to the sort of questions you could expect in the final exam.

Three field practical exercises have been set to help the student appreciate how to apply basic surveying techniques to real world situations. Previous students have found field practicals to be the most rewarding and enjoyable part of the course and for this reason they are compulsory for all students. **A doctor's certificate or other supporting documentation will be needed in the event that a student misses a field practical.**

Private Study	• Review lecture material and textbook • Do set problems and assignments • Reflect on workshop problems • 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 lecturers to solve set problems • Ask questions
Assessments (multiple choice questions/quizzes, mid-session test, hand-in field exercises, examinations)	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving
Field Practicals (labs)	• Hands-on work, to achieve practical field work tasks • Prepare concise reports in the field • Practice working in groups • Attempt, fail, learn, repeat, improve

EXPECTED LEARNING OUTCOMES

By the end of this course students should be able to:

- ✓ Critically assess the quality of geospatial data.
- ✓ Practice some basic field surveying techniques such as handheld GPS and GIS, levelling, and use of a total station to acquire raw field observations and set out of a minor structure.
- ✓ Develop efficient field work practices such as skill with various surveying instruments, forward planning for survey tasks, production of clear field notes and redundant field checks to ensure accuracy.
- ✓ Undertake basic survey computations from raw field observations to support a range of surveying and engineering applications such as levelling and terrain representation, area and volume calculations, traversing and construction set out.
- ✓ Carry out some basic operations using Geographical Information System software.
- ✓ Study the basic theory of cartography, GIS and remote sensing techniques.
- ✓ For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

ASSESSMENT

Field practicals (labs):

Each student will be a member of a group of 4 (or possibly 3) students who generally work together. The groups will be formed during the lectures in Week 1 of the course. Students are free to select their partners. **(Students that do not attend the first lecture, or cannot find a partner, will be put in a group by the lecturer.)** Students are advised to select their partners very carefully. Uncommitted students may cause erroneous field measurements, may not be present on the day, and may drop out of the course during the session. Make sure that you get the address, mobile phone number, e-mail address, etc of your partner(s) immediately after the formation of the group. Group submissions are required for the reports on the field exercises (unless otherwise advised) and are given to the prac supervisor upon completion of the exercise in the field or lab. Late submissions will be penalised. It is expected that all work is divided equally amongst group members. Assessment will consider this at the lecturer's discretion. As field pracs are compulsory, attendance at the start of practicals (ie during the initial briefing) will be recorded. Late arrivals for practicals will be penalised 10% the first time and 20% thereafter or if more than 15 mins late.

Online Assignment/ Quiz

As the workshops will not be assessed, a series of online quizzes will be given to students to test their knowledge at that stage of the curriculum. Go to **http://moodle.telt.unsw.edu.au** . More instructions will be given in the lectures. Questions will require some calculation and preparation before a nominated solution can be given. Please note that these exercises are not only assessable but can be seen as revision for the final exam. The workshop questions are the same style as the sort of questions you could expect in the final exam.

Mid-session test:

The mid-session test will be multiple choice and test all material up to and including week 8 (but not the traverse lecture material). Prac 1 & 2, Wkp 1 & 2 and lectures 1 – 7 are included. Any work on P-R, R-P in the lecture in week 8 is also considered examinable in the mid-session test.

Final Exam:

The final exam will be external and will cover all material from the session. Students are required to score at least 30% in the final exam to pass this course.

ASSIGNMENTS

Assessment for the course includes:

• Practical reports (4)	30%	Due at completion of prac
• Mid-session test	15%	In week 9
• Online assignment/ quiz (5)	15%	During session
• Final Exam	40%	In formal exam period

COURSE PROGRAM

Wk	Week start	LEC Mon 2 – 4 Civ Eng 101	W'SHOP THURS 2 – 4 Civ Eng G8/ Field	PRAC THURS 4 - 6 Civ Eng G8/ Field
1	25/7	Intro, Admin & Overview of SAGE (cr)		
2	1/8	**L1**: Levelling (cr)		
3	8/8	**L2**: Orientation/ theodolites (cr) **L3**: Distance I (cr)	**Prac 1A** – Levelling (**re**, cr, ba, js) Physics Lawn	**Wkp 1A** – Levelling (cr)
4	15/8	**L3**: Distance II (cr) **L4**: Coordinates and Calculations (cr)	**Prac 1B** – Levelling (cr, ba, js, yz) Survey Store EE G16	**Wkp 1B** – Levelling (cr)
5	22/8	**L5**: Intro to GPS (cr)	**Prac 2A** – GPS/GIS (***cr***, re, js, ba) Physics Lawn	**Prac 2B** – GPS/GIS (***cr***, re, js, ba) Physics Lawn
6	29/8	**L6**: Intro to GIS & Cartography (lg)	**Prac 3A –** Angles/ Radiations (**cr**, yz, js, ba) **Wkp 2B** – Angles & Dists (re)	**Prac 3B –** Angles/ Radiations (**cr**, yz, js, ba) **Wkp 2A** – Angles & Dists (re)
7	5/9	**L7**: Intro to Remote Sensing (lg)		
8	12/9	**L8**: Traverse and Control surveys (cr)	Calculations P→R, R→ P revision (optional) (cr)	
9	19/9	***Mid Session Test*** (***cr***, yz, ba)	**Wkp 3A** – Coords & trav (cr)	**Wkp 3B** – Coords & trav (cr)
Mid-session break				
10	3/10	***Public Holiday***		
11	10/10	**L9:** Areas and Vol(re) **L10:** Construction setout (re)	**Prac 4A** – Setout (cr, js, **re**, ba) Physics Lawn	**Prac 4B** – Setout (cr, js, **re**, ba) Physics Lawn
12	17/10	**L11:** Deformation surveys (cr) **L12:** Detail surveys and contouring (cr)	**Wkp 4A** – Area, vol, const(re)	**Wkp 4B** – Area, vol, const(re)
13	24/10	**L13:** Cadastral Surveying (cr)	Revision practice Exam (cr) **Wkp Revision**	

cr – Craig Roberts, re – Rod Eckels, lg – Linlin Ge, ba – Bandar Alharbi, js – Jak Sarmiento, yz – Yincai Zhou

RELEVANT RESOURCES

Lecture Material (check the course website):

http://moodle.telt.unsw.edu.au

The Powerpoint lecture slides and other documents are available for download as PDF files at the course website.

Lectures can also be viewed as Echo recordings.

Text and Reference Books

Text:

Uren, J & Price, WF. "Surveying for Engineers", 5th edition, 2010

(available in bookshop – compulsory to purchase for B Eng(Surveying) students only. Optional for other students)

Reference book:

- Uren, J & Price, WF. "Surveying for Engineers", 4th edition, 2006
- Schofield, W. "Engineering Surveying", 4th edition, 1993
- Bannister, A., Raymond, S. Baker, R. (1992) Surveying, 6th Edition, Pitman, London.
- Kavanagh, B.F. (2003) Surveying: Principles and Applications, 6th Ed, Prentice Hall, ISBN 0-13-099582-7

5.3 Computational Aids

Pocket calculators are required during lecturing hours, for workshops, field practicals as well as exams in this course. They have to be hand-held, internally powered and silent. They must be brought to all lectures and practicals.

From 2009 students may bring their own calculators to the exam but they must be approved calculators. The list of "approved" calculators is the same as that published by the Board of Studies NSW at https://my.unsw.edu.au/student/academiclife/assessment/examinations/Calculator.html

Students must attain a tamper proof sticker from the Engineering Student Centre to guarantee that their calculator is approved for the final exam.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

https://my.unsw.edu.au/student/resources/KeyDates.html

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,
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- SurvSOC.

Refer to Academic Advice on the School website available at:

http://www.engineering.unsw.edu.au/civil-engineering/resources/academic-advice

I hope you enjoy your first voyage into the wonderful world of Surveying and Geospatial Engineering.

Craig Roberts, July 2016