THE UNIVERSITY OF NEW SOUTH WALES
SYDNEY · 2052 · AUSTRALIA

SCHOOL OF SURVEYING & SPATIAL INFORMATION SYSTEMS

GMAT 1110

SURVEYING and GIS 1

Course Outline – Session 1, 2009

Version: 23/02/2009

This document, and other material, is available at the Course Website:
http://www.gmat.unsw.edu.au/gmat1110

(User name and password supplied in class)

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1. Staff involved in the Course and their Contact Details

1.1 Lecturer & Coordinator: Dr. Craig Roberts (cr)

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1.2 Lecturer: Dr. Samsung Lim (sl)

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1.3 Practical/Tutorial Supervisor : Hong Joo Park (hj)

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1.4 Practical/Tutorial Supervisor : Yincai Zhou (yz)

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1.5 Staff absences during session: CR Friday week 5 prac exercise.

2. Educational Aspects of the Course

2.1 How this course relates to others in the program

This course is fundamental to most other subsequent GMAT courses and is recommended to be taken in session 1 followed by GMAT1400 Land Studies in session 2 for Surveying and SIS students. It will form the basis for all of the GMAT second year courses which will extend the concepts presented. It is core course for Civil and Environmental Engineering students and elective for all students in the Faculty of Engineering and Construction and Building Management students from the Faculty of the Built Environment.

2.2 Aim of the Course

The aim of this course is to provide a broad overview of the surveying and spatial industry. Powerful Geographical Information Systems software will be introduced and combined with GPS data captured by the student. This knowledge gives context 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 (global positioning system) and applications of these techniques to solve some real world problems. The theory presented in lectures will be reinforced with practicals, assignments and tutorial exercises.

2.3 Learning Outcomes

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

- Critically assess the quality of spatial 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 produce a topographic plan.

- 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.

2.4 Teaching Strategies

Three main aspects of teaching will be offered in this course: lectures, tutorials and practicals.

The **lectures** introduce the course material and are supported by relevant chapters from the reference book for this course (Uren and Price, 4th Ed). All notes can be accessed from the class website (see pg 1). Despite this 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. A lot of reading outside of lectures using reference material (see below) is expected.

Tutorials will support the lectures. Tutorial 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 tutorial problems prior to the tutorial sessions. Tutors will assume that all students attending have attempted the tutorial problems. The tutorial problems are very similar in nature to the sort of questions you could expect in the final exam.

Four **practical exercises** have been set to help the student appreciate how to apply basic surveying techniques to real world situations. Previous students have found 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.

2.5 Suggested Learning Methods

Download course notes from the webpage, print and bring to lectures. It is not necessary to take detailed notes in lectures, rather annotate the printed notes. However, it is important to complete all the tutorials, practical reports, GIS exercise and the assignment to aid your learning.

The student will be expected to follow carefully the timetable given in this document. The field practicals can only accommodate 40 students at any time so the class will be split into max. 40-student blocks. A mid-session test will be used to ensure all students are keeping up with the material.

2.6 UNSW Graduate Attributes

This course provides an environment that fosters in our students the following attributes listed:

the skills involved in scholarly enquiry	Significant
an in-depth engagement with relevant disciplinary knowledge in its interdisciplinary context	Some
the capacity for analytical and critical thinking and for creative problem solving	Significant
the ability to engage in independent and reflective learning	Some
the skills to locate, evaluate and use relevant information (Information Literacy)	Some
the capacity for enterprise, initiative and creativity	Significant
an appreciation of and respect for, diversity	
a capacity to contribute to, and work within, the international community	
the skills required for collaborative and multidisciplinary work	Some
an appreciation of, and a responsiveness to, change	Some
a respect for ethical practice and social responsibility	

3. Proposed Course Schedule GMAT1110 S1 2009

Wk	Week start	Lec TUES 12-2 EE 418	Tut FRI 9- 10:15 OMB 150	Prac FRI 10:15 – 1:00 See Below
0	2/3	**TUESDAY 3 MARCH EE 418 12 – 2** L: Introduction, Admin & Overview of surveying (cr)		
1	9/3	**L**: Intro to GPS (cr)		
2	16/3	**L**: Intro to GIS (sl)		**Prac 1A** – GPS/GIS (**cr**,*sl*) Surveyors Lawn ***Handout GIS Exercise A***
3	23/3	**L**: Levelling (cr)	**T1B**: Levelling (sl)	**Prac 1B** – GPS/GIS (**cr**,*sl*) Surveyors Lawn ***Handout GIS Exercise B***
4	30/3	**L**: Orientation/ theodolites (cr) ***GIS Exercise A due***	**T1A**: Levelling (sl) **Prac 2B** – Levelling (**cr**, *hj*) Survey Store EE G16	**Prac 2A** – Levelling (**cr**, *hj*) Survey Store EE G16
5	6/4	**L**: Distance Measure-ment/ EDM (cr) **L**: Spatial Applications (sl) ***GIS Exercise B due***	PUBLIC HOLIDAY GOOD FRIDAY	PUBLIC HOLIDAY GOOD FRIDAY
6	20/4	**L**: Coordinates and Calculations (cr)	**T2A**: Angles and Distances (cr)	**Prac 3A** – Setout (**cr,** *hj*) Survey Store EE G16
7	27/4	**L**: Traverse and Control surveys, P → R, R → P revision (cr)	**T2B**: Angles and Distances (cr)	**Prac 3B** – Setout (**cr,** *hj*) Survey Store EE G16
8	4/5	***Mid Session Test*** (***cr***,sl,hj) ***Handout Assignment***	**T3A**: Coords and Traverses (sl)	**Prac 4A** – Detail (field) (**yz**, hj) Survey Store EE G16
9	11/5	**L**: Detail surveys and contouring (cr) **L**: Areas and Vol (cr)	**T3B**: Coords and Traverses (sl)	**Prac 4B** – Detail (field) (**cr**, hj) Survey Store EE G16
10	18/5	**L**: Construction setout and deformation surveys (cr)	**T4A**: Areas, Volumes, construction (cr)	**Prac 4A** – Detail (Plan) (**yz**, sl) EE401A
11	25/5	**L**: Cadastral Surveying (cr) ***Assignment Due***	**T4B**: Areas, Volumes, construction (cr)	**Prac 4B** – Detail (Plan) (**yz**, sl) EE401A
12	1/6	Revision practice Exam (cr)		

GMAT1110 Schedule of Lectures, Tutorials and Practicals: Practical Supervisors: Craig Roberts (cr), Samsung Lim (sl), Yincai Zhou (yz) & Hong Joo Park (hj). The supervisor/tutor listed in brackets in **bold** type is in charge of the practical/tutorial, checks the attendance and gives the briefing, & those in *italics* marks the submission.

GMAT1110 has been scheduled with two slots. A two hour slot for lectures on Tuesdays followed by a 4hr slot on Fridays which is split into two x 2hr periods for either Tutorials or Practicals. Note that I can

only accommodate 40 students in one practical group so I will split into two blocks (during the Week Zero admin lecture) called block A and Block B. Please pay close attention to the course schedule above and attend on time when your block is scheduled. Note that you are not required to attend every week. This course will be presented as 12 lecture periods, 4 tutorials and 4 field practicals. A mid-session test will also be given in week 8 based on all material from the first 7 weeks. The final exam will assess all 12 weeks. An assignment will be set in week 8 after the mid-session test due on Tuesday of week 11. The student is asked to follow carefully the proposed schedule given above.

Lectures: Tues 12.00 – 2.00 - Room EE418 - Lecturers: Craig Roberts & Samsung Lim. This course has been organised such that the lecture material is presented on Tuesdays. *Please pay **close** attention to the schedule of lectures* and attend ***all*** lectures.

Tutorials: Fri 9.00 – 11.00 h - Room OMB 150
Tutorials will be up to 2 hours in duration (but usually 1hr 15 mins followed by a field prac). Tutorials will not be assessed. See course schedule of tutorials and only attend when your block is scheduled. Bring copies of tutorial problems to all tutorial sessions. *It is expected that students have already attempted most or all tutorial problems and will have questions to ask their tutor.* All students must attend all scheduled tutorials.

Practicals: Fri 11.00 – 1.00 h - See Course Schedule above
Pracs will be 2+ hours in duration. Pay close attention to the course schedule of practicals and only attend when your block is scheduled. Bring copies of the fieldwork instructions to all sessions. Read through beforehand. All students must attend all practicals scheduled for their group. Students who are late will be penalised at least 10%.

4. Assessment in the Course

Assessment for the course includes:

• Practical reports (4)	40%	Due at completion of prac
• GIS Exercise	5%	Due week 4 & 5 depending on block
• Mid-session test	10%	On Tuesday week 8
• Assignment	10%	Due Tuesday week 11
• Final Exam	35%	In formal exam period

***Practicals**:*

Each student will be a member of a group of 4 (or possibly 3) students. On some days, the four (or three) students work together. On some days, two students (half-group) will work together. The groups will be formed during the lectures in Week 0 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, phone number, mobile phone number, fax number, e-mail address, etc of you partner(s) immediately after the formation of the group. **Also make sure** that ***all*** **field forms are *always* photocopied (note: not hand copied!!)** immediately after the fieldwork, that is **on the day of the field work**, so that all students of a group always have access to all data.

Individual submissions are required for the reports on the field exercises (unless otherwise advised). Only the fieldwork is shared. Late submissions will be penalised.

GIS Exercise

A minor GIS Exercise will be given to students to complete in their sub groups of 2.

***Assignment**:*

As the tutorials will not be assessed, an assignment will be given based on tutorial style questions. Please note that this exercise can be seen as revision for the final exam. The tutorial and assignment questions are the same style as the sort of questions you could expect in the final exam. Submissions must be hand written and neat. Word processed submissions will not be accepted.

Mid-session test:

The mid-session test will be multiple choice and test all material up to and including week 8.

Attendance:

As field pracs are compulsory, attendance at the start of practicals (ie during the initial briefing) will be recorded. Late arrival at briefings will be penalised 10%.

Final Exam*:*

The final exam will be external and will cover all material from the session.

All assignments and assessment items should be submitted with a signed Assessment Cover Sheet:

I declare that this assessment item is my own work, except where acknowledged, and has not been submitted for academic credit elsewhere, and acknowledge that the assessor of this item may, for the purpose of assessing this item: Reproduce this assessment item and provide a copy to another member of the University; and/or, Communicate a copy of this assessment item to a plagiarism checking service (which may then retain a copy of the assessment item on its database for the purpose of future plagiarism checking). I certify that I have read and understood the University Rules in respect of Student Academic Misconduct. Signed: .....date: ☐☐ ☐☐ ☐☐

5. Course Resources

5.1 Lecture Material (check the course website):

http://www.gmat.unsw.edu.au/gmat1110

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

5.2 Text and Reference Books

Text:

Uren, J & Price, WF. "Surveying for Engineers", 4th edition, 2006

Reference book:

- Uren, J & Price, WF. "Surveying for Engineers", 3rd edition, 1994
- 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 tutorials and practicals in this course. They have to be hand-held, internally powered and silent. They must be brought to all lectures and practicals.

In 2009 the university policy toward calculators has changed. In the past the University provided CASIO fx-911W calculators in the final exam. Some hints about the use of the CASIO fx-911W for surveying computations may be found on
https://my.unsw.edu.au/student/academiclife/assessment/examinations/Calculator.html

In 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 http://www.boardofstudies.nsw.edu.au/manuals/calculators_hsc.html

6. Administrative Matters

6.1 Expected work load

At UNSW, the normal workload expectations of a student are 25-30 hours per session for each unit of credit, including class contact hours, preparation and time spent on all assessable work.

To assist students with the organisation of their studies, the expected workloads of the various components of the course are listed below. It is strongly suggested that students use the listed hours to plan their work during session.

Lectures	24hr
Tutorials (4 x 2hr + 4 x 3hr calcs at home)	20hr
Assignment	10hr
Field exercises (4 x 2hr + 4 x 3hr preparation or extra calcs)	30hr
Revision of Lectures, preparation of practical/tutorial reports, background reading (approximately 5hr x 12wk)	60hr
Total	144hr

6.2 Rules

Students should read the University Calendar or Student Guide for details of University Rules and special considerations.

Students are reminded that the University regards academic misconduct as a very serious matter. Unauthorised material must not be taken into a test or examination. The penalty for any suspected academic misconduct ranges from zero mark for the assignment or exam involved, through failure of the subject, to expulsion from the University. If absent from an examination, class test or practical, students must submit written documentation to the University, via the Student Centre in the Chancellery.

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:** -10% (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 via email or doctor's certificate 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 students attend less than 80% of their possible classes they may be refused final assessment.

6.3 Plagiarism

Plagiarism is the presentation of the thoughts or work of another as one's own.*

Examples include:

- direct duplication of the thoughts or work of another, including by copying work, or knowingly permitting it to be copied. This includes copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and,
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

Submitting an assessment item that has already been submitted for academic credit elsewhere may also be considered plagiarism.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

Students are reminded of their Rights and Responsibilities in respect of plagiarism, as set out in the University Undergraduate and Postgraduate Handbooks, and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

The Learning Centre website is the central University online resource for staff and student information on plagiarism and academic honesty. It can be located at:

www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students 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 items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle.

† Adapted with kind permission from the University of Melbourne.

6.4 Grievances

In the first instance all grievances should be discussed with the lecturer involved. If the problem cannot be resolved, students should contact the School's Grievance Officer in writing.

6.5 Rules for practical / field classes

If there is light rain field work is on, if rain is heavy then the practical might be postponed. Do not assume a class will be cancelled, attend on time and ask the supervisor. Practical classes take place in a variety of weather. Do not forget umbrellas, water proof jackets, hats, sun cream, **sturdy footwear (thongs or sandals are not acceptable and you will be asked to leave and given a mark of zero)**, warm clothes, etc.

There will be a short briefing session at the start of each practical class. Punctual attendance at the briefing is essential. 10% will be deducted for late attendance. All group members are expected to attend the briefings.

The practical exercises form an important part of the course. A good deal of time and care has gone into the organisation of these classes to ensure that you get the maximum benefit from the time that you spend and the equipment which is available. Most practicals will be done in groups of students, however the calculations and reports require individual work unless otherwise directed in the instructions. It is important that each student within a group gets experience in each aspect of each practical.

The location of fieldwork will depend on the state of construction on campus. Supervisors will advise you of the site and OHS matters at the briefings. If you have any questions or doubts about an OHS matter discuss it with you supervisor.

Students are required to read the supplied instructions well before the exercise is commenced.

ISSUING OF EQUIPMENT

During the issue of equipment, a large crowd around the store causes difficulties for everyone, so one group collects their equipment and the remaining groups should stand well back. A group is responsible for all equipment issued to it, with the student signing for the equipment as the representative.

1. *You should first inspect all equipment and make sure that it is in working order, otherwise you will be held responsible.* When returning equipment at the end of the field class, it should be handed back to the Stores Officer, piece by piece, so that he can check it off. Not until all your equipment has been returned and signed off, does your responsibility end.

2. ***It is not sufficient to leave the equipment near the store and depart.***

3. ***Any equipment lost or damaged will have to be paid for by the group.*** In the field, there is less danger of losing items if everything is laid close to an instrument box or in a group where pedestrians can safely bypass it.

INSTRUMENTS

The equipment used in surveying is sometimes delicate and often valuable (> $10,000). Please make sure that you take due care of the equipment and give some thought to the way in which you handle it. The staff member in charge of your class will give detailed instructions about its use. *Theodolites and electronic total stations*, have fragile optical mechanical and electronic components and are delicately adjusted. ***Shut instrument boxes immediately after removing/replacing the instrument.*** Carrying theodolites (on tripods) over the shoulder will not be tolerated in this School. Do not force any parts to move, check whether clamps are set, and do not over tighten clamps.

IN THE PUBLIC EYE

It is hoped that students taking part in surveying practicals on the campus will create a favourable impression on passers-by, **so behave like professionals**. The field classes give you an opportunity to handle interesting equipment and should be a welcome break from lectures. It is hoped you find them enjoyable as well as instructive.

Students should not normally leave the field work location during the practical sessions. However students leaving the field for short periods must ask another student to look after their equipment and must inform the student (and the supervisor, if present) of their time of return. No equipment is to be left unattended in the field at any time.

SUBMISSION OF REPORTS ON PRACTICAL WORK

Time: Reports may be submitted at any time prior to the due date. **Late submissions will not be marked**, unless accompanied by an appropriate reason. Reports should be submitted to your practical supervisor.

Contents of Reports: Your report should have a front/title page, then a summary of results page, then the rest of the report including computations and plans. Reports may consist of original field notes or a photocopy of the originals, *but not rewritten field notes*. The requirements for each practical will be discussed at the briefings before the practicals, if in doubt ask the supervisor. The front cover of all submissions should include: Course No. and Name, Group number and names of students in the group, Title of Exercise

Field Notes: All field notes must be recorded on proper field sheets available from the practical instructions or from the Store. On the first page of your notes for a particular exercise the following information should be given: Title of Exercise, Date, Names of students present in the group, Instrument serial number and Make of instruments used.

Field notes should be written neatly and not overcrowded. Pens or pencils may be used but pencils are recommended in wet conditions. Use tabular form where possible and draw neat sketches or diagrams where applicable. You should include a locality sketch plan. Overwriting is not permissible in the field sheets and wrong figures or words should be crossed and the true one written above it and initialled by the booker whose name must appear at the top of each page. NEVER EVER USE LIQUID PAPER OR SIMILAR ON FIELD NOTES.

At the end of the exercise **original field notes** should be presented to a supervisor for signature.

Computations: Computations must be done individually by every member of the group. The Group No., Name of a student, Date of exercise and Title of exercise should be shown. There is no need to show in the computation sheet all observed quantities as they are in the field notes. Tabular form must be used as much as possible. Formulae used must be shown, and symbols or letters used explained.

I hope you enjoy your first exposure to the world of Surveying and Spatial Information Systems and consider enrolling in other GMAT courses in your Program at UNSW.

Craig Roberts, February 2009