



THE UNIVERSITY OF
NEW SOUTH WALES
SYDNEY · 2052 · AUSTRALIA

SCHOOL OF SURVEYING & SPATIAL INFORMATION SYSTEMS

GMAT 2130

SURVEYING 3

Course Outline – Session 2, 2008

Version: 24/07/2008

This document, and other material, is available at the Course Website:
<http://www.gmat.unsw.edu.au/gmat2130>

(User name and password supplied in class)

Page	Table of Contents
1	Staff involved in the course and their contact details
2	Educational Aspects of the course
3	Course schedule
4	Assessment in the course
4	Course resources
5	Administrative matters
6	Rules
6	Rules for practical / field classes

1. Staff involved in the Course and their Contact Details

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

Office: EE408

Email: c.roberts@unsw.edu.au

Phone: 9385 4464

1.2 Practical/Tutorial Supervisor : Simon McElroy (sm)

Office: Dept of Lands, Bathurst

Email:

Phone:

1.3 Staff absences during session: none

2. Educational Aspects of the Course

2.1 How this course relates to others in the program

This course extends and applies material taught in GMAT courses 1110, 2500, 2700 and 2120. It will augment the course GMAT2550, ideally running in the same session, and form the basis for applied courses such as GMAT3100 and 3150 in 3rd year.

Co-requisites: GMAT2550

2.2 Aim of the Course

Up until now, the program has delivered courses which focus on a particular aspect. The aim of this course is to combine parts of a few courses together to achieve a given objective. An offsite project will take place at Queens Park where a range of exercises using total station and real time kinematic (RTK) GPS techniques will be investigated and compared. Trigonometric heighting and EDM height traversing will also be introduced in this course with an on campus practical exercise. In order to carry out these exercises, some new material will be presented and old material revised. A range of online services offered to surveyors will be explored in the early weeks to aid the work during the practical exercises. The remaining weeks will be devoted to computations and presentation of a major assignment.

2.3 Learning Outcomes

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

- Perform simple coordinate transformations between datums.
- Practice field surveying techniques using total station and RTK GPS proficiently and discern which technique is suitable for which style of survey application.
- 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.
- Utilise a range of online services available to the surveying and spatial community to produce a high quality survey report.

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 reference material for this course. All notes can be accessed from the class website (see above). Despite this it is highly recommended that the student attend all lectures. I will ask questions in the lectures to stimulate debate, deepen understanding of the topics and to give 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. Some tutorial questions can be accessed from the class website. This course is both computational and conceptual in nature and it is very important that the student practice all of the tutorial problems. The tutorial problems are very similar in nature to the sort of questions you could expect in the final exam.

Practical exercises combine with GMAT2550 and the Queens Park exercise. Students will carry out an EDM height traversing prac and use the Monday timeslot for the GMAT2550 EDM calibration prac. A series of half day (or more) exercises will be conducted on Fridays at Queens Park where student groups will be asked to carry out a number of exercises during that time and prepare a large report thereafter. Students will have to find their own way to Queens Park. 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 and the assignment to aid your learning. Read and understand all ancillary materials supplied on the website and referred to in emails from the course coordinator.

The student will be expected to follow carefully the timetable given in this document.

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	Significant
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)	Significant
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

Wk	Week start	Lec Monday 9 - 11 Quad 1047	Tute Wed 13 – 14 ASB 115	Prac Friday 10 – 2pm Survey Store
1	23/7	Introduction, form groups, explanation of course, Revision of map proj, scale factor, geodetic datums		
2	30/7	2D similarity transformations applied to engineering and cadastral surveys.	Tut: Transformations	
3	6/8	Online services GA, DoL (datum trans), GDA tech Manual, FIG, SCIMS.	Tut: GDA spreadsheets & SydNet exercise	
4	13/8	Trigonometric heighting, effects of earth curvature and refraction.	Tut: Compute height of pillar from 2120 resection prac	
5	20/8	Trig heighting observation procedures, precision of computed heights. EDM-height traversing.	Tut: Computation of coeff of refraction /elevation by EDM heighting Tut: Trig. heighting with horizontal distances	EDM Height traversing Prac
6	27/8	EDM calibration Short lecture and prac briefing		EDM Calibration, cyclic error Fieldwork (half groups in morning/ half afternoon)
7	3/9	GPS revision, error sources and Real Time Kinematic GPS surveying	Tut: SCIMS search for Queens Park Prac	Reconnaissance for Queens Park survey with hand held GPS
8	10/9	Practical use of RTK GPS surveying, pitfalls and integrated surveying.	Tut: Acronymia	Traverse at Queens Park
9	17/9	Class & order, positional & local uncertainty, SP1 Briefing: Queens Park survey + OHS	Tut: 2D transformation @ QP for assignment	RTK & GPS @ QP
10	1/10	Tut: AUSPOS and CSRS	Tut: Traverse comps with FIXIT3 for Assignment	Extra Prac time for QP (if necessary)
11	8/10	Debrief camp – what did we learn Guest Lecture – Lands Dept	Tut: Static GPS processing with LGO for assignment	
12	15/10	Prepare assignments from camp		Deadline for assignment 4pm

GMAT2130 has been scheduled with two slots. A one 2-hour slot for lectures on Mondays. On Wednesday there is a one hour tutorial slot. This course will be presented as 10 lecture periods (with two extra slots for camp de-brief and comps), 9 tutorials, 5 field practical days (3 of which comprise a major field project at Queens Park). The final exam will assess all 14 weeks. The student is asked to follow carefully the proposed schedule given above.

Lectures: Mon 9:00 – 11:00 - Room QUAD 1047 - Lecturers: Craig Roberts. *Please pay close attention to the schedule of lectures.*

Tutorials: Wed 14.00 – 15.00 h - Room ASB 115
See schedule of tutorials for details. 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 10.00 – 14.00 h - Survey Store
Pay close attention to the schedule of practicals and bring copies of the fieldwork instructions to all sessions. Read through beforehand. All students must attend all briefings and practicals scheduled for their group.

4. Assessment in the Course

Assessment for the course includes:

- | | | |
|--|-----|-----------------------------------|
| • Practical EDM Height Traversing | 10% | Due next Thursday after fieldwork |
| • GDA exercise | 5% | See on exercise |
| • Tutorial Exercises | 15% | Due 1 weeks after Tute |
| ○ 2D trans + Pillar ht + EDM Ht + Acro | | |
| • Major Practical Assignment | 40% | Due Thursday week 13 |
| • Final Exam (internal) | 30% | In formal exam period |

Practicals:

Each student will be a member of a group of 2 (or possibly 3) students. 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, phone number, mobile phone number, fax number, e-mail address, etc of your 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.

Attendance:

All field pracs are compulsory. A doctors certificate or other suitable reason will be required for non-attendance and a new time will be rescheduled for conducting the prac exercise.

Final Exam:

The final exam will be internal (due to under 15 in class) 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/gmat2130>

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

GDA Technical Manual

ICSM SPI

www.ga.gov.au

www.lands.nsw.gov.au

+ other materials published on the class website.

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

Rizos, C. (1997a) *Principles and Practice of GPS Surveying*, Monograph 17, School of Geomatic Engineering, The University of New South Wales, Sydney, Australia, 560pp.

Hofmann-Wellenhof, B., Lichtenegger, H., & Collins, J. (1994) *GPS Theory and Practice*. Fifth revision, Springer-Verlag, Wien New York, 355pp.

Seeber, G. (1993) *Satellite Geodesy: Foundations, Methods and Applications*. Walter de Gruyter, Berlin New York, 531 pp

Harvey, B. R. (2006) *Practical Least Squares for Surveyors*, 3rd Ed, The School of Surveying, University of New South Wales, Sydney, Australia.

Leick, A. (1995) *GPS Satellite Surveying*. Second Edition, John Wiley & Sons, Inc., 560pp.

Parkinson, B. W., & Spilker, J.J. (eds) (1996) *Global Positioning System: Theory and Applications Vol. 1 & 2*, Vol. 163 progress in Astronautics and Aeronautics, USA, 793pp & 643pp.

Rüeger, J.M. (1996) *Electronic Distance Measurement: An Introduction*. Springer Verlag. 4th Edition, Berlin, 276pp.

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 should be brought to all lectures and practicals. "A surveyor without their calculator is like a cowboy without his boots on!"

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 + further reading and revision	72 hr
Tutorials (9 x 1hr + 9 x 2hr for extra work)	27 hr
Field exercises (2 x 5 + 3 x 6)	28 hr
Preparation of major assignment + calcs	23 hr

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**. 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 your 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.
4. **Students will be asked to use their own vehicles to take survey gear to Queens Park.** Students should enter the university via gate 2 on High St and park behind the skip next to the survey store. Students should take care to not block the thoroughfare with their vehicle and should pack equipment as quickly as possible to avoid parking fines. The lecturer will inform students of a suitable place to park at Queens Park. Students should be careful when using their personal vehicles during survey camp.

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 and at Queens Park 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 the course.

