



THE UNIVERSITY OF
NEW SOUTH WALES
SYDNEY · 2052 · AUSTRALIA

SCHOOL OF SURVEYING & SPATIAL INFORMATION SYSTEMS

**GMAT 4910
Modern Navigation & Positioning
Technologies**

**GMAT 9210
Geopositioning Technologies for
Infomobility Applications**

Course Outline – Session 2, 2009

Version: 7-July-2009

*This document, and other material, is available at the Course Website:
<http://www.gmat.unsw.edu.au/cr/gmat4910/home4910.htm>*

(User name and password supplied in class)

Page	Table of Contents
2	Staff involved in the course and their contact details
2	Educational aspects of the course
3	Course schedule
5	Assessment in the course
5	Course resources
6	Administrative matters

1. Staff involved in the Course and their Contact Details

1.1 Lecturer & Course Convenor: Prof. Chris Rizos (CR)
Office: EE454 (Whenever present, you may just drop in)
Email: c.rizos@unsw.edu.au
Phone: 938 54205

1.2 Assistant Lecturers:
Dr. Jinling Wang (JLW)
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Phone: 938 54203
Assoc. Prof. Andrew Dempster (AD)
Office: EE425
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Phone: 938 56890

1.3 Staff absences during session:
C. Rizos's absences in weeks 3, 5, 7, 8, 10 will be covered with lectures by JLW, AD or guest speakers from industry.

2. Educational Aspects of the Course

2.1 How this course relates to others in the program

This course is a fourth year undergraduate elective 6UOC course in the B.E. (SSIS) program. The lecture material and assessable tasks are identical to the graduate courses GMAT9210 Geopositioning Technologies for Infomobility Applications, as part of Masters by coursework programs.

2.2 Aims of the Course

To present the basic principles of modern navigation & positioning technologies through a series of lectures, tutorials, laboratory sessions, and presentations by guest speakers. The navigation/positioning technologies will include GPS, INS/DR, indoor positioning, and digital maps. Complementary technologies such as wireless, communications, spatial databases/GIS, the Internet and mobile computing will also be studied. The application areas will include Intelligent Transport Systems (ITS) or 'Transport Telematics', and the personal Location-Based Services (LBS).

2.3 Learning Outcomes

By the end of this session you should be able to:

- (a) Explain the principles of range-based positioning systems.
- (b) Have an overview of the full range of possible positioning technologies, as well as their pros and cons.
- (c) Understand the objectives of Transport Telematics, and explain how positioning technology can address vehicular applications.
- (d) Have an overview of the full range of potential Location Based Services (LBS).
- (e) Understand many of the non-technical issues associated with vehicular and personal location/navigation, such as location privacy, RF-interference, market cases, etc.

The student will gain an appreciation of the central role played (or will be played in the near future) by positioning/navigation technology for "consumer-type" applications such as Transport Telematics and LBS. Mathematical and technical details will be kept to a minimum.

2.4 Teaching Strategies

A variety of teaching activities will be included to achieve the optimal teaching and learning outcomes. Major teaching activities in this course are:

- 1) Regular (nominally weekly) lectures by staff and guest speakers from industry.
- 2) Tutorials addressing several issues.
- 3) Essays on topics introduced in the tutorials.
- 4) Regular quizzes on the tutorial topics.

The lectures will provide the foundation to the course. The tutorials and assignments are intended to reinforce the basic principles.

2.5 Suggested Learning Methods

The most important factors in learning are students' commitment and learning methods. You are encouraged to attend all the lectures and other teaching activities. In addition, relevant resources on the web (visit the course website for details) are of great help in understanding the positioning technologies and applications discussed in the lectures.

A significant component of this course will be based on the six tutorials. Different groups of students will be assigned the tutorial topics (3 per student) to be researched and written up as essays.

2.6 UNSW Graduate Attributes

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

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	Some
the ability to engage in independent and reflective learning	Significant
the skills to locate, evaluate and use relevant information (Information Literacy)	Significant
the capacity for enterprise, initiative and creativity	Some
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	Minimal
an appreciation of, and a responsiveness to, change	Minimal
a respect for ethical practice and social responsibility	Minimal

3. Proposed Course Schedule

(Any changes will be notified in the class and by email to the students.)

Week No. (Start Date)	Monday - Lecture 9-11am EE224	Monday – Tutorial 11am-12noon EE224
1 (20/7)	Introduction to Telematics Apps & Positioning (CR)	Introduction to Tutorials
2 (27/7)	Overview of Positioning Systems (CR)	Lecture continued
3 (3/8)	Principles of GPS Positioning (CR)	Tutorial 1
4 (10/8)	Next Generation GNSS (CR)	Tutorial 2

5 (17/8)	Maps & Mapping (JB)	Lecture continued
6 (24/8)	Positioning Using Mobile Phone Signals (Guest Speaker)	Tutorial 3
7 (31/8)	Indoor Positioning (JB)	Tutorial 4
	<i>Mid-session Break</i>	<i>Mid-session Break</i>
8 (14/9)	Review of Positioning Technologies	Lecture continued
9 (21/9)	Integrated GPS/INS (JLW)	Lecture continued
10 (28/9)	ITS & LBS (CR)	Tutorial 5
11 (5/10)	Wireless Comms & Mobility (AD)	Tutorial 6
12 (12/10)	Review of ITS & LBS Applications (CR)	Lecture continued

4. Assessment in the Course

Assessment for the course includes:

- Essay 1: --%
- Essay 2: --%
- Essay 3: --% Total 80%
- 6 mini-quizzes: 20%

4.1 Essays & Tutorials

An important part of the learning process will be the tutorials. This is the primary means by which students will learn through “outside reading”. Students may be issued with handouts containing required reading for tutorials in the week prior to the scheduled tutorial. The class will be divided into two groups during week 1.

There will be six (6) tutorials. Each tutorial will require students to read the handouts, and carry out some literature (or web) research, in order to answer the questions posed for that tutorial (and the mini-quizzes). During the tutorial period students will be asked to participate in the discussion concerning the week’s topic. **The tutorial topics will also be the essay topics (max. 5000 words each), of which three will be submitted for assessment.** Group 1 will submit essays on tutorial topics 1, 3 & 5. Group 2 will submit mini-essays on tutorial topics 2, 4 & 6. Essays are to be submitted two weeks following the tutorial period in which the topic is discussed. See timetable at http://www.gmat.unsw.edu.au/cr/gmat4910/tt_4910.htm.

4.2 Mini-Quizzes

To reinforce the learning experience, 15min mini-quizzes will be given during the tutorial periods. Simple questions will be asked on the material dealt with in the tutorials (including the prior reading).

All essay items should be submitted with a signed Assessment Cover Sheet:

<p>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:</p> <p>Reproduce this assessment item and provide a copy to another member of the University; and/or,</p> <p>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).</p> <p>I certify that I have read and understood the University Rules in respect of Student Academic Misconduct.</p> <p>Signed:date: <input type="text"/><input type="text"/> <input type="text"/><input type="text"/> <input type="text"/><input type="text"/></p>

5. Course Resources

5.1 Lecture Material (check the course website):

<http://www.gmat.unsw.edu.au/cr/gmat4910/home4910.htm>

The Powerpoint lecture slides are available for download as PDF files at the course website, however these are from last year's course. The updated versions of the lectures will be uploaded after the lecture period in which the topic is presented.

Electronic resources on the lecture topics are also available at the course website.

5.2 Reference Books

There is no text book for this course. The following general reference books will assist the student:

- Ackroyd N. & Lorimer R. (1994), *Global Navigation, A GPS User's Guide*, 2nd ed., Lloyd's of London Press Ltd.
- Dye S. & Baylin F. (1997), *GPS Manual, Principles & Applications*, Baylin Pubs.
- El-Rabbany A. (2002), *Introduction to GPS: The Global Positioning System*, Artech House, 176pp.
- Hofmann-Wellenhof B., Legat K. & Wieser M. (2003), *Navigation: Principles of Positioning & Guidance*, Springer, 427pp.
- Hurn J. (1989), *GPS: A Guide to the Next Utility*, Trimble Navigation, 76pp.
- Kaplan E. (ed.) (1996), *Understanding GPS: Principles & Applications*, Artech House.
- Karimi H.A. & Hammad A. (ed.) (2004), *Telegeoinformatics: Location-Based Computing and Services*, CRC PressLtd., 377pp.
- McElroy S., et al (2001), *Exploring GPS: A GPS User's Guide*, 2nd ed., GPSCO (Australia), 126pp.
- Misra P. & Enge P. (2001), *Global Positioning System: Signals, Measurements, and Performance*, Ganga-Jamuna Press, 390pp.
- Spilker J. & Parkinson B. (eds.) (1996), *Global Positioning System: Theory and Applications*, Vol. I & II, AIAA.

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 (UOC), including class contact hours, preparation and time spent on all assessable work. Hence a total of 150-180hrs is expected to be invested in this course.

To assist students with the organisation of their studies, the expected approximate workloads of the various components of this 6UOC course are listed below. It is strongly suggested that students use the listed hours to plan their work during session.

Lectures/tut (12 x 3hr)	36hr
Tutorials (6 x 2hr study)	12hr
Self-study of reference material (12 x 3hr)	36hr
Tutorial mini-essays (3 x 25hr)	75hr

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. Any work submitted for assessment must be entirely the student's own work. The penalty for any suspected academic misconduct ranges from zero mark for the assignment involved, through failure of the course, to expulsion from the University.

Essay writing is a compulsory part 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. (The lecturer has the discretion to vary this penalty up or down, depending upon circumstances.)

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 (or sent as an email) 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.

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

(See <http://www.gmat.unsw.edu.au/currentstudents/general/plagiarism.htm>.)

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.

6.3 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 (the Head of School) in writing.