COURSE DETAILS

Units of Credit
6

Contact hours
5 hours per week

Class
Tuesday: 11:00am - 1:00pm
Wednesday: 4:00pm - 6:00pm

Quadrangle 1049
Quadrangle G055

Tutorial
Tuesday: 1:00pm – 2:00pm
CE 201

Course Coordinator and Lecturer
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office: CE413, Civil Engineering Building
phone: 9385 4203

INFORMATION ABOUT THE COURSE

This 6 UoC course is one of the core subjects in the undergraduate programs (3741/3742). It is based on the first year course GMAT1110. This course introduces several fundamental concepts in surveying, geodesy, spatial information systems, which will be used in forthcoming courses during your studies, such as GMAT3700, 3600, 4900, 4910 and 9211.

HANDBOOK DESCRIPTION

Cartesian coordinate systems, applications of Cartesian coordinate transformations in geomatics. Mathematical transformations between geodetic, Cartesian and topocentric coordinate systems, ellipsoid geometry, orthometric and ellipsoid height systems; Map projections and ellipsoidal geometry, principles of map projections, surveying and mapping projections, transverse Mercator projection, ellipsoidal computations. Corrections to field observations. Geodetic and astronomical reference systems; the relationship between natural and geodetic reference systems, deflection of the vertical; geoid models and reference ellipsoids, height systems, celestial coordinate systems. Geodetic coordinate systems and datums; definition of AGD, GDA and AHD.

See link to virtual handbook as


OBJECTIVES

The objectives of this course are

(a) to enhance your knowledge and skills gained in the first year courses;
(b) to introduce you to the basic concepts of geodesy;
(c) to extend your knowledge base to the areas of the reference and coordinate systems fundamental to geopositioning in both the global and regional context;
(d) to provide you with the concept and theory of map projections and their applications in surveying;
(e) to provide an environment that fosters in our students the following attributes:
Attributes | Related to this course
--- | ---
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) | Some
the capacity for enterprise, initiative and creativity | Minimal
an appreciation of and respect for, diversity | Minimal
a capacity to contribute to, and work within, the international community | Minimal
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 | Minimal
the skills of effective communication. | Significant

More details on how the teaching and learning activities in this course are linked to each of these attributes will be discussed in classes.

**TEACHING STRATEGIES**

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

1. Regular lectures;
2. Tutorials and computing tasks;
3. Sun tracking assignment;
4. Regular quizzes, and discussions on the questions from the quizzes;
5. Essay writing;
6. Class discussions.

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 basic concepts discussed in the lectures and the trends in the discipline of surveying and geospatial engineering. Due to the nature of the course, the course materials are more theoretical than other courses in the program. *Linking the abstract concepts to the real world applications will improve your learning outcomes.*

Based on some studies by a higher education research expert John Biggs, most active students in the class do not just listen, see, collect notes and take notes, but most importantly, they will "express understanding; raise issues, speculate, solve problems, discuss, answer questions and reflect".

Students are strongly encouraged to do sufficient preparation for class discussions on selected topics.

An example of the approaches to learning is:

| Lectures | • Find out what you must learn  
• See methods that are not in the textbook  
• Follow worked examples |
|---|---|
| Visit Sydney Observatory | • Ask questions on the invited talks  
• Reflect on the evolution of timing and reference frames |
| Sun Tracking Experiment | • Understand the concepts through hands-on work,  
• Set studies in context  
• Demonstrate data analysis and presentation skills |
| Tutorials | • Practice solving set problems  
• Ask questions |
| Assessments (min-quizzes, tutorials, reports etc.) | • Demonstrate your knowledge and skills  
• Demonstrate higher understanding and problem solving |
| Private Study | • Review lecture material and textbook  
• Do set problems and assignments  
• Reflect on class problems and assignments |

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**EXPECTED LEARNING OUTCOMES**

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

(a) Explain the definition of geodesy and its major tasks;
(b) Understand the basic concepts of the reference and coordinate systems;
(c) Implement the practical procedures of the transformation between the coordinate systems;
(d) Describe the purposes and methods of map projections;
(e) Transform terrestrial observations onto the projection plane;
(f) Identify the geodetic reference frames (datums) and map projection systems used in practice in Australia (and in the state of New South Wales in particular).

**At UNSW, the normal workload expectations of a student are 24-28 hours per session for each unit of credit, including class contact hours, preparation and time spent on all assessable work.**

For each hour of contact it is expected that you will put in at least 1.5 hours of self-centred and self-directed study: for example, reading the course related materials provided through the course website and reflecting on the conceptual framework discussed in the classes.

**ASSESSMENT**

Assessment for the course includes:

- Mini-quizzes/Tutorials 25%
- Essay task 10% (due week 7)
- Sun tracking assignment 15% (due week 11)
- Class discussion/participation 10%
- Final exam 40% (during the formal examination period)

**Mini-Quizzes:**
To reinforce the learning experience, mini-quizzes will be given during the lectures. Simple questions will be asked on the material presented in the PREVIOUS lecturing period.

**Class Discussions/Participation:**
Students should regularly attend the lectures and participate in class discussions during the lectures. In addition, students are invited to give a short presentation to the class workshop in Week 12. The attendance at the scheduled classes is necessary to achieve a satisfactory learning outcome from this course.

**Sun Tracking Assignment, Essay Task and Tutorial Exercises** will be documented separately and distributed to you during the lectures and tutorial sessions. Any changes to the above assessment arrangement will be notified in the class and will also be updated at the course website. All the marking schedules will be explained to the class.

**Final Exam** will be of 2 hours duration, and will be held in the formal examination period, in ‘closed book’ format, but the ‘complicated’ formulae to be used in the exam will be provided in the examination paper. The formal exam scripts will not be returned.

Students who perform poorly in the mini-quizzes and tutorials are recommended to discuss progress with the lecturer during the semester.

**Note:**

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 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. Otherwise, the marks for late submissions will be reduced: -10% (of the maximum mark) for each day late.
COURSE PROGRAM

(The time slots for invited lecture/visiting Sydney Observatory as well as any other changes will be notified in the class and at the course website).

SEMESTER 1, 2014

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture Topics</th>
<th>Lab/Tutorial Topics</th>
<th>Assignment Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3 March</td>
<td>Introduction to geodesy; Geodesy and Earth motion</td>
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<tr>
<td>2</td>
<td>10 March</td>
<td>Concepts of reference systems; Transforming coordinates</td>
<td>MATLAB for geodetic computations</td>
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<tr>
<td>3</td>
<td>17 March</td>
<td>Reference systems in geodesy and astronomy; Earth-fixed coordinates</td>
<td>Coordinate transformation</td>
<td>Quiz 1</td>
</tr>
<tr>
<td>4</td>
<td>24 March</td>
<td>Earth’s gravity field; Geodid and gravity models; Time systems;</td>
<td>Web resources on reference frames; Gravity</td>
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<tr>
<td>5</td>
<td>31 March</td>
<td>Terrestrial Positioning; Horizontal and Vertical Datums; Heights</td>
<td>Geodetic datums</td>
<td>Quiz 2</td>
</tr>
<tr>
<td>6</td>
<td>7 April</td>
<td>No Class (the time slots are rescheduled for Sun tracking experiments)</td>
<td>No Class (the time slot is rescheduled for Sun tracking experiments)</td>
<td></td>
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<tr>
<td>7</td>
<td>14 April</td>
<td>Spherical trigonometry; Image coordinates and transformations; Overview of map projections</td>
<td>Computations with spherical trigonometry.</td>
<td>Essay Report</td>
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<td>Break</td>
<td>Mid-Session Break</td>
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<tr>
<td>8</td>
<td>28 April</td>
<td>Geometry of ellipsoid; Reduction of observations onto a reference ellipsoid</td>
<td>Computing radii of curvatures</td>
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<tr>
<td>9</td>
<td>5 May</td>
<td>Computations on ellipsoids; Map projections: concepts and classifications</td>
<td>Direct/inverse solutions; Review Sun tracking results</td>
<td>Quiz 3</td>
</tr>
<tr>
<td>10</td>
<td>12 May</td>
<td>Basic map projection theory; Transversal Mercator Projection</td>
<td>Coordinate transformation between GDA and-MGA</td>
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<tr>
<td>11</td>
<td>19 May</td>
<td>No class (this time slot re-scheduled for Visit to Sydney Observatory)</td>
<td>No class (this time slot re-scheduled for Visit to Sydney Observatory)</td>
<td>Sun Tracking Report</td>
</tr>
<tr>
<td>12</td>
<td>26 May</td>
<td>Grid computation; Lambert conformal conic projection</td>
<td>Class Discussions</td>
<td></td>
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<tr>
<td>13</td>
<td>2 June</td>
<td>(Optional: Class Discussions)</td>
<td>Analysing Sun tracking results/ Revision</td>
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RELEVANT RESOURCES

Lecture Materials

The course materials will be available through “Moodle”: [http://moodle.telt.unsw.edu.au/](http://moodle.telt.unsw.edu.au/)

The Power Point lecture slides are available for download as PDF files at the course website.
Electronic resources on the lecture topics are available at the course website.

The class notes, latest journal articles and references related the course topics will be referred to and/or distributed during the lectures.

Text and Reference Books


Stolz, A (2001) An Introduction to Geodesy, Monograph 16, School of Surveying & SIS, UNSW.


Computational Aids

Pocket calculators are required during lectures and tutorials in this course. They have to be hand-held, internally powered and silent. Pocket calculators for examinations in this course are provided by the University (CASIO fx-911W).

Computer software relevant to this course and available in the School’s computer lab CE201, includes: Matlab.

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

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: □□□□□□□□□
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
- CEVSOC.

Refer to Academic Advice on the School website available at:

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