COURSE DETAILS

Units of Credit: 6
Contact hours: 3 hours per week
Class: Tuesday 10:00 - 12:00 CE G6
Exercises: Tuesday 12:00 - 13:00 CE 201
Course Coordinator and Lecturer: Jinling Wang
  email: jinling.wang@unsw.edu.au
  office: CE413
  phone: 9385 4203

INFORMATION ABOUT THE COURSE

This 6 UoC course is one of the elective courses for the postgraduate coursework programs (such as 8338, 8538; 8539). This course may also become an advanced elective subject in the undergraduate programs in surveying and geospatial engineering. The course is based on the concepts learned and the skills gained in other courses in the undergraduate programs. Major topics of this course have close connections with the subjects GMAT2700, GMAT3700, GMAT9205 and GMAT9212. This course will focus more on the modern geodetic techniques as well as the three pillars of geodesy.

HANDBOOK DESCRIPTION

Modern concerns of geodesy; Roles of modern geodesy in surveying and geospatial engineering, environmental monitoring and climate change studies; Variations of geodetic positions with time; Satellite orbit determination; Introduction to space geodetic methods: Satellite Laser Ranging (SLR), VLBI; DORIS, satellite altimetry; Gravimetric geodesy, air- and space-born gravimetric measurements; the concepts and computations in gravimetry and geoid determination; Global Geodetic Observing System (GGOS); Engineering geodesy and applications.

See link to virtual handbook as

OBJECTIVES

The objectives of this course are

a) to enhance your understanding of the basic concepts and classification of modern geodesy;
b) to introduce you to the basic steps for gravity survey and geoid determination;
c) to extend your knowledge base to the areas of major modern geodetic techniques: satellite altimetry, airborne and satellite gravimetry, SLR/VLBI/DORRIS, space-based positioning, navigation and timing (PNT), GGOS; and their applications;
d) to provide with you the practical procedures of GPS heighting;
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 | Minimal
an appreciation of, and a responsiveness to, change | Minimal
a respect for ethical practice and social responsibility | Some
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) Exercises and computing tasks;
3) Regular quizzes, and discussions on the questions from the quizzes;
4) Invited lectures given by professionals from industry/government agencies;
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 spatial information systems.

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:

<table>
<thead>
<tr>
<th>Lectures</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Find out what you must learn</td>
<td></td>
</tr>
<tr>
<td>• See methods that are not in the textbook</td>
<td></td>
</tr>
<tr>
<td>• Follow worked examples</td>
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</tbody>
</table>

Visit Geoscience Australia

• Familiarise key aspects of national geodetic operations
• Ask questions on the invited talks
• Reflect on the evolution of geodesy and applications

Exercises

• Practice solving set problems
• Ask questions

Assessments (Quizzes, 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

EXPECTED LEARNING OUTCOMES

By the end of this session you should be able to

a) Understand the basic concepts and classification of modern geodesy;
b) Explain the basic steps for gravity survey and geoid determination;
c) Describe the principles of major modern geodetic techniques: satellite altimetry, airborne and satellite gravimetry, SLR/VLBI/DORRIS;
d) Apply the practical procedures of GPS heighting;
e) Appreciate the advantages and limitations of the various global/satellite geodetic techniques;
f) Explain the trends in modern geodesy (such as GGOS);

Locate and use web-based resources for selected topics in geodesy

At UNSW, the normal workload expectations of a student are 24-28 hours per semester 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 2.5 hours of self-centred and self-directed study: for example, reading the course related materials provided through the course website and reflect on the conceptual framework discussed in the classes.

### ASSESSMENT

Assessment for the course includes:
- Mini-quizzes during lectures 10%
- Class discussion/participation 10%
- Assignment on GPS heighting 10% (due week 7)
- Essay task 15% (due week 10)
- Exercise submissions 15%
- Final exam 40% (during the formal exam period)

**Mini-Quizzes:**
To reinforce the learning experience, mini-quizzes will be given during the lectures. Some typical questions with short answers will be asked on the material presented in the previous lecturing period.

**Class Discussions/participation:**
Students should regularly attend the lectures and participate actively in class discussions during the lectures. In addition, students are invited to give a presentation to the class during the session and the scheduled class discussions in Week 12. The scheduled class discussions aim to (a) extend the scope of the contents provided in the lectures; (b) advance your ability for independent learning and critical analysis; (c) provide an opportunity for developing your presentation skills.

At least 80% attendance at the scheduled classes is necessary to achieve a satisfactory learning outcome from this course. Both attendance and class discussion are assessed.

**The Essay Task, Exercises and GPS heighting assignments** will be documented separately and distributed to you during the lectures/Exercise sessions. The Essay and exercise submissions will be evaluated in terms of: a) Presentation; b) Clarity; c) In-depth discussions on relevant issues.

**Final Exam** will be in ‘closed book’ format, but the ‘complicated’ formulae to be used in the exam will be provided in the examination paper.

Students who perform poorly in the mini-quizzes and exercises 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 visiting Geoscience Australia as well as any other changes will be notified in the classes and at the course website).

<table>
<thead>
<tr>
<th>Week start</th>
<th>Tuesday – Lecture 10:00 – 12:00 CE 6</th>
<th>Tuesday - Exercises 12:00 – 13:00 CE201</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 27/7</td>
<td>Course Outline; Modern geodesy: an overview</td>
<td>Characteristics of surface spherical harmonics in geopotential model</td>
<td></td>
</tr>
<tr>
<td>2 3/8</td>
<td>Fundamentals of physical geodesy</td>
<td>Practicing geoid computations with software packages/</td>
<td></td>
</tr>
<tr>
<td>3 10/8</td>
<td>Geoid Determination</td>
<td></td>
<td></td>
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<tr>
<td>4 17/8</td>
<td>GPS heighting</td>
<td>Error analysis for GPS heighting</td>
<td>Quiz 1</td>
</tr>
<tr>
<td>5 24/8</td>
<td><em>(No class, the time slot will be used for the visit to Geoscience Australia in Canberra)</em></td>
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<td></td>
</tr>
<tr>
<td>6 31/8</td>
<td>Airborne and satellite gravimetry</td>
<td>Review GPS heighting assignment; Web-based resources on geoid determination</td>
<td></td>
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<tr>
<td>7 7/9</td>
<td>Satellite orbit determination</td>
<td>Classifications and applications of GNSS based satellite orbit determination</td>
<td>GPS Heighting Assignment due</td>
</tr>
<tr>
<td>8 14/9</td>
<td>QUIZ 2 SLR/DORIS and VLBI</td>
<td>Web-based resources on VLBI/SLR/DORIS</td>
<td>Quiz 2</td>
</tr>
<tr>
<td>9 21/9</td>
<td>Satellite Altimetry</td>
<td>Environmental Geodesy: Case Studies</td>
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<tr>
<td>Break 28/9</td>
<td>Mid-Session Break</td>
<td>Mid-Session Break</td>
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</tr>
<tr>
<td>11 12/10</td>
<td>Global Geodetic Observing System – GGOS and Applications</td>
<td>Web-based resources on GGOS; Preparation for Class Discussions</td>
<td>Quiz 3</td>
</tr>
<tr>
<td>12 19/10</td>
<td>Class Discussions (presentations)</td>
<td>Class Discussions (presentations)</td>
<td></td>
</tr>
<tr>
<td>13 26/10</td>
<td>Reviewing the GPS heighting results; Revisions</td>
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</tbody>
</table>

*The time slots are used for visit Geoscience Australia on one of the Fridays during the Semester, the date of this visit will be discussed in the class and is to be finalised with the Geoscience Australia. Every student should attend this important activity.
RELEVANT RESOURCES

Lecture Materials

The course materials will be available through “Moodle”: 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


Computational Aids

Computer software relevant to this course and available in the School’s computer lab CE611/CE201, includes: Matlab or MicroSoft Excel, Grav, which will be used for exercises. See more details for the instructions for the individual assignments

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

https://student.unsw.edu.au/dates

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