SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

THE UNIVERSITY OF NEW SOUTH WALES

Session 2 2013

CVEN1300 Engineering Mechanics for Civil Engineers

COURSE DETAILS

Units of Credit	6
Contact hours	5 hours per week
Class	Monday 12.00-14.00 Central Lecture Block 7 Thursday 9.00-10.00 Central Lecture Block 7
Tutorial	Thursday 10.00-12.00
Course Coordinator	**Dr. Wei Gao (STATICS)** Email: w.gao@unsw.edu.au Office: Room 608 Civil and Environmental Engineering Building (H20) Phone: 9385 4123
Lecturer	**Dr. Carolin Birk (DYNAMICS)** Email: c.birk@unsw.edu.au Office: Room 707 Civil and Environmental Engineering Building (H20) Phone: 9385 5026

INFORMATION ABOUT THE COURSE

Course Overview

The aim is to introduce students to the fundamental concepts and principles applied by engineers - whether civil, mechanical, aeronautical, etc. - in the design of structures of all sorts of sizes and purpose. We build upon the mathematics and physics courses, extending Newtonian Mechanics to understand what happens to a body when force(s) is/are applied to it. **Statics** is a branch of mechanics that deals with the study of objects, structures, fluids in equilibrium. **Dynamics** is a branch of mechanics that deals with the study of bodies in motion.

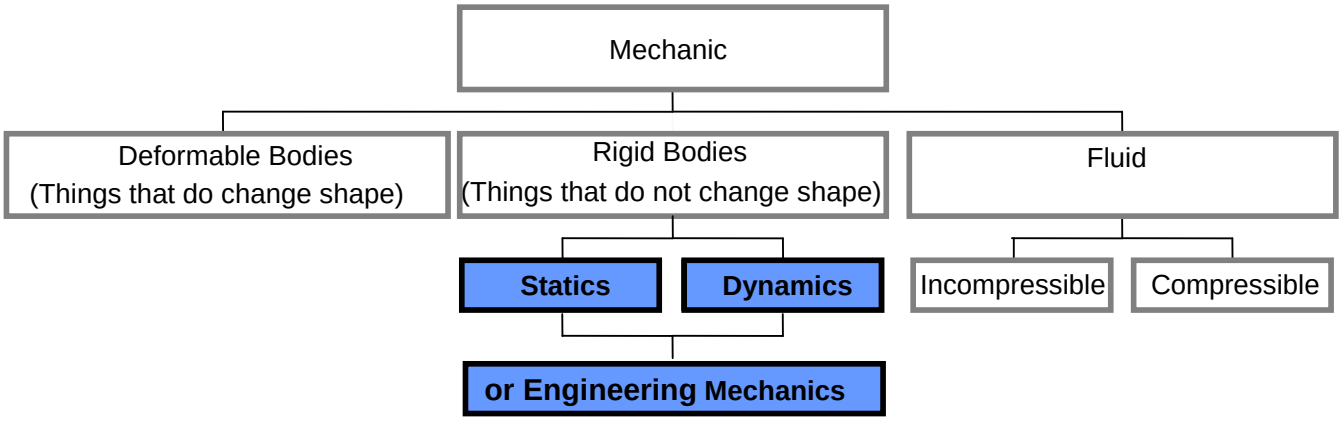
This course will also provide you with opportunities to develop the following **graduate attributes**:

- the capacity for analytical and independent critical thinking;
- skills related to lifelong learning, such as self-reflection (ability to apply theory to practice in familiar and unfamiliar situations); and
- collaborative and teamwork skills.

How does this course relate to other course offerings in the discipline?

This course will continue with and will build on the concepts introduced in Mathematics and Physics. During this course you will be supported in developing the core skills, qualities and understandings needed for more advanced courses in your program, such as Mechanics of Solids, Structural Analysis and Design, Geotechnical Engineering, Civil Engineering Practice and

Special Topics in Concrete, Steel and Composite Structures subjects, and associated with your role as a future Civil/Environmental Engineer.



Handbook description

An introductory subject in engineering mechanics dealing with Statics (the equilibrium of objects, structures and fluids) and Dynamics (the mechanics of bodies in motion). Topics include: (i) **Statics** - 2-D concurrent and non-concurrent force systems; resultant of forces; equilibrium of forces; friction; distributed forces; centre of gravity; centroids; internal actions; analysis of beams (shear force and bending moment diagrams); analysis of frames (determinancy, internal hinges); analysis of trusses (methods of joints and sections); cables; fluid statics including hydrostatic pressure, body forces, buoyancy, stability, and manometry; introduction to three dimensional statics. (ii) **Dynamics** - Laws governing continuity, energy and momentum; dynamics of particles; planar motion of rigid bodies; simple spring mass systems responding to forces of simple form. (iii) The concepts of stress and strain; principal stresses and an introduction to Mohr's circle of stress.

The objectives of the course

The objectives of this course are to:

- to build on your knowledge in Mathematics and Physics to encompass the fundamental concepts of Statics and Dynamics
- introduce you to thinking processes for practical Engineering Problems
- give you opportunities to develop and reflect on graduate attributes such as collaborative skills, communication skills, and lifelong learning skills

TEACHING STRATEGIES

The teaching strategies that will be used include:

- **Lectures** that will provide a broad overview and introduction to statics and dynamics. Lectures will also emphasise the relationship of the content to the engineering practice and will provide an opportunity for reflection on learning.
- **Tutorial** classes will concentrate on strategies for solving practical problems. You will be working in small groups to solve problems.
- **UNSW Moodle** resources such as lecture material, tutorial problems, links to other sites, etc.

SUGGESTED APPROACHES TO LEARNING IN THE COURSE

- Weekly reading and recording of your learning. *Before the lecture, look at the allocated reading for that Week.*
- NOTE: It is your responsibility to come to the class prepared. Lecture material and tutorial exercises will only be understood if you have completed your readings prior to attending the class.
- After the lecture review your lecture notes and textbook. Do set problems. It is most important to do the set problems as you go. Without them you won't know whether your listening and reading have borne fruit. Doing problems is often where it all comes together.
- Prepare for tutorial activities. Remember, YOU CANNOT LET YOUR TEAM DOWN! *Reflect on class problems, tutorial exercises, quizzes and assignments.*

"What I hear, I forget; What I see, I remember; What I do, I UNDERSTAND" - *T. A. Angelo*

- Plan your time to achieve all assessment requirements (see assessment).
- We encourage you to work with your peers whenever possible. A good way to learn the material is in small study groups. Such groups work best if members have attempted the problems individually before meeting as a group. A valued and honest collaboration occurs when, for example, you "get stuck" early on in attacking an exercise and go to your classmate with a relevant question. Your classmate then has the opportunity to learn from your question as well as help you. You then bring something to the collaboration.
- Students who perform poorly in tutorial exercises and quizzes are strongly encouraged to discuss their progress with the lecturers during the semester. Please do not suffer in silence – seek the help at an early stage! We would like you to make most of this learning process and receive a high grade in the course.

Process is as important as product; means as important as ends.

- Regular participation in tutorials is mandatory. Some bonus marks towards the final mark will also be allocated based on your class participation.
- Be guided by course notes and tutors. Ask questions.

ASSESSMENT

Assessment will be based on **one assignment**, **three quizzes, two online tutorials** and **a final exam**. The purpose of **Assignment** and **Quizzes** will provide you with a clear study framework and the opportunity to develop self-learning and problem solving skills. **Final Exam** will take place in the UNSW examination week. **A mark of at least 40% in the final examination is required before the marks for the three quizzes, one hand-in assignment and two online tutorials are included in the final mark.** The formal exam scripts will not be returned.

The Final Mark for this Course will be contributed by:
Statics (65%) + Dynamics (35%) = Total (100%)

The relative value of each of the assessable tasks is as follows:

Quiz 1	**(Statics)**	**10%**
Assignment	**(Statics)**	**10%**
Quiz 2	**(Statics)**	**10%**
Quiz 3	**(Dynamics)**	**10%**
2 Online Tutorials	**(Dynamics)**	**5%**
Final Exam	**(Statics)**	**35%**
Final Exam	**(Dynamics)**	**20%**
Total		**100%**

There are no exemptions from any part of this assessment. If you are repeating the subject you must complete all components this year.

Note: All quizzes and the final exam will be held under closed book conditions. The course coordinator reserves the right to adjust the final scores by scaling if agreed to by the Head of School.

EXPECTED LEARNING OUTCOMES

After completing this course, you will:

- be able to demonstrate an understanding of fundamental concepts of Statics and Dynamics
- become proficient in developing Free Body Diagrams, Equations of Equilibrium and Internal Actions Diagrams
- become proficient in calculation layout and development
- become proficient in using Statics and Dynamic to solve practical problems
- come to see the world through "engineers' eyes"
- be able to interpret and understand the requirements of a engineering problem and identify the potential problems presented by the objectives of the brief
- have the ability to use computers to solve engineering problems
- have the ability to communicate your problem solution in written form
- demonstrate collaborative skills by working with other students in TEAMS

SELF-CENTRED AND SELF-DIRECTED LEARNING (expectations of the students)

Using your time

UNSW expects 25-30 hours of student time per Unit of Credit spread across all the learning opportunities listed above. For CVEN1300 Engineering Mechanics Course this means:

In Class	**5 hours per week**
Self-study	**6-7.5 hours per week**
TOTAL	**12.5 HOURS PER WEEK**

Use this as a guide. You might need more self-study (or possibly less) depending upon your previous studies and aptitudes and the grade you are aiming for.

CONSULTATION

We would like you to learn the material, gain the required skills and make a high grade in this Course. Please do not suffer in silence; questions are welcome in class and during the Consultation times. Ask your class mates, ask your tutor and ask me. Also, your comments/suggestions/criticisms, expressed either to your lecturer or tutors, are most welcome!

COURSE PROGRAMME

Approximate schedule as follows:

Week	Topic	Reading	Assessment
1	Introduction; Vectors; Concurrent and non-concurrent forces.	Chapters 1 & 2	
2	Forces; Moments and Couples; Equilibrium.	Chapters 3 & 4	
3	Types of Supports; Free Body Diagrams.	Chapter 5	
4	Internal Actions; Axial Force Diagram; Shear Force Diagram; Bending Moment Diagram.	Chapter 10	
5	Pin-jointed trusses; Method of Joints; Method of Sections.	Chapter 6	**Quiz 1**
6	Friction; 2D Frames; Structures with Internal Hinges.	Chapter 9	
7	Fluid Statics; Geometric properties of plane figures; Centroid.	Chapters 10 & 7	
8	Second Moment of Area; Parallel Axis Theorem; Stress and Strain; Hooke's Law; Principal stresses and Mohr's circle of Stress.	Chapter 8	**Assignment due**
9	Kinematics of particles; Motion in one dimension; Rectilinear motion.	Chapter 13	**Quiz 2**
11	Curvilinear motion; Kinetics of particles.	Chapter 14	
12	Work and energy.	Chapter 15	**Online Tutorial 1 due**
13	Impulse and momentum.	Chapter 16	**Online Tutorial 2 due** **Quiz 3**

TEXTS AND RECOMMENDED READING

Textbooks:

Bedford and Fowler, "Engineering Mechanics STATICS" + "Study Pack", 5th Edition, Prentice Hall, 2008.

Bedford and Fowler, "Engineering Mechanics DYNAMICS" + "Study Pack", 5th Edition, Prentice Hall, 2008.

Moodle - Lecture Notes, Tutorial Exercises, Quiz Problems and Solutions, Assignments, URLs, Discussions, Email.

COMMON SCHOOL INFORMATION

PLEASE VISIT: http://www.civeng.unsw.edu.au/info-about/our-school/policies-procedures-guidelines/academic-advice

COURSE EVALUATION AND DEVELOPMENT

The School of Civil and Environmental Engineering evaluates each course each time it is run through (i) the UNSW Course and Teaching Evaluation and Improvement (CATEI) process, and (ii) Focus Group Meetings.

As part of the CATEI process, your student assessments on various aspects of the course are graded; the Course Coordinator prepares a summary report for the Head of School. Any problem areas are identified for remedial action, and ideas for making improvements to the course are noted for action the next time that the course is run.

Focus Group Meetings are conducted by the four Year Managers (academic staff) for any students Who wish to attend, in each year of the civil and/or environmental engineering programs. Student comments on each course are collected and disseminated to the Lecturers concerned, noting any points which can help improve the course.

NOTES ON ASSESSMENT

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: http://www.lc.unsw.edu.au/onlib/plag.html