SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

THE UNIVERSITY OF NEW SOUTH WALES

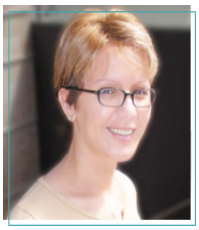
Session 1 2012

CVEN 1300 Engineering Mechanics

COURSE DETAILS

Units of Credit	6			
Contact hours	3 hpw lectures/ 2 hpw tutorial			
Lectures	Tuesday Thursday	13.00-15.00 11.00-12.00	CLB 2 CLB 3	
Tutorials	Friday	12.00-14.00	Start in Week 2	(Venue TBA)

Course Coordinator:



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Other Lecturers:

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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. First eight (8) weeks of this Course will focus on Statics, whilst remaining four (4) weeks of this Course will focus on Dynamics.

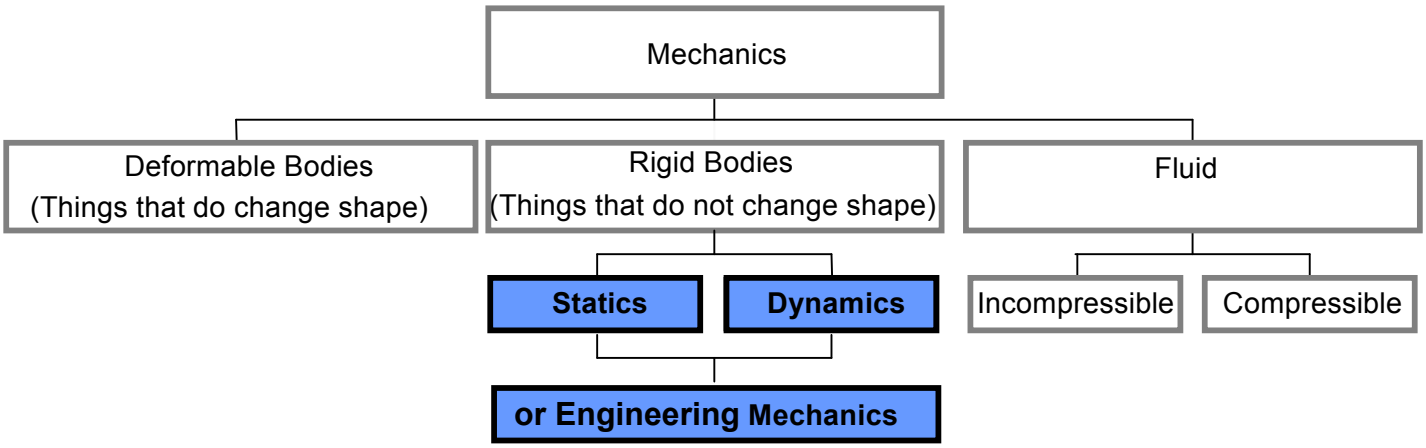
We aim also to engage students in the formulation and resolution of open-ended, design-type exercises, thereby bridging the divide between scientific theory and engineering practice.

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 design of steel members. Lectures will also emphasise the relationship of the content to the engineering practice and will provide an opportunity for reflection on learning.
- Small group **tutorial** classes in Statics component will concentrate on strategies for solving such design-based problems. You will be working in small groups to solve problems and complete a number of assessable tasks. For example, in Statics Component:
    - *Two (2) Tutorial Exercises* will involve four team members and the team members will be selected by your lecturer.

  Team-work is very important! As a Professional at your future workplace, you will never work alone on any project - every Project is a Team effort. It is therefore very important to develop the team-work skills and attitudes.

  What is the difference between groups and teams?

  "TEAMS" are distinct from and more powerful than "GROUPS". When a lecturer initially puts students into a group, the students are a "group," not a "team." As the students begin to trust each other and develop a commitment to the goals and welfare of the group, they *become* a team. When they become a cohesive team, the team can do things that neither a single individual nor a newly-formed group can do. Team-based learning starts with groups and then creates the conditions that enable them to become teams.
- **Blackboard** resources such as lecture material, tutorial problems, discussions, online quizzes, emails, 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).
- Keep up with the notices via Blackboard and UNSW email. It is your responsibility to check your UNSW email regularly. **NOTE:** *Announcements made in emails are equally official as announcements made during lectures.*

- 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

We need to find out how well you have:

- Grasped the fundamentals of engineering statics and dynamics
- Become proficient in developing Free Body Diagrams
- Become proficient in calculation layout and development
- Developed correct, professional technique
- Become proficient in using Statics and Dynamics to solve practical problems
- Come to see the world through "engineering eyes"
- Prepared yourself for your next engineering science courses.

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

The Final Mark for this Course will be contributed by:

Statics	65%
Dynamics	35%
Total	100%

STATICS:

The relative value of each of the assessable tasks for the **Statics Component** is as follows:

Two (2) Tutorial Exercises	**16%**
Quiz 1	**12%**
Quiz 2	**12%**
Final Exam	**25%**
Total	**65%**

Two (2) tutorial exercises will be handed out at the start of the tutorial class in Weeks 2 and 5. You will work on these problems in a team of four (4) students (selected by your lecturer in Week 2) during tutorial classes and also outside the class (time to be arranged by your team members). A single submission will be prepared by your team and handed-in at the start of the tutorial class two weeks after receiving the exercise.
The team designations and compositions will be available on Blackboard before Week 2 tutorial Class. The Tutorial Exercises can be discussed with your tutors.
Tutorial attendance is compulsory. Failure to attend two or more tutorial classes will result in your tutorial exercises marked zero!

Two Quizzes are scheduled for Weeks 5 and 9 and will take place during the **last hour** of the 2-hour tutorial block. The duration of the quizzes is 50min. The quizzes will be held under exam, closed book conditions. 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 class work is included in the final mark.** The formal exam scripts will not be returned.

NOTE: *If you or your team are not satisfied with the marks allocated for any of the assessment components, and you are convinced that you deserve more marks, you will need to complete the Assessment Appeal Form, as explained on pgs. 9 and 10, and submit it to your tutor. It is important that the Form is written in a professional manner, appropriate terminology used and relevant concepts and issues addressed. Complaints/requests/etc. other than the Assessment Appeal Form process will not be considered.*

DYNAMICS

The relative value of each of the assessable tasks for the **Dynamics Component** is as follows:

Quiz 1	**9%**
Quiz 2	**9%**
Final Exam	**17%**
Total	**35%**

Two Quizzes are scheduled for Weeks 11 and 13 during the **last hour** of the 2-hour tutorials. The duration of the quizzes is 50min. The quizzes will be held under exam, closed book conditions.

Final Exam will take place in the UNSW examination week. The formal exam scripts will not be returned.

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 for your 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, ask me, post the questions on Blackboard. Also, your comments/suggestions/criticisms, expressed either to your lecturers or tutor, are most welcome!

TEXTS AND RECOMMENDED READING

Textbooks:

STATICS:

Prescribed:

Bedford and Fowler, "Engineering Mechanics STATICS & study pack", 5 ED SI, Prentice Hall

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

Recommended:

Archer, Gilbert & Hall " Engineering Statics 2ED", UNSW Press.

Bedford, "Engineering Mechanics Statics & Dynamics + Study Guides", 4ED SI, Prentice-Hall.

DYNAMICS:

Recommended:

Bedford, "Engineering Mechanics Dynamics SI + Study Pack, Prentice-Hall, SI edition, 2005.

Bedford, "Engineering Mechanics Statics & Dynamics + Study Guides", 4ED SI, Prentice-Hall.

Meriam, "Engineering Mechanics (Dynamics & Statics) 6ED Value Pack, Halsted (Jac Wiley)

COMMON SCHOOL INFORMATION

PLEASE VISIT: http://www.civeng.unsw.edu.au/currentstudents/

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.

COURSE PROGRAMME* - CVEN1300 Engineering Mechanics

Week	Readings	Lecture	Tutorial	Assessment Tasks
1	B & F~ Chapters 1 & 2	Introduction. Vectors. Concurrent and non-concurrent forces.	Buy the Textbook. ~	
2	B & F Chapters 3 & 4	Forces. Moments and Couples. Equilibrium.	*Tutorial Exercise 1 Handed Out.* Meet your team members. Team-work. Tutorial Problems.	
3	B & F Chapter 5	Types of Supports. Free Body Diagrams (FBD).	Team-work. Tutorial Problems.	
4	B & F Chapter 10	Internal Actions. Axial Force Diagram (AFD). Shear Force Diagram (SFD). Bending Moment Diagram (BMD).	**Tutorial Exercise 1 Due.** Tutorial Problems.	**Tutorial Exercise 1 Due.**
5	B & F Chapter 6	Pin-jointed trusses. Method of Joints. Method of Sections.	**QUIZ 1** *Tutorial Exercise 2 Handed Out.*	**QUIZ 1**
6	B & F Chapter 9	Friction. 2D Frames. Structures with Internal Hinges.	**GOOD FRIDAY**	
7	B & F Chapters 10, 6 & 7	Fluid Statics. Geometric properties of plane figures. Centroid.	Team-work. Tutorial Problems.	
8	B & F Chapter 8	Second Moment of Area. Parallel Axis Theorem. Stress and Strain. Hooke's Law. Principal stresses and Mohr's circle of Stress.	**Tutorial Exercise 2 Due.** Tutorial Problems.	**Tutorial Exercise 2 Due.**
9	B & F Chapters 12 & 13	Introduction to Dynamics. Kinematics of Particles: Straight-Line Motion; Curvilinear Motion	Tutorial Problems. **QUIZ 2** (Statics)	**QUIZ 2**
10	B & F Chapters 13 & 14	Kinematics of particles - Curvilinear Motion (cont'ed), Kinetics of particles	Tutorial Set D1	
11	B & F Chapter 15	Work and Energy	Tutorial Set D2	**Dynamics QUIZ 1**
12	B & F Chapter 16	Impulse and Momentum	Tutorial Set D3	
13			Tutorial Set D4	**Dynamics QUIZ 2**

~ Bedford and Fowler, "Engineering Mechanics STATICS & study pack", 5 ED SI, Prentice Hall.

* The above timetable is indicative only and is subject to slight changes throughout the semester. Every effort will be made by the lecturers to inform students of variations to the above programme.

APPENDIX

Assessment Appeals Instructions

Purposes of the appeals process:

1. Clarify uncertainty about your understanding of the concepts.
2. Give additional recognition and credit when "missing" a question was caused by:
    a. Ambiguity in the reading material
    b. Disagreement between the reading material and our choice of the "correct" answer.
    c. Ambiguity in the wording of the Question

Guidelines for preparing successful appeals:

Appeals are granted when they demonstrate that you understood the concept(s) but missed the question anyway or that your confusion was due to ambiguity in the reading material.

If the appeal is based on **ambiguity in the question**, you should:

1. Identify the source of ambiguity in the question and,
2. Offer an alternative wording that would have helped you to avoid the problem.

If the appeal is based on either **inadequacies in the reading material** or **disagreement with our answer**, you should:

1. State the reason(s) for disagreeing with our answer and,
2. Provide specific references from the reading materials to support your point of view.

Impact of appeals on assessment scores:

When an appeal is accepted on a question that a student/team has missed (no individual appeals will be accepted):

1. It "counts", i.e. the points missed will be added to:
    a. Their group score, or individual student's score in case of quizzes.
    b. Only those groups/students that appeal.
2. Groups/students who had the original correct answer will continue to receive credit on the question.

Team Number:

Student(s) name(s) and ID number(s):

Reason for Appeal:

Please submit this appeal to your tutor who will pass this on to your lecturer.

Appeals will be considered by your lecturer.