SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING

THE UNIVERSITY OF NEW SOUTH WALES

CVEN 1300 Engineering Mechanics for Civil Engineers – Summer 2013

Distance Learning Mode

COURSE DETAILS

Units of Credit	6	
Contact hours	4.5 hpw recorded lectures, 3 hpw recorded tutorials	
Lectures	provided as videos on a weekly basis	weeks 1-8
Tutorials	provided as videos on a weekly basis	weeks 1-8

Course Coordinator:

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Other Lecturer: **Dr Zora Vrcelj (STATICS)**

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 five (5) weeks of this Course will focus on Statics, whilst remaining three (3) weeks of this Course will focus on Dynamics.

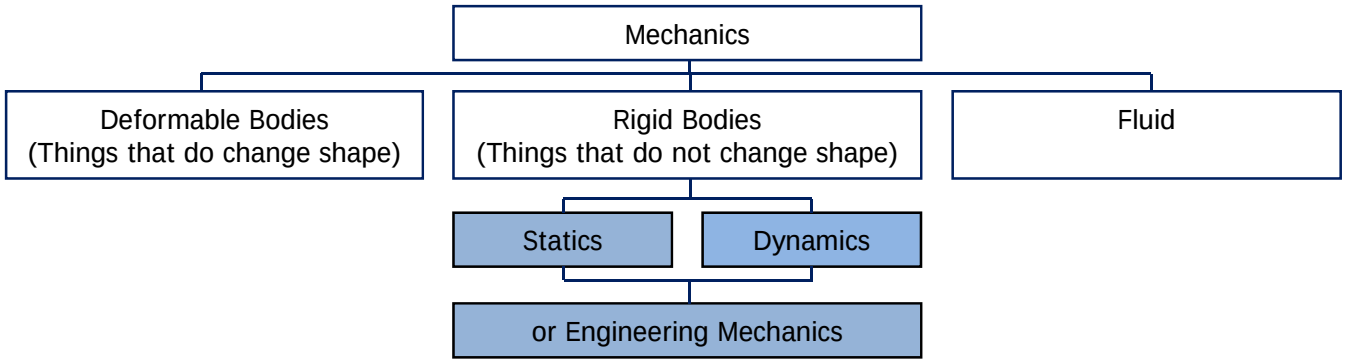
We aim also to engage students in the formulation and resolution of open-ended, design-type exercises, thereby bridging the divide between scientific theory and engineering practice.

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).

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.

Objectives

The objectives of this course are 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 engineering practice and will provide an opportunity for reflection on learning.

  All lectures have been pre-recorded. The lecture recordings will be provided through BLACKBOARD 2 days in advance of the corresponding teaching week. Each

video will be available for two weeks. The restriction of viewing times of individual videos is imposed with the intention of helping students to follow a clear study schedule.

- **Tutorials** will concentrate on strategies for solving practical problems. Some tutorial classes have been recorded and will be made available through BLACKBOARD. These will provide you with a selection of demonstrated worked examples.

  Being taught in distance mode, your initiative is crucial for your success in this course. It is essential that you solve as many example problems as possible by yourself. All students will be allocated a demonstrator whom they can contact during set "virtual tutorial hours". Assistance will be available online using email and/or BLACKBOARD.

- **BLACKBOARD** resources such as recorded lectures and tutorials, tutorial problems, discussions, emails, links to other sites, etc.

SUGGESTED APPROACHES TO LEARNING IN THE COURSE

The lecture content on BLACKBOARD will be organised in weekly folders. For each week, you will find a summary document giving you instructions on which textbook chapters to read, which videos to watch and which tutorial problems to solve. The suggested approach to learning in this course is as follows:

- Weekly reading and recording of your learning. *Study the allocated reading **before** you watch the recorded lecture.*
- Watch the allocated lecture recordings. Note that these are live recordings of real lectures. It is recommended that you print out the corresponding lecture notes and complete them as you watch the video. The recorded lectures contain sequences where the lecturer asks the students to work on a set problem. Use the time to attempt solving the problem yourself and do not fast forward the movie. Note down any aspects you don't understand when first watching the video. Try to clarify these aspects by reading more or by asking for assistance. Then go back to the video and watch critical sections again.
- Do set problems. It is most important to do set problems as you go. Without them you won't know whether your watching and reading have borne fruit. Doing problems is often where it all comes together.
- Plan your time to achieve all assessment requirements (see assessment). **NOTE:** This course covers the content of 12 weeks in only 8 weeks. The amount of study time you are expected to put in each week is therefore higher than average. A good time management is crucial for not falling behind.
- Keep up with notices via BLACKBOARD and UNSW email. It is your responsibility to check your UNSW email regularly. **NOTE:** *Announcements made in emails are official.*
- Students who perform poorly in the tutorials/quizzes are strongly encouraged to discuss their progress with the lecturer. 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.
- Ask questions!

EXPECTED LEARNING OUTCOMES

At the conclusion of this course, you should:

1. be able to demonstrate an understanding of fundamental concepts of Statics and Dynamics

2. become proficient in developing Free Body Diagrams, Equations of Equilibrium and Internal Actions Diagrams
3. become proficient in calculation layout and development
4. become proficient in using Statics and Dynamics to solve practical problems
5. come to see the world through "engineers' eyes"
6. be able to interpret and understand the requirements of an engineering problem and identify the potential problems presented by the objectives of the brief
7. have the ability to use computers to solve engineering problems
8. have the ability to communicate your problem solution in written form

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 "engineer's eyes"
- prepared yourself for your next engineering science courses

Assessment in this course is based on **four hand-in tutorials**, **two quizzes**, and **a final exam**.

- The purpose of **hand-in tutorials** will be to provide you with a clear study framework. It will also provide you with the opportunity to develop self-learning and problem solving skills.
- **Two quizzes** are scheduled for Weeks **3** (10-14 December) and **7** (21-25 January) and will take place **on campus**. The room(s) and dates for the quizzes are to be determined and will be announced by email and on BLACKBOARD. The duration of the quizzes is 50min. The quizzes will be held under exam conditions.
- 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.

The final mark for this course will be contributed by

Statics	65%
Dynamics	35%
Total	100%

There are no exemptions from either the Statics or Dynamics component. If you are repeating the subject you must complete both components this year.

STATICS:

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

Three Hand-in Tutorials:	**24%**
Quiz 1	**11%**
Final Exam:	**30%**
Total	**65%**

DYNAMICS:

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

One Hand-in Tutorial:	**8%**
Quiz 2	**11%**
Final Exam:	**16%**
Total	**35%**

Note: The course coordinator reserves the right to adjust the final scores by scaling if agreed to by the Head of School.

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 for Civil Engineers in **distance mode** this means:

Recorded videos / tutorials	**7.5 hours per week**
Self-study	**11.5-15 hours per week**
TOTAL	**20-22.5 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 grade you are aiming for.

TEXTS AND RECOMMENDED READING

Textbooks:

STATICS:

Prescribed:

Bedford and Fowler, "Engineering Mechanics STATICS & study pack", 5 ED SI, Prentice Hall, 2008

Blackboard – Lecture and Tutorial Video Recordings, Lecture Notes, Tutorial Exercises, Quiz Problems and Solutions, 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, 5 ED SI, Prentice-Hall, 2008.

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

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

COURSE PROGRAM

W	Date	Lecture Content	Assessment Tasks
1	26/11	Introduction to Engineering Mechanics, 2D vectors, 3D vectors, Forces / Force Systems, Moments and Couples	
2	03/12	Equivalent force-couple systems, Reduction of distributed loading, Equilibrium, types of support, Free Body Diagrams, Equations of equilibrium in 2D Equations of equilibrium in 3D	**Tutorial Hand-in 1** **Due 07 December 2012, 6pm**
3	10/12	Internal forces, (Axial force diagram, shear force diagram, bending moment diagrams, exercises)	**QUIZ 1 (STATICS)**
4	17/12 + 02/01	Trusses and rigid frames, Trusses Method of Sections – exercises, Beams with internal hinges, Frames with internal hinges,	**Tutorial Hand-in 2** **Due 04 January 2013, 6pm**
5	07/01	Friction, Hydrostatic forces, Cross-sectional properties (centroids) Moment of Inertia, Parallel axes theorem, Principal axes / Mohr's circle	
6	14/01	Introduction to Dynamics + Revision, Kinematics of a particle / Rectilinear Kinematics, Curvilinear motion / projectile motion, Curvilinear motion / cylindrical coordinates	**Tutorial Hand-in 3** **Due 18 January 2013, 6pm**
7	21/01	Kinetics / Force, mass and accelerations, Equations of motion in polar coordinates, Energy methods, Principle of work and energy	**QUIZ 2 (DYNAMICS)**
8	28/01	Conservation of energy, Impulse and momentum, Conservation of linear momentum, Revision / additional examples on Dynamics	**Tutorial Hand-in 4** **Due 01 February 2013, 6pm**

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

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 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

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.