

Course Profile

School of Civil and Environmental Engineering

THE UNIVERSITY OF
NEW SOUTH WALES



CVEN2301 Mechanics of Solids – Session 1, 2013

COURSE DETAILS

Units of Credit	6	
Contact hours	5 hours per week	
Class	Wednesday, 12:00pm - 2.00pm	CLB7
	Friday, 2.00pm - 3:00pm	CLB7
Tutorial	<i>Friday, 3:00pm - 5.00pm</i>	

Room	Demonstrators
<i>Quad G053</i>	Simon Elder
<i>Law 203</i>	Edwin Kan Shenggang Wang
<i>Mat 232</i>	Kosmas Kokkinos
<i>OMB 144</i>	Danny Abdalla
<i>RedC M010</i>	Xian Hui Tan Ahsan Parvez
<i>Gold G04</i>	Kelvin Nguyen Chen Wang
<i>Gold G06</i>	Rodney Chan Fairul Zahri Mohamad Abas
<i>Mat 102</i>	Binhua WU Irene Chiong
<i>Mat 231</i>	Richard Cornwell Maryam Ghodrat
<i>TETB2 G16</i>	Fan Yang Luo Kai
<i>TETB2 G17</i>	Junchao Wang Xiaojun Chen
<i>MechEng 301</i>	Anna Nguyen Yun Bai
<i>CivEng G8</i>	Lennox To Aidin Amiri

Lecturers	Associate Professor Mario M. Attard		
	Email: m.attard@unsw.edu.au	CE 514	Phone: +61 2 9385 5075
	Dr. Hamid Vali Pour Gaudarzi		
	Email: h.valipour@unsw.edu.au	CE 710	Phone: +61 2 9385 6191

Post-Doctoral Teaching Assistant	Dr. David Kellermann		
	Email: d.kellermann@unsw.edu.au	CE 508	Phone: +61 2 9385 5037

INFORMATION ABOUT THE COURSE

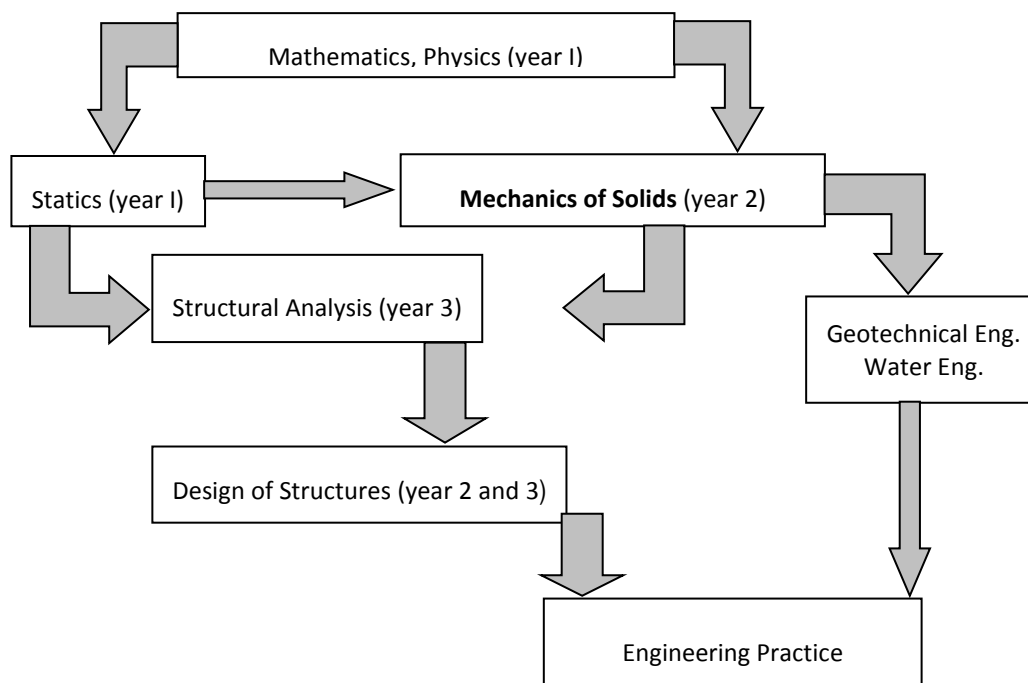
The aim of this course is to introduce you to the fundamental concepts and principles applied by engineers - whether Civil, Environmental, Mechanical, Aeronautical - in the design of structures of all sorts of sizes and purpose. We will build upon the mathematics, physics and statics courses of the first year, extending Newtonian Mechanics to address and understand the elastic and to certain extent inelastic behaviour of trusses, beams and frames. Also, we will aim to engage you in the formulation and resolution of open-ended, design-type exercises, thereby bridging the divide between scientific theories and engineering practice.

During this competency-based course you will be supported in developing the core skills, qualities and understandings needed for more advanced courses in your program and associated with your role as a future Civil/Environmental Engineer.

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?



HANDBOOK DESCRIPTION

An introduction to the strength of materials: revision of statics and properties of sections; 3 dimensional statics; concepts of stress and strain; stress-strain relationships; bars under axial force, bending moment, shear force, torsion; deflections due to bending and shear; combined stresses; stresses and strains at a point; principal stresses and strains; failure criterion; slender column buckling.

Refer to Online Handbook available at:

<http://www.handbook.unsw.edu.au/undergraduate/courses/2012/CVEN2301.html>

OBJECTIVES

The objectives of this course are to:

- reinforce your knowledge of statics and to expand this knowledge in the areas of linear strain and stress analysis, thus enabling you to deal with more complex and integrated engineering problems involving Mechanics of Solids;
- to introduce you to the basic principles and laws underlying Mechanics of Solids;
- to familiarise you with the modelling and analysing techniques when formulating and solving problems for predicting the states of stress and strain for bodies in static equilibrium;
- to give you an opportunity to develop and reflect on graduate attributes such as critical thinking and problem solving, lifelong learning skills and collaborative skills.

TEACHING STRATEGIES

The teaching strategies that will be used include:

- **Lectures** that will focus on the development and application of generalised problem-solving processes for the stress, strain and deformation analysis of structures. 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 such problems. You will be encouraged, from time to time, to work in small groups to solve problems.

Suggested approaches to learning in this course include:

- Regular participation in lectures and tutorials. *Review lecture and tutorial material. Follow worked examples. Reflect on class problems and quizzes.*
- Weekly reading and recording of your learning.
- Appropriate preparation for tutorial activities.
- Planning your time to achieve all assessment requirements (see assessment).
- We encourage you to work with your peers. 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. You can learn too from last years problem sets and quizzes if used as a check or corrective when you seem to have hit a dead end.
- Students who perform poorly in the 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.

EXPECTED LEARNING OUTCOMES

After completing this course, you will:

- be able to demonstrate an understanding of basic concepts and the role of Mechanics of Solids in the analysis and design of structures;
- gain knowledge about the theoretical background that has led to the concept of stresses and strains;
- be able to understand and apply the concepts of stresses and strains to formulate and evaluate determinate and indeterminate axial force and bending moment problems; be able to evaluate stresses due to axial force, bending moment, shear and torsion in symmetrical and unsymmetrical cross-sections; be able to calculate and evaluate beam deflections for statically determinate and indeterminate beams by using integration methods and step functions; be able to calculate shear and torsion stresses due to shear and torsion forces respectively;
- be able to calculate principal stresses, strains and combined stresses and draw Mohr’s circle;
- develop collaborative skills by working with other students in groups.

Self-centred and self-directed learning (expectations of the students):

In addition to the tutorials, you are expected to commit **6 - 8 hours per week** (1.5 hours for each hour of contact) to independent learning and general problem solving.

ASSESSMENT

Assessment will be based on **hand-in tutorials, one major quiz and a final exam**. These components will address problems consistent with those you are likely to face as professional Civil/Environmental Engineer.

- The purpose of **Hand-in tutorials** and **Quiz** 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. Hand-in tutorials and Quizzes will serve as a basis for discussion with your tutor and lecturer.
- 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 relative value of each of the assessable tasks is as follows:

Hand-in tutorials:	20%
Mid-semester quiz:	20%
Final Exam:	<u>60%</u>
	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: The course coordinator reserves the right to adjust the final scores by scaling if agreed to by the Head of School.

RESOURCES

Reference

Hibbeler, R.C., Mechanics of Materials, SI Version 8th Edition. Pearson Education.

Additional Readings

Riley, W., Sturges L. and Morris D. (2007), Mechanics of Materials, 6th Edition, John Wiley & Sons.

Websites

www.mdsolids.com

Technology Enabled Learning and Teaching Web Site and login to Blackboard

<http://telt.unsw.edu.au/>

UNSW Library Database

Access Engineering – platform of e-books, videos and interactive tables and graphs.

Look at the Curriculum Map and select “Strength of Materials”

TUTORIALS

The tutorials begin in the 2nd week of semester. Each class will have a one or two tutors and we encourage you to develop a close working relationship with your tutors and the rest of your tutorial group.

COURSE PROGRAM

Week	Topic	Assessment
1	Introduction. Revision of Statics. Geometric Properties of sections. (Equilibrium, FBD, BMD, SFD, AFD)	
2	Principal section properties. Concept of Stresses.	Tutorials Start
3	Stress block. Concept of Strain.	
4	Mechanical properties of materials. Indeterminate axial force problems.	Tutorial Hand In 1
	Easter Semester Break (1st April to 5th April)	
5	Bending stresses.	
6	Composite sections. Inelastic bending stresses.	Tutorial Hand In 2
7	Beam deflections. Indeterminate beams.	Mid-Semester QUIZ
8	Shear stress in beams. Shear flow.	
9	Shear stress in thin-walled beams. Torsion.	Tutorial Hand In 3
10	Torsion.	
11	Stress transformation, Principal stresses. Principal strains. Mohr's circle. 3-D Hook's law, Plane stress & Plane strain.	Tutorial Hand In 4
12	Failure criteria. Revision	
13		Tutorials Finish

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>

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 evaluations 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.

COMMON SCHOOL INFORMATION

Common School information may be found at:

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

The **Common School Information** site has information on the following:

1. **Dates to Note** - important dates relating to enrolling and disenrolling, and a University website (via MyUNSW) with a calendar of other important UNSW dates (semester dates, recess weeks, stuvac dates and exam periods).

Refer to MyUNSW for Important Dates available at:

<https://my.unsw.edu.au/student/resources/KeyDates.html>

2. **School Contacts**

- i. for enrolment or timetable difficulties,
- ii. referral chain of contacts for course difficulties:
Course Coordinator/Lecturer → Year Coordinators → Grievance Officer
- iii. Advanced Standing, and
- iv. Mentoring.

3. **Course Requirements**

- i. attendance at lectures, tutorials and laboratory classes,
- ii. participation in tutorials, and
- iii. completion of assessment work.

4. **Notes on Assessment**

- i. plagiarism (with link to UNSW Learning Centre web site on plagiarism),
- ii. keep a copy of written submissions,
- iii. submitting assignments, and
- iv. late submissions (obtaining extensions and special consideration)

5. **Supplementary Exams** – includes link to School website with School policy on supplementary exams.

- i. Special Consideration – includes link to UNSW website (New South Q) for downloading forms, requirements for lodging special consideration forms.

6. **Solutions to Problems – Troubleshooters**

- i. Learning Centre,
- ii. student counsellors, and
- iii. student support services.

7. **CEVSOC** – is the Civil and Environmental Engineering Student Social Committee. For further details contact CEVSOC at cevsoc@gmail.com

<http://www.civeng.unsw.edu.au/information-for/current-students/current-undergraduates/help-support/student-societies-clubs>

<http://www.unswengsoc.com/societies/cevsoc/>