CVEN2303

Structural Analysis and Modelling

Term 2, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Ehab Hamed	e.hamed@unsw.edu.au			

Lecturers

Name	Email	Availability	Location	Phone
Ehab Hamed	e.hamed@unsw.edu.au			

School Contact Information

Engineering Student Support Services – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

Engineering Industrial Training – Industrial training questions

UNSW Study Abroad – study abroad student enquiries (for inbound students)

UNSW Exchange – student exchange enquiries (for inbound students)

UNSW Future Students – potential student enquiries e.g. admissions, fees, programs, credit transfer

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

Course Details

Units of Credit 6

Summary of the Course

This course introduces students to structural analysis and computer modelling of structures. It explains the theory and physics behind existing computer software that are used for the analysis of complicated structures. It also provides students with a better understanding of the structural behaviour of beams, frames and trusses under different loading conditions. The tools and knowledge gained in this course are inevitable for the design of structures. The topics that are covered in this course include revision of statics with emphasise on drawing internal forces diagrams; conjugate beam method, energy of structures, principles of virtual work; the force (flexibility) method; stiffness method; and moment distribution method applied to continuous beams.

Course Aims

The aim of this course is to introduce students to the fundamental concepts and principles applied by engineers in the analysis of structures. We will build upon the mathematics, physics, statics and mechanics of solids courses to address and understand the behaviour of trusses, beams and frames.

Course Learning Outcomes

1. Understand structural behaviour and structural inderterminacy
2. Apply principles of work and energy in structural analysis to estimate deformations of structures.
3. Analyse statically indeterminate structures such as continuous beams, trusses, and frames using force and displacement methods and moment distribution method.
4. Draw internal forces and moments diagrams in statically indeterminate structures.
5. Solve large degree of freedom systems using stiffness method implemented in computer codes.

Teaching Strategies

Following are our suggested approaches to learning in the course.

Private Study

- Review lecture material and textbook
- Do set problems on Moodle
- Reflect on class problems and practicing problems
- Download materials from Moodle
- Keep up with notices and find out marks via Moodle

Lectures

- Find out what you must learn
- See methods that are not in the textbook
- Follow worked examples
- Hear announcements on course changes

Workshops

- Be guided by Demonstrators
- Practice solving set problems
- Ask questions
- Teamwork

Assessments (quizzes, examination)

- Demonstrate your knowledge and skills
- Demonstrate higher understanding and problem solving

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Lab assignment	8%	Week 10	1, 3, 5
2. Weekly Assignments	27%	Not Applicable	1, 2, 3, 4, 5
3. Mid-term exam	15%	Not Applicable	1, 2, 3, 4
4. Final Exam	50%	Not Applicable	1, 2, 3, 4

Assessment 1: Lab assignment

Due date: Week 10

Only a lab simulation will be conducted followed by a video that describes the test. You will not do the test yourself but would need to submit an assignment related to the lab simulation.

This assignment would give you the chance to see actual testing of a truss, and to compare theoretical calculations with experimental measurements taken in the laboratory.

A video of the test will be available to view at your convenience. The assignment will be assessed on the basis of technical accuracy of calculations and evidence of good engineering judgment with assumptions and problem simplification.

Assessment 2: Weekly Assignments

9 Assignments will be available online on moodle. They need to be submitted online by the due date shown on moodle.

These assignments will keep you up-to-date with the course material, and will encourage you to practice some problems on a weekly basis. Each assignment includes a number of questions. Only final answer is needed and it is checked online. You have the chance to attempt the solution as much as you want to get a full mark of each assignment.

Assessment 3: Mid-term exam

The mid-term exam will be assessed on the basis of technical accuracy of calculations and evidence of good engineering judgment. The mid-term exam will be held under open book conditions.

Assessment 4: Final Exam

The final exam will be held under open book conditions. You need to score at least 40% in the final exam to be able to pass the course.

Hurdle requirement

A mark of at least 40% in the final examination is required before the class work is included in the final mark.

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Course Schedule

View class timetable

Timetable

Date	Type	Content
O-Week: 23 May - 27 May		
Week 1: 30 May - 3 June	Topic	Introduction. Structural analysis and design. Revision of internal forces diagrams. Statically determinate structures. Statically indeterminate structures.
Week 2: 6 June - 10 June	Topic	Conjugate beam method.
Week 3: 13 June - 17 June	Topic	The principle of work – Deformations in statically determinate structures.
Week 4: 20 June - 24 June	Lecture	Force/Flexibility method for statically indeterminate trusses.
Week 5: 27 June - 1 July	Topic	Force/Flexibility method for statically indeterminate frames.
Week 6: 4 July - 8 July	Topic	**Mid-Term break**
Week 7: 11 July - 15 July	Topic	Principles of stiffness analysis in trusses.
Week 8: 18 July - 22 July	Topic	Temperature, and Fit loads in stiffness analysis of trusses.
Week 9: 25 July - 29 July	Topic	Stiffness analysis in Frames.
Week 10: 1 August - 5 August	Topic	Moment Distribution Method.
	Assessment	Lab assignment

Resources

Recommended Resources

- **Textbooks:** Any “Structural Analysis” textbook**;** Online resources
- **Reference textbook :** Structural Analysis: Principles, Methods and Modelling, CRC Press, Gianluca Ranzi, Raymond Ian Gilbert

Submission of Assessment Tasks

Please refer to the Moodle page of the course for further guidance on assessment submission.

UNSW has a standard late submission penalty of:

- 5% per day, for all assessments where a penalty applies, capped at five days (120 hours), after which a student cannot submit an assessment, and no permitted variation.

Academic Honesty and 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

Academic Information

Final Examinations:

Final exams in T2 2022 will be held online between 12th - 25th August 2022 inclusive, and supplementary exams between 5th - 9th September 2022 inclusive. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

ACADEMIC ADVICE

- Key Staff to Contact for Academic Advice (log in with your zID and password): https://intranet.civeng.unsw.edu.au/key-staff-to-contact-during-your-studies-at-unsw
- Key UNSW Dates - eg. Census Date, exam dates, last day to drop a course without academic/financial liability etc.
- CVEN Student Intranet (log in with your zID and password): https://intranet.civeng.unsw.edu.au/student-intranet
- Student Life at CVEN, including Student Societies: https://www.unsw.edu.au/engineering/civil-and-environmental-engineering/student-life
- Special Consideration: https://student.unsw.edu.au/special-consideration
- General and Program-Specific Questions: The Nucleus: Student Hub
- Book an Academic Advising session: https://app.acuityscheduling.com/schedule.php?owner=19024765

Disclaimer

This course outline sets out description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle should be consulted for the up to date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

Mike Gal.

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Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.