UNSW Course Outline

CVEN2303 Structural Analysis and Modelling - 2024

Published on the 23 May 2024

General Course Information

Course Code : CVEN2303
Year : 2024
Term : Term 2
Teaching Period : T2
Is a multi-term course? : No
Faculty : Faculty of Engineering
Academic Unit : School of Civil and Environmental Engineering
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links
Handbook Class Timetable

Course Details & Outcomes

Course Description

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 essential for the design of structures. The topics that are covered in this course include revision of statics with emphasis on drawing internal forces diagrams; conjugate beam method, energy of structures, principles of virtual work; 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 and design 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. Also, the course aims to engage students in the formulation and resolution of open-ended, design-type exercises, thereby bridging the divide between scientific theories and engineering practice.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Describe structural behaviour and structural indeterminacy.
CLO2 : Apply principles of work and energy in structural analysis to estimate deformations of structures.
CLO3 : Analyse statically indeterminate structures such as continuous beams, trusses, and frames using the force and displacement methods and the moment distribution method.
CLO4 : Draw internal force and moment diagrams in statically indeterminate structures.
CLO5 : Solve large degree of freedom systems using the stiffness method.

Course Learning Outcomes	Assessment Item
CLO1 : Describe structural behaviour and structural indeterminacy.	• Lab assignment • Weekly Assignments • Quiz • Final Exam
CLO2 : Apply principles of work and energy in structural analysis to estimate deformations of structures.	• Lab assignment • Weekly Assignments • Quiz • Final Exam
CLO3 : Analyse statically indeterminate structures such as continuous beams, trusses, and frames using the force and displacement methods and the moment distribution method.	• Lab assignment • Weekly Assignments • Final Exam
CLO4 : Draw internal force and moment diagrams in statically indeterminate structures.	• Lab assignment • Weekly Assignments • Final Exam
CLO5 : Solve large degree of freedom systems using the stiffness method.	• Weekly Assignments • Final Exam

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Lab assignment Assessment Format: Individual	8%	Start Date: 27/05/2024 12:00 AM Due Date: Week 10: 29 July - 04 August
Weekly Assignments Assessment Format: Individual	27%	Start Date: Not Applicable Due Date: Not Applicable
Quiz Assessment Format: Individual	15%	Due Date: Week 5, Thursday, lecture time
Final Exam Assessment Format: Individual	50%	Due Date: TBA

Assessment Details

Lab assignment

<u>Assessment Overview</u>

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 will 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.

<u>Course Learning Outcomes</u>

- CLO1 : Describe structural behaviour and structural indeterminacy.
- CLO2 : Apply principles of work and energy in structural analysis to estimate deformations of structures.
- CLO3 : Analyse statically indeterminate structures such as continuous beams, trusses, and frames using the force and displacement methods and the moment distribution method.
- CLO4 : Draw internal force and moment diagrams in statically indeterminate structures.

<u>Detailed Assessment Description</u>

In this assignment, you are expected to calculate axial forces of a Warren truss and a basic Roof truss using the stiffness method, and then to compare with experimental results. The test videos can be watched on moodle. A guide for using Matlab (optional) is also available on moodle.

Assignment submission Turnitin type

This assignment is submitted through Turnitin and students can see Turnitin similarity reports.

Weekly Assignments

Assessment Overview

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

Course Learning Outcomes

- CLO1 : Describe structural behaviour and structural indeterminacy.
- CLO2 : Apply principles of work and energy in structural analysis to estimate deformations of structures.
- CLO3 : Analyse statically indeterminate structures such as continuous beams, trusses, and frames using the force and displacement methods and the moment distribution method.
- CLO4 : Draw internal force and moment diagrams in statically indeterminate structures.
- CLO5 : Solve large degree of freedom systems using the stiffness method.

Detailed Assessment Description

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 the final answer is needed and it is checked online. You have the chance to attempt the solution as many times as you want to get a full mark of each assignment.
You do not need to submit these assignments weekly. The first three weeks' assignments are due on Friday 6 pm, 28 June, Week 5, while all the other assignments are due on Friday 6 pm, 9 August, Week 11.

Assessment information

If you do not submit any of the Weekly Assignments, you will lose the 3 marks allocated to that assignment.

Assignment submission Turnitin type

This is not a Turnitin assignment

Quiz

Assessment Overview

The quiz will be assessed on the basis of technical accuracy of calculations and evidence of good engineering judgment. The entire solution procedure will be marked and not just the final answers.

Course Learning Outcomes

- CLO1 : Describe structural behaviour and structural indeterminacy.
- CLO2 : Apply principles of work and energy in structural analysis to estimate deformations of structures.

Detailed Assessment Description

The mid-term exam will be held under open book conditions. No electronic devices will be allowed during the exam, except for the UNSW approved calculators. Please print out the digital notes if any.

Assessment information

The mid-term exam will be on Week 5 during the Thursday lecture.

Final Exam

Assessment Overview

The final exam will be 2 hours in length and content from all weeks may be examined.

Course Learning Outcomes

- CLO1 : Describe structural behaviour and structural indeterminacy.
- CLO2 : Apply principles of work and energy in structural analysis to estimate deformations of structures.
- CLO3 : Analyse statically indeterminate structures such as continuous beams, trusses, and frames using the force and displacement methods and the moment distribution method.
- CLO4 : Draw internal force and moment diagrams in statically indeterminate structures.
- CLO5 : Solve large degree of freedom systems using the stiffness method.

Detailed Assessment Description

The final exam will be held under open book conditions. No electronic devices will be allowed during the exam, except for the UNSW approved calculators. Please print out the digital notes if any.

Assignment submission Turnitin type

This is not a Turnitin assignment

Hurdle rules

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

General Assessment Information

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Topic	Introduction. Structural analysis and design. Revision of internal forces diagrams. Statically determinate structures. Statically indeterminate structures.
Week 2 : 3 June - 9 June	Topic	Conjugate beam method.
Week 3 : 10 June - 16 June	Topic	The principle of work – Deformations in statically determinate structures.
Week 4 : 17 June - 23 June	Topic	Force/Flexibility method for statically indeterminate trusses.
Week 5 : 24 June - 30 June	Topic	Force/Flexibility method for statically indeterminate frames.
Week 6 : 1 July - 7 July	Other	Mid-Term break
Week 7 : 8 July - 14 July	Topic	Principles of stiffness analysis in trusses.
Week 8 : 15 July - 21 July	Topic	Thermal changes and fabrication errors in trusses.
Week 9 : 22 July - 28 July	Topic	Stiffness analysis in Frames.
Week 10 : 29 July - 4 August	Topic	Moment Distribution Method.
	Assessment	Lab assignment.

Attendance Requirements

For courses with Workshops and/or Labs, attendance for those classes is a necessary part of the course. You must attend at least 80% of the workshop/lab in which you are enrolled for the duration of the session.

General Schedule Information

View class timetable

Course Resources

Recommended Resources

Print:

https://www.bookshop.unsw.edu.au/details.cgi?ITEMNO=9781292247137

Digital:

https://unswbookshop.vitalsource.com/products/structural-analysis-in-si-units-russell-c-hibbeler-v9781292247236

- Textbooks: Any Structural Analysis textbook; Online resources
- Reference textbook: Structural Analysis in SI Units, 10th edition, Russell C. Hibbeler

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Daniel Chen		Room 614, Level 6, Civil Engineering Building (H20)	+61-2-9065 -2417		No	Yes
	Ulrike Dac kermann		Civil Engineering Building (H20), Level 6, Room CE610	+61 2 9385 5146		No	No

Other Useful Information

Academic Information

I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's Special Consideration page.

II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Equitable Learning Services

III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

IV. Professional Outcomes and Program Design

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: https://www.unsw.edu.au/engineering/student-life/student-resources/program-design.

Note: This course outline sets out the 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 or your primary learning management system (LMS) 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/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.

Academic Honesty and Plagarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

Faculty-specific 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)

School-specific Information

Final Examinations

Final Exams in T2 2024 will be held on campus between the 9th - 22nd August, and Supplementary Exams between the 2nd - 6th September 2024. You are required to be available on these dates. Please do not to make any personal or travel arrangements during this period.

School Contact Information

For assistance with enrolment, class registration, progression checks and other administrative matters, please see the Nucleus: Student Hub. They are located inside the Library – first right as you enter the main library entrance. You can also contact them via http://unsw.to/webforms or reserve a place in the face-to-face queue using the UniVerse app.

For course administration matters, please contact the Course Coordinator.

Questions about the this course should normally be asked during the scheduled class so that everyone can benefit from the answer and discussion.