UNSW Course Outline

CVEN3303 Steel Structures - 2024

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General Course Information

Course Code : CVEN3303
Year : 2024
Term : Term 1
Teaching Period : T1
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 : Postgraduate, Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

Steel structures form the critical building blocks of our nation's infrastructure. Structural steel elements form the backbone of building structures, bridges and major infrastructure. Structural steel is one of the most sustainable building materials available as it is 100% recyclable and is being increasingly reused. It is therefore increasingly becoming one of the most important

materials to assist in the reduction of embodied carbon in the built environment. Civil/structural engineers play a key role in being able to conceive, design and construct these structures in an efficient and safe manner. This course will introduce these design concepts and will focus on the design of structural elements subject to bending, shear and combined bending and axial compression. Topics include: introduction to limit states design and codes of practice (design objectives; strength and serviceability limit states); loads and load combinations (permanent/ dead, imposed/live and wind loads); design of structural steel tension members; Euler column buckling; design of stocky and slender compression members; design of laterally supported steel beams, laterally unsupported steel beams (lateral-torsional buckling in bending and shear strength); steel beam-columns (in-plane and out-of-plane failure); steel members subjected to biaxial bending; design of steel frames, steel connections and detailing (force and moment connections).

Course Aims

The aim of this course is to introduce students to the design codes that govern structural design and to extend the understanding of structural behaviour by studying new concepts in the context of design of steel structures.

This course will also provide you with opportunities to develop the following graduate attributes:

- the capacity for analytical and independent critical thinking; and
- skills related to lifelong learning, such as self-reflection (ability to apply theory to practice in familiar and unfamiliar situations)

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Practically employ design concepts of structural steel members such as tension members, compression members, flexural members and beam columns and connections in practice.
CLO2 : Describe steel design principles with respect to advanced theory of stability and solid mechanics.
CLO3 : Interpret the requirements of a design brief and identify the potential design problems presented by the objectives of the brief.
CLO4 : Communicate design in written and graphical form.
CLO5 : Design structural steel members, connections, and braced and unbraced framed systems, under combined actions using AS4100.

Course Learning Outcomes	Assessment Item
CLO1 : Practically employ design concepts of structural steel members such as tension members, compression members, flexural members and beam columns and connections in practice.	• Examination • Assignments
CLO2 : Describe steel design principles with respect to advanced theory of stability and solid mechanics.	• Examination • Assignments
CLO3 : Interpret the requirements of a design brief and identify the potential design problems presented by the objectives of the brief.	• Examination • Assignments
CLO4 : Communicate design in written and graphical form.	• Assignments
CLO5 : Design structural steel members, connections, and braced and unbraced framed systems, under combined actions using AS4100.	• Examination • Assignments

Learning and Teaching Technologies

Moodle - Learning Management System | Blackboard Collaborate | Echo 360

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Examination Assessment Format: Individual	60%	
Assignments Assessment Format: Individual	40%	

Assessment Details

Examination

Assessment Overview

Examination

Course Learning Outcomes

- CLO1 : Practically employ design concepts of structural steel members such as tension members, compression members, flexural members and beam columns and connections in practice.
- CLO2 : Describe steel design principles with respect to advanced theory of stability and solid mechanics.
- CLO3 : Interpret the requirements of a design brief and identify the potential design problems presented by the objectives of the brief.
- CLO5 : Design structural steel members, connections, and braced and unbraced framed systems, under combined actions using AS4100.

Detailed Assessment Description

Assessment length: 2 hours

Students are required to answer two questions (2 hour exam) that involve different aspects of steel structures such as analysis and design of axially loaded members, flexurally loaded beams, beam-columns and connections.

Hurdle rules

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

Assignments

Assessment Overview

Assignment work

Course Learning Outcomes

- CLO1 : Practically employ design concepts of structural steel members such as tension members, compression members, flexural members and beam columns and connections in practice.
- CLO2 : Describe steel design principles with respect to advanced theory of stability and solid mechanics.
- CLO3 : Interpret the requirements of a design brief and identify the potential design problems presented by the objectives of the brief.
- CLO4 : Communicate design in written and graphical form.
- CLO5 : Design structural steel members, connections, and braced and unbraced framed systems, under combined actions using AS4100.

Detailed Assessment Description

Assessment 1: Assignment 1

Start date: 15/02/2024 05:00 PM

Assessment length: 2 weeks

Due date: 01/03/2024 05:00 PM

Deadline for absolute fail: 06/03/2024 5:00 PM

Marks returned: 08/03/2024

Assignment work: Design of steel members subjected to axial loads

Additional details

Note: This target assessment timetable is indicative and subject to change. Every effort will be made to

inform students of variations to the above program.

Assessment 2: Assignment 2
Start date: 28/03/2024 05:00 PM
Assessment length: 2 weeks
Due date: 12/04/2024 05:00 PM
Deadline for absolute fail: 17/04/2024 5:00 PM
Marks returned: 19/04/2024
Assignment work: Design of steel members (beams) subjected to bending and shear
Additional details
Note: This target assessment timetable is indicative and subject to change. Every effort will be made to
inform students of variations to the above program.

Assessment Length

2 weeks

Assessment information

Note: This target assessment timetable is indicative and subject to change. Every effort will be made to inform students of variations to the above program.

General Assessment Information

The final grade for this course will normally be based on the sum of the scores from each of the assignments (class work) and the Final Examination. The Final Examination is worth 60% of the final grade if the class work is included and 100% if class work is not included. The class work is worth 40% of the final grade if included. A mark of at least 40% in the Final Examination is required before the class work is included in the final grade. The formal exam scripts will not be returned. Students who perform poorly in the workshops are recommended to discuss progress with the lecturer during the term.

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.

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

Grading Basis

Standard

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 12 February - 18 February	Lecture	Week 1 - Lecture 1 : Introduction Introduction, general principles, limit state design principles, actions, and action effects. Week 1 - Lecture 2 : Steel tension members Design of steel members under tension, including fracture & yielding
	Screening	Before first lecture, watch Summary Screencast (1) - General Principles available in Lecture Week 1 folder. Before the Demonstration on Week 1 watch screencast Videos 1 to 5 provided in the Additional Materials folder on Moodle
Week 2 : 19 February - 25 February	Lecture	Week 2 - Lectures: Steel compression members Design of steel members subjected to compression & effect of buckling on the capacity of steel sections and members.
	Screening	Before the Demonstration on Week 2 watch screencast Videos 6 & -7 provided in the Additional Materials folder on Moodle.
Week 3 : 26 February - 3 March	Lecture	Week 3 - Lecture: Effective length and 2nd order effects Braced and sway frames, and effective length of columns in frames and trusses.
	Screening	Before the Demonstration on Week 3 watch screencast Videos 8 & 9 provided in the Additional Materials folder on Moodle.
Week 4 : 4 March - 10 March	Lecture	Week 4 - Lecture 1: Steel flexural members: (Part 1) and (Part 2) Elastic and plastic section modulus, lateral-torsional buckling, effective section modulus and effective length of flexural members.
	Screening	Before the Demonstration on Week 4 watch screencast Videos 10 & 11 provided in the Additional Materials folder on Moodle.
Week 5 : 11 March - 17 March	Lecture	Week 5 - Lecture: Steel flexural members: (Part 3) Bending moment distribution and slenderness effects and design of steel beams with and without lateral restraints.
	Screening	Before the Demonstration on Week 5 watch screencast Videos 12 & 13 provided in the Additional Materials folder on Moodle.
Week 6 : 18 March - 24 March	Other	Non teaching week for all courses
Week 7 : 25 March - 31 March	Lecture	Week 7 - Lecture: Shear and compression bearing effect Principles of flexural-shear and compression bearing and design of stiffeners.
	Screening	Before the Demonstration on Week 7 watch screencast Videos 14 & 15 provided in the Additional Materials folder on Moodle.
	Lecture	Week 8 - Lecture 1: Plate Girders General requirements for the design of plate girders. Week 8 - Lecture 2: Connections (Part 1) An introduction to connections and fastener types in steel structures.
Week 8 : 1 April - 7 April	Screening	Before the Demonstration on Week 8 watch screencast Video 16 provided in the Additional Materials folder on Moodle.
Week 9 : 8 April - 14 April	Lecture	Week 9 - Lecture 1: Connections (Part 2) Design of bolted and welded connections subjected to in- and out-of-plane actions. Week 9 - Lecture 2: Beam-columns (Part 1) In-plane versus out-of-plane design of beam-columns: general requirements.
	Screening	Before the Demonstration on Week 9 watch screencast Video 17 provided in the Additional Materials forlder on Moodle.
Week 10 : 15 April - 21 April	Lecture	Week 10 - Lecture 1: Beam-columns (Part 2) Design of beam-column for combination and bending and axial compression. Week 10 - Lecture 2: Serviceability (non-examinable) Deflection control in the design of steel structures.
	Screening	Before the Demonstration on Week 10 watch screencast Video 18 provided in the Additional Materials folder on Moodle.

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.

Course Resources

Prescribed Resources

AS4100-2020 Steel Structures. Standards Australia, Sydney, 2016AS4100 Supp 1-1999 Steel Structures – Commentary. Standards Australia, Sydney, 2020.

AS/NZS 1170.0-2002 Structural Design Actions: Part 0 General Principles. SA Sydney / SNZ Wellington, 2016.AS/NZS 1170.1-2002 Structural Design Actions: Part 1 Permanent, Imposed and Other Actions. SA Sydney / SNZ Wellington, 2016.

Australian Standards may be accessed through the UNSW Library as follows:

Go to the library homepage at www.library.unsw.edu.au Select “Data Bases” Locate “Australian Standards” Click on “Australian Standards (SAI Global) and enter the relevant standard into the search field.
A very useful link is that to the Australian Steel Institute: www.steel.org.au

Recommended Resources

N.S. Trahair and M.A. Bradford. The Behaviour and Design of Steel Structures to AS4100. 3rd Australian Edition, E&FN Spon, London, 2017.

M.A. Bradford, R.Q. Bridge and N.S. Trahair. Worked Examples for Steel Structures. 4th Edition, Australian Steel Institute, Sydney, 2013.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Scientia Professor Brian Uy		No. 712, Level 7, School of Civil & Environmental Engineering	02 9065 2201	By Appointment	No	No
Lecturer	Scientia Professor Brian Uy		No. 712, Level 7, School of Civil & Environmental Engineering	02 9065 2201	By Appointment	No	Yes

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 T1 2024 will be held on campus between the 26th April and 9th May, and Supplementary Exams between the 20th - 24th May 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.