School of Civil and Environmental Engineering

Trimester 1, 2020

CVEN3303 STEEL STRUCTURES

COURSE DETAILS

Units of Credit	**6**		
Contact hours	6 hours per week		
Class	Mon,	16:00 – 18:00	Sir John Clancy Auditorium (K-C24-G17)
	Thurs,	11:00 – 12:00	Mathews Theatre A (K-D23-201)
Workshop	Fri,	13:00 – 15:00	**http://timetable.unsw.edu.au/2020/CVEN3303.html**
Course Coordinator and Lecturer	Scientia Professor Mark A. Bradford email: m.bradford@unsw.edu.au office: Civil Engineering Building (H20) Level 7, Room 702 9385 5014		

INFORMATION ABOUT THE COURSE

Steel Structures (CVEN3303) was introduced in 2016 in the third year, as part of the structural analysis and design component of the structural engineering stream. In this course, loading types, fundamentals of the design of steel tension, compression and flexural members, design of bolted and welded connections will be dealt with.

HANDBOOK DESCRIPTION

https://www.handbook.unsw.edu.au/undergraduate/courses/2019/CVEN3303/?q=cven3303&ct=all

A course on design concepts and specific 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).

OBJECTIVES

The objectives of this course are:

- To become familiar with the different types of structural steel components in the context of the Australian standard for steel structures AS4100.
- To develop an in-depth understanding of the philosophies and principles of structural loading and design.
- To develop the ability to proportion and check the adequacy of steel members subjected to tension, compression, flexure or a combination of flexure and compression.
- To use gained knowledge of solid mechanics to assess the loading capacity of steel members and connections with respect to the material properties of steel and the modes of structural failure.
- To nurture abilities in creative and critical thinking through the opportunity to develop and design new types of structural systems.

TEACHING STRATEGIES

Private Study	• Review lecture material and textbook • Do set problems and assignments • Join Moodle discussions of problems • Reflect on class problems and assignments • 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
Assessments (assignments and final exam)	• Demonstrate your knowledge and skills • Demonstrate higher understanding and problem solving

EXPECTED LEARNING OUTCOMES

For each hour of contact it is expected that you will put in at least 1.5 hours of private study.

This course is designed to address the learning outcomes below and the corresponding **Engineers Australia Stage 1 Competency Standards for Professional Engineers** as shown. The full list of Stage 1 Competency Standards may be found in Appendix A. After successfully completing this course, you should be able to:

Learning Outcome		**EA Stage 1 Competencies**
1.	*Employ structural design concepts to determine the initial size and to check the adequacy of structural steel members such as tension members, compression members, flexural members and beam-columns*	*PE1.1, PE1.5, PE2.1*

	and connections in practice.	
2.	*Demonstrate an understanding of advanced concepts in structural design.*	*PE2.1*
3.	*Interpret and understand the requirements of a design brief and identify the potential design problems presented by the objectives of the brief.*	*PE2.3, PE3.3*
4.	*Use computers to solve engineering problems.*	*PE2.1*
5.	*Communicate their design in written and graphical form.*	*PE2.1, PE3.4*

COURSE PROGRAM

TRIMESTER 1 2020

Date	Topic	Lecture Content	Demonstration Content
17/02/2020 20/02/2020 (Week 1)	Introduction to structural design	Introduction, Limit States Design principles, Actions and effects of actions	Introduction, Limit States Design principles, Actions and effects of actions
24/02/2020 27/02/2020 (Week 2)	Axially loaded members	Steel tension members Steel tension members	Steel tension members
02/03/2020 05/03/2020 (Week 3)	Axially loaded members	Steel compression members Steel compression members	Steel compression members
09/03/2019 12/02/2020 (Week 4)	Axially loaded members, Flexurally loaded members	In-plane effective length and second-order effects In-plane effective length and second-order effects	In-plane effective length and second-order effects
16/03/2020 19/03/2020 (Week 5)	Flexurally loaded members	Steel flexural members Steel flexural members Steel flexural members	Steel flexural members
23/03/2020 (Week 6)		***Non-teaching week for all courses***	
30/03/2020 02/04/2020 (Week 7)	Flexurally loaded members, Connections	Steel flexural members Welded and bolted connections	Steel flexural members
06/04/2020 09/04/2020 (Week 8)	Connections, Combined actions	Welded and bolted connections Welded and bolted connections	Welded and bolted connections
16/04/2020 (Week 9)	Combined actions	Steel beam-columns	Steel beam-columns
20/04/2020 23/04/2020 (Week 10)	Combined actions	Steel beam-columns Steel beam-columns	Steel beam-columns
27/04/2019 (Week 11)	Review of material (TBC)	Review of material (TBC)	Review of material (TBC)

ASSESSMENT

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 semester.

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

Supplementary Examinations for Trimester 1 2020 will be held on Monday 25th – Friday 29th May (inclusive) should you be required to sit one. You are required to be available during these dates. Please do not to make any personal or travel arrangements during this period.

ASSIGNMENTS

Assignment 1: Design/Tension Members	issued on: 21 February	due on: 05 March
Assignment 2: Compression Members	issued on: 13 March	due on: 27 March
Assignment 3: Flexural Members	issued on: 27 March	due on: 09 April
Assignment 4: Beam-Columns/Connections	issued on: 09 April	due on: 24 April

PENALTIES

Late submissions will be penalised at the rate of 20% per day after the due time and date have expired.

ASSESSMENT OVERVIEW

Item	Length	Weighting of Total Classwork (%)	Learning outcomes assessed	Assessment Criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned (indicative)
1. Introduction to design	4 hrs	10	Strength limit state philosophy	Assignment	05 March	12 March	13 March
2. Tension members	3 hrs	10	Design of tension members	Assignment	05 March	12 March	13 March
3. Compression members, second-order effects	7 hrs	20	Design of compression members in frames	Assignment	27 March	03 April	09 April
4. Flexural members	8 hrs	25	Section and bending strength	Assignment	09 April	17 April	23 April
5. Connections	5 hrs	10	Bolted and welded connections	Assignment	24 April	29 April	08 May
6. Beam-columns	8 hrs	25	Combined actions	Assignment	24 April	29 April	08 May

RELEVANT 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.
- S.T. Woolcock, S. Kitipornchai, M.A. Bradford and G.A. Haddad. *Design of Portal Frame Buildings.* 4th Edition, Australian Steel Institute, Sydney, 2011.
- *AS4100-1998 Steel Structures*. Standards Australia, Sydney, 2016
- *AS4100* Supp 1-1999 *Steel Structures – Commentary*. Standards Australia, Sydney, 1999.
- *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.
- A very **useful link** is that to the Australian Steel Institute: **www.steel.org.au**

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

1. Go to the library homepage at **www.library.unsw.edu.au**
2. Select “Data Bases”
3. Locate “Australian Standards”
4. Click on “Australian Standards (SAI Global) and enter the relevant standard into the search field.

DATES TO NOTE

Refer to MyUNSW for Important Dates available at:

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

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 ADVICE

(Formerly known as Common School Information)

For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations: student.unsw.edu.au/special-consideration
- Solutions to Problems,
- Year Managers and Grievance Officer of Teaching and Learning Committee, and
- CEVSOC.

Refer to Academic Advice on the School website available at:

https://www.engineering.unsw.edu.au/civil-engineering/student-resources/policies-procedures-and-forms/academic-advice

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex problem solving
	PE2.2 Fluent application of engineering techniques, tools and resources
	PE2.3 Application of systematic engineering synthesis and design processes
	PE2.4 Application of systematic approaches to the conduct and management of engineering projects
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (professional and lay domains)
	PE3.3 Creative, innovative and pro-active demeanour
	PE3.4 Professional use and management of information
	PE3.5 Orderly management of self, and professional conduct
	PE3.6 Effective team membership and team leadership