



UNSW
SYDNEY

Australia's
Global
University

School of Civil and Environmental Engineering
Term 2, 2020

CVEN9822 Steel and Composite Structures

COURSE DETAILS

| | | |
|----------------------------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Units of Credit | 6 | |
| Contact hours | 4 hours per week | |
| Class | Friday, 11:00 – 14:00 | online |
| Workshop | Friday, 14:00-15:00 | online |
| Course Coordinator and Lecturer | | A/Prof Ehab Hamed email: e.hamed@unsw.edu.au office: Rm 716 Civil and Environmental Engineering Building (H20) phone: 93859765 |

INFORMATION ABOUT THE COURSE

A course on the advanced analysis and design of structural elements for students looking towards a career in Structural Engineering. The aim of this course is to extend the understanding of structural behaviour by studying new concepts in the context of design of steel and composite structures. In particular, the course will build on your knowledge in structural steel design to introduce you to detailed design of bolt and weld connections, design of pin connections, and the design and analysis of composite steel-concrete structures at the serviceability and strength limit states.

COURSE LEARNING OUTCOMES

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 the Appendix.

After successfully completing this course, you should be able to:

| Learning Outcome | EA Stage 1 Competencies |
|-------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| 1. Become proficient in the design and analysis of steel connections | PE1.1, PE1.5, PE2.1, PE2.3 |
| 2. Be able to demonstrate an understanding of the elastic and plastic methods of analysis and design for composite structures | PE1.1, PE1.5, PE2.1, PE2.3 |
| 4. Demonstrate collaborative skills by working with other students in teams | PE3.2, PE3.6 |

HANDBOOK DESCRIPTION

See link to virtual handbook:

<https://www.handbook.unsw.edu.au/undergraduate/courses/2020/CVEN9822/>

TEACHING STRATEGIES

| | |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Private Study | <ul style="list-style-type: none">• Review lecture material and textbook• Do weekly set problems• Reflect on class problems and practicing problems• Download materials from Moodle• Keep up with notices and find out marks via Moodle |
| Lectures | <ul style="list-style-type: none">• Find out what you must learn• See methods that are not in the textbook• Follow worked examples• Hear announcements on course changes |
| Workshops | <ul style="list-style-type: none">• Be guided by Demonstrators• Practice solving set problems• Ask questions• Teamwork |
| Assessments (quizzes, examination) | <ul style="list-style-type: none">• Demonstrate your knowledge and skills• Demonstrate higher understanding and problem solving |

ASSESSMENT

Assessment will be based on weekly assignments, mid-term quiz, and a final exam. The Final Exam will take place in the UNSW examination week. A mark of at least 40% in the final examination is required before the marks for the quiz and assignments are included in the final mark. If you score in the final exam higher than in the quiz, then the quiz will be disregarded and the weight of the final exam becomes 70%.

The relative value of each of the assessable tasks is as follows:

| Item | Marks | Due date | Rational and Assessment criteria | Marks returned |
|----------------------|-------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| 9 Weekly Assignments | 18 | Weekly | <p>9 Homework Assignments will be available on moodle on a weekly basis. You will need to submit these assignments online to the moodle link. The assignment should be hand-written and scanned. A general marking of Satisfactory = 100, Unsatisfactory = 50, Null = 0 will be given for each assignment and these will be posted on moodle on a weekly basis. A zero score will be given if you do not submit the assignment in due date.</p> <p>Each assignment worth two marks of the total mark.</p> <p>These assignments will keep you up-to-date with the course material, and will encourage you to practice some problems on a weekly basis.</p> | Within one week after due date. |
| Quiz | 22 | Week 5 | The quiz will be assessed on the basis of technical accuracy of calculations and evidence of good engineering judgment. The quiz will be held under open book conditions. | Within two weeks from the day of the quiz |

| | | | | |
|------------|-----|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Final Exam | 60 | | The course learning outcomes include a significant level of technical learning, calculations, and engineering understanding of problems. These outcomes can be effectively and ideally assessed in an exam environment that can reflect the students' understanding of concepts, and the students' abilities to make decisions and solve problems within limited time. 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. | |
| | 100 | | Total Mark for the course | |

PENALTIES

If you do not show up on the quiz for any reason, the weight of the quiz will be automatically allocated to the Final Exam. No need to contact the course coordinator in this regard.

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

COURSE PROGRAM

| Week | Date | Topic |
|------|------------|--------------------------------------------------------------------------|
| 1 | 05/06/2020 | Steel connections; Design of bolted steel connections |
| 2 | 12/06/2020 | Design of group of bolts in steel connections; Design of pin connections |
| 3 | 19/06/2020 | Design of welded connections |
| 4 | 26/06/2020 | Introduction to composite structures and elastic analysis |
| 5 | 03/07/2020 | Serviceability of flexural composite structures |
| 6 | 10/07/2020 | Mid-Term break |
| 7 | 17/07/2020 | Rigid plastic analysis of composite beams |
| 8 | 24/07/2020 | Design for strength of composite beams (I) |
| 9 | 31/07/2020 | Design for strength of composite beams (II) |
| 10 | 07/08/2020 | Design of composite columns |

RELEVANT RESOURCES

These books are not compulsory as all material will be covered during the lectures. But they are recommended for further explanations and demonstrations. All students are encouraged (but not compulsory) to have copies of AS4100 and AS2327.

- **Textbooks:**

Trahair, N.S. and Bradford, M.A. "The Behaviour and Design of Steel Structures to AS4100", 3rd Australian edn., E&FN Spon, London, 1998.

Oehlers, D.J. and Bradford, M.A. "Elementary Behaviour of Composite Steel and Concrete Structural Members", Butterworth-Heinemann, Oxford, 1999.

Bradford, M.A., Bridge, R.Q., and Trahair, N.S., "Worked Examples for Steel Structures", 3rd edn, AISC, Sydney, 1997.

- **Standards:**

AS4100. 1998 "Steel Structures". Australian Standards.

AS2327. 2017: "Composite structures - Composite Steel-Concrete Construction in Buildings". Australian Standards.

DATES TO NOTE

Quiz – Week 5 (online, Tuesday 30/06/2020, exact time TBA)

Supplementary Examinations for Term 2 2020 will be held on Monday 7th September – Friday 11th September (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.

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

For information about:

- Notes on assessments and plagiarism,
- School policy on Supplementary exams,
- Special Considerations,
- 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: 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 |