CVEN9806

Prestressed Concrete Design

Term 3, 2022

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Daniel O'Shea	d.oshea@unsw.edu.au	Please email for availability.	Room 108, H20	

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

NOTE: This course is being run over a shortened 5 week period due to the Course Convener being on parental leave in the earlier weeks of Term 3. Thankyou for understanding!

Reference to Weeks in this term refers to those of Term T3B. Week 1 commences on the 17th of October (equivalent to Week 6 in T3)

The topics covered in this course include:

Introduction to Prestressed Concrete:

Methods of Prestressing. Forces Imposed by Prestressing (Straight and Draped Tendon Profiles), Load Balancing, Introductory Examples, Design Requirements: Strength and Serviceability. Material Properties.

Design for Serviceability:

Stress limits. Serviceability criteria. Determination of prestress and eccentricity. Cable profiles. Losses of prestress.

Design for Strength:

Limit State Design. Equivalent Rectangular Stress Block. Ultimate Moment Capacity. Effect of Non-Prestressed Steel. Ductility. Transfer Strength. Design for Shear. Effect of Prestress on Shear. Flexure-Shear and Web-Shear Cracking. Stirrup Design.

Statically Indeterminate Beams:

Introduction to Continuous Prestressed Concrete Beams; Secondary Moments; Method of Equivalent Loads; Load Balancing; Practical Tendon Profiles; Moment Redistribution; Secondary Effects at Ultimate Capacity; Post-Tensioned Slabs

End Block Design:

Bursting and Spalling Forces in Post-Tensioned End-Blocks; Single and Multiple Anchorages; Design and Analysis; Transmission Lengths in Pretensioned Members;

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

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

Course Aims

The aims of this course are to provide graduate with the ability to:

- Establish the philosophies and principles of the structural design of prestressed concrete.
- Present techniques for proportioning and detailing simple structural members in prestressed concrete.
- Develop an insight into the behaviour of prestressed concrete structural members both at service loads and overloads.
- To give you an opportunity to develop and reflect on graduate attributes such as critical thinking and problem solving, lifelong learning skills and collaborative skills.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Be familiar with the types of prestressed concrete members, their fabrication, design and use.	PE1.1
2. Be familiar with the Australian Standard for Prestressed Concrete Design AS3600-2018.	PE1.1, PE1.2
3. Proportion the dimensions of simple structural prestressed concrete members such as simply supported beams, continuous beams, one-way slabs	PE1.1, PE1.2, PE2.1
4. Proportion reinforcement for flexural and shear strength.	PE1.1, PE1.2, PE2.1

Teaching Strategies

NOTE: This course is being run over a shortened 5 week period due to the Course Convener being on parental leave in the earlier weeks of Term 3. Thankyou for understanding!

This course will be available hybrid, weekly seminars delivered face-to-face though with hybrid capabilities to access remotely. These seminars will be recorded for those that cannot make it to campus.

The scheduled seminars will include a mix of lectures and problem solving workshop sessions with the Course Convener.

The teaching strategies that will be used include:

- **Lectures** that will focus on the development and application of generalised problem-solving processes for the stress, strain and deformation analysis of structures. Lectures will also emphasise the relationship of the content to engineering practice and will provide an opportunity for reflection on learning. The lectures are recorded and should be available on the Moodle course page.
- **Moodle Learning Course Page** provides a step by step guide on the course. Links to video recordings and learning modules to help you learn the solution techniques for many of the

subject areas.
- **MSTeams** will be used a course forum and to access the online version of the scheduled classes.

Suggested approaches to learning in this course include:

- Regular participation in lectures and class problem sessions. *Review lecture and class problem material. Follow worked examples. Reflect on class problems and quizzes.*
- Complete all the required tasks in the Moodle course page for this course.
- Weekly reading and recording of your learning.
- Appropriate preparation for class problem activities.
- Students who perform poorly in the quizzes are strongly encouraged to discuss their progress with the lecturers during the Term. Please do not suffer in silence – seek the help at an early stage! We would like you to make most of this learning process and receive a high grade in the course.

Additional Course Information

In addition to the viewing of the pre-recorded lecture videos and completing online tasks, you are expected to commit an additional 8 - 10 hours per week to independent learning and general problem solving.

The teaching staff in this course are here to help you succeed. In order to receive assistance most efficiently regarding course content, please be proactive, and use the following steps:

1. Ask your lecturer / demonstrator during scheduled seminar workshops for immediate response
2. Post your question on Teams, where peers and staff can quickly answer your query (responses provided within 48 hours)
3. Email the course convener (responses provided within a week)

If you are having issues of a confidential nature please feel free to contact the course convener by email at any time and you will receive a reponse within 2 working days.

Personal responses to individual questions regarding course content sent by email to the course convener may take longer, and so posting in the appropriate Teams channels is recommended.

Assessment

Note: A mark of at least 40% in the final examination is required before the class work is included. If a student does not receive greater than 40% in the final exam, the final grade will be the final exam mark

The examinations and online modules show evidence of application of theoretical concepts to solving problems. There are no exemptions from any part of this assessment.

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Online Learning Modules	10%	See Moodle for due dates	1, 2, 3, 4
2. Progress Quizzes	30%	6pm Wednesday Week 3 and Week 5	1, 2, 3, 4
3. Final Examination	60%	See Exam Timetable	1, 2, 3, 4

Assessment 1: Online Learning Modules

Due date: See Moodle for due dates

Each week, revision problems will be required to be completed through Moodle in the form of online learning modules. There are unlimited attempts to complete each learning module before the due date. Each new attempt provides you randomised values, the attempt with the highest mark will be recorded

Feedback is immediate following submission. Each module is worth the same weighting.

Additional details

If you cannot complete any given module before the due date you must receive special consideration for the duration it was open. If successful, your total weighting of each module will be re-weighted accordingly

Assessment 2: Progress Quizzes

Due date: 6pm Wednesday Week 3 and Week 5

There will be two Progress Quizzes held at 6pm on the Wednesday of Week 3 (2nd Nov) and Week 5 (16th Nov), to be completed through Moodle. There is one attempt to complete the quiz. Students may upload hand-written worked solutions to be marked by the course marker to receive partial marks.

Results returned within 2 weeks of each quiz

Additional details

If you cannot sit a progress quiz you must receive special consideration prior to the date. If successful, your weighting of each missed quiz will be transferred to the final exam. Each quiz is worth the same weighting (15%)

Assessment 3: Final Examination

Due date: See Exam Timetable

The final exam is a 2 hour Open Book examination. The exam covers all the worked covered during the term. Marks are awarded for correct answers, and there are marks provided for using correct methods if working is uploaded

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

Each of the two seminars each week will focus on a given topic. Some topics may require multiple sessions to complete.

The topic schedule is as follows (note this is estimated only and **subject to change** during term):

Week (Date)	Topic 1	Topic 2	Assessment
Week 1 (17th Oct)	Introduction to Prestressed Concrete	Serviceability	Online Module 1
Week 2 (24th Oct)	Losses of Prestress	Flexural Strength	Online Module 2
Week 3 (31st Oct)	Transfer Strength	Shear Strength	Online Module 3 **Progress Quiz 1**
Week 4 (7th Nov)	Statically Indeterminate Problems (Continuous Beams)	Statically Indeterminate Problems (Slabs)	Online Module 4
Week 5 (14th Nov)	End Block Design	Revision	Online Module 5 **Progress Quiz 2**

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 T3 2022 will be held online between 25th November - 8th December 2022 inclusive, and supplementary exams between 9th - 13th January 2023 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.

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

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

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering 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	
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in 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	