COURSE OUTLINE

CIV504 Advanced Structural Analysis and Design

School: School of Science, Technology and Engineering

2026 | Trimester 1

UniSC Moreton Bay	BLENDED LEARNING	Most of your course is on campus but you may be able to do some components of this course online.
Online	ONLINE	You can do this course without coming onto campus, unless your program has specified a mandatory onsite requirement.

Please go to unisc.edu.au for up to date information on the teaching sessions and campuses where this course is usually offered.

1. What is this course about?

1.1. Description

This course will enhance your skills in structural analysis and design, emphasising their application to real-world structural engineering scenarios. It will introduce you to advanced levels of structural analysis, using specialised software, and will provide you with in-depth theoretical and technical knowledge in the field of structural design. Upon completion, you will possess the expertise to engage in complex structural engineering tasks. Whenever applicable, the course content will be aligned with the requirements outlined in Australian Standards.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Learning materials – Asynchronous weekly learning material	1hr	Week 1	12 times
Seminar – On campus	1hr	Week 1	3 times
Tutorial/Workshop 1 – On campus	2hrs	Week 1	10 times
ONLINE			
Learning materials – Asynchronous weekly learning material	1hr	Week 1	12 times
Seminar – Online	1hr	Week 1	3 times
Tutorial/Workshop 1 – Online	2hrs	Week 1	10 times

1.3. Course Topics

Topics may include:

- Analysis of Indeterminate Structures using the Slope-Deflection Equation
- Plastic Theory of Structures, including the Upper and Lower Bound Theorems
- Design Principles for Dynamic Loading, including Earthquake and Blast Loads
- Computer Analysis of Dynamic Loads
- Stability of Structures
- Computer Analysis of Structural Stability
- Deflection of Reinforced Concrete Beams and Slabs
- Design Aspects of Reinforced Concrete Foundations
- Design of Prestressed Concrete Elements

2. What level is this course?

500 Level (Advanced)

Engaging with new discipline knowledge and skills at an advanced level or deepening existing knowledge and skills within a discipline. Independent application of knowledge and skills in unfamiliar contexts.

3. What is the unit value of this course?

12 units

4. How does this course contribute to my learning?

COURSE LEARNING OUTCOMES On successful completion of this course, you should be able to...		GRADUATE QUALITIES MAPPING Completing these tasks successfully will contribute to you becoming...	PROFESSIONAL STANDARD MAPPING * Engineers Australia Stage 1 Professional Engineer Competency Standards
1	Discern the principles, considerations and processes in the design of steel frame buildings, various types of reinforced concrete slab systems, foundations and columns, as total systems and with regard to the design of individual components.	Knowledgeable	1, 1.3.a, 1.3
2	Develop computer models of complex structural systems and validate the results by independent manual means to assess alternative structural design approaches and justify optimal solutions.	Empowered	2, 2.1.f, 2.2.b, 2.1, 2.2
3	Design steel/portal frame buildings, with due regard for relevant Australian Standards and contemporary construction practices and produce calculations and checks to ensure compliance with appropriate deflection controls.	Empowered	2, 2.2.b, 2.2.c, 2.3.a, 2.3.b, 2.2, 2.3
4	Design reinforced concrete flat slab floors and foundations for buildings, on the basis of flexure and two-way shear, on the basis of AS3600 and with due regard for current industry practice and produce calculations and checks to ensure compliance with appropriate deflection controls.	Empowered	2, 2.2.b, 2.2.c, 2.3.a, 2.3.b, 2.2, 2.3
5	Demonstrate effective teamwork in the completion of structural design tasks.	Engaged	3, 3.6.b, 3.6
6	Create well-communicated and professional high-quality documents presenting analysis and design computations and computer modelling details and outcomes.	Engaged	3, 3.2.a, 3.2
7	Synthesise and critically evaluate core course concepts and their interrelationships and effectively communicate a comprehensive understanding of the course's main ideas and their broader implications.	Knowledgeable Creative and critical thinker Empowered Communication Problem solving Applying technologies	1.6, 2.3, 3.2, 3.5

* Competencies by Professional Body

CODE	COMPETENCY
ENGINEERS AUSTRALIA STAGE 1 PROFESSIONAL ENGINEER COMPETENCY STANDARDS	
1	Elements of competency: Knowledge and Skill Base
1.3.a	Knowledge and Skill Base - In-depth understanding of specialist bodies of knowledge within the engineering discipline: Proficiently applies advanced technical knowledge and skills in at least one specialist practice domain of the engineering discipline.
1.3	Knowledge and Skill Base: In-depth understanding of specialist bodies of knowledge within the engineering discipline.

CODE	COMPETENCY
1.6	Knowledge and Skill Base: Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline.
2	Elements of competency: Engineering Application Ability
2.1.f	Engineering Application Ability - Application of established engineering methods to complex engineering problem solving: Conceptualises alternative engineering approaches and evaluates potential outcomes against appropriate criteria to justify an optimal solution choice.
2.2.b	Engineering Application Ability - Fluent application of engineering techniques, tools and resources: Constructs or selects and applies from a qualitative description of a phenomenon, process, system, component or device a mathematical, physical or computational model based on fundamental scientific principles and justifiable simplifying assumptions.
2.2.c	Engineering Application Ability - Fluent application of engineering techniques, tools and resources: Determines properties, performance, safe working limits, failure modes, and other inherent parameters of materials, components and systems relevant to the engineering discipline.
2.3.a	Engineering Application Ability - Application of systematic engineering synthesis and design processes: Proficiently applies technical knowledge and open ended problem solving skills as well as appropriate tools and resources to design components, elements, systems, plant, facilities and/or processes to satisfy user requirements.
2.3.b	Engineering Application Ability - Application of systematic engineering synthesis and design processes: Addresses broad contextual constraints such as social, cultural, environmental, commercial, legal political and human factors, as well as health, safety and sustainability imperatives as an integral part of the design process.
2.1	Engineering Application Ability: Application of established engineering methods to complex engineering problem solving.
2.2	Engineering Application Ability: Fluent application of engineering techniques, tools and resources.
2.3	Engineering Application Ability: Application of systematic engineering synthesis and design processes.
3	Elements of competency: Professional and Personal Attributes
3.6.b	Professional and Personal Attributes - Effective team membership and team leadership: Functions as an effective member or leader of diverse engineering teams, including those with multi-level, multi-disciplinary and multi-cultural dimensions.
3.2.a	Professional and Personal Attributes - Effective oral and written communication in professional and lay domains: Is proficient in listening, speaking, reading and writing English.
3.2	Professional and Personal Attributes: Effective oral and written communication in professional and lay domains.
3.5	Professional and Personal Attributes: Orderly management of self, and professional conduct.
3.6	Professional and Personal Attributes: Effective team membership and team leadership.

5. Am I eligible to enrol in this course?

Refer to the UniSC Glossary of terms for definitions of “pre-requisites, co-requisites and anti-requisites”.

5.1. Pre-requisites

Enrolled in MC002 or MC006 or GC002 or GC006 or GD002 or GD006

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

Not applicable

5.4. Specific assumed prior knowledge and skills (where applicable)

Not applicable

5.5. Microcredential Information

Not applicable

6. How am I going to be assessed?

6.1. Grading Scale

Standard Grading (GRD)

High Distinction (HD), Distinction (DN), Credit (CR), Pass (PS), Fail (FL).

6.2. Details of early feedback on progress

Early feedback will be provided through completion of weekly activities in workshops. Furthermore, feedback on each assessment will be provided which will be used to help with the following assessment.

6.3. Assessment tasks

DELIVERY MODE	TASK NO.	ASSESSMENT PRODUCT	INDIVIDUAL OR GROUP	WEIGHTING %	WHAT IS THE DURATION / LENGTH?	WHEN SHOULD I SUBMIT?	WHERE SHOULD I SUBMIT IT?
All	1	Written Piece	Individual	50%	3000 words	Throughout teaching period (refer to Format)	Online Assignment Submission with plagiarism check
All	2	Written Piece	Group	30%	2000 words	Exam Period	Online Assignment Submission with plagiarism check
All	3	Activity Participation	Individual	20%	A 10-12 minute presentation and defence.	Exam Period	Online Submission

All - Assessment Task 1: Written Piece

GOAL:	Formulate and solve mechanics problems based on the problem descriptions provided
PRODUCT:	Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	Formulate and solve mechanics problems based on the problem descriptions provided. Weeks 3, 6, 10 and 12

CRITERIA:

No.		Learning Outcome assessed
1	Development of computer models of complex structural systems and validation of the results by independent manual means to assess alternative structural design approaches and justification of optimal solutions.	2
2	Design of steel/portal frame buildings, with due regard for relevant Australian Standards and contemporary construction practices and production of calculations and checks to ensure compliance with appropriate deflection controls.	3
3	Creation of well-communicated and professional high-quality documents presenting analysis and design computations and computer modelling details and outcomes.	6
4	Discernment of the principles, considerations and processes in the design of steel frame buildings, various types of reinforced concrete slab systems, foundations and columns, as total systems and with regard to the design of individual components.	1

GENERIC SKILLS:	Problem solving, Organisation

All - Assessment Task 2: Report

GOAL:	Advance skills and understanding of structural analysis
PRODUCT:	Written Piece
AUTHORSHIP STATEMENT:	
FORMAT:	Group project to advance skills and understanding of structural analysis

CRITERIA:

No.		Learning Outcome assessed
1	Verification of the principles, considerations and processes in the design of steel frame buildings, various types of reinforced concrete slab systems, foundations and columns, as total systems and with regard to the design of individual components.	1
2	Development of computer models of complex structural systems and validate the results by independent manual means to assess alternative structural design approaches and justify optimal solutions.	2
3	Design of steel/portal frame buildings, with due regard for relevant Australian Standards and contemporary construction practices and produce calculations and checks to ensure compliance with appropriate deflection controls.	3
4	Design of reinforced concrete flat slab floors and foundations for buildings and produce calculations and checks to ensure compliance with deflection controls	4
5	Demonstratration of effective teamwork in the completion of structural design tasks.	5
6	190 Creation of well-communicated and professional high-quality documents presenting analysis and design computations and computer modelling details and outcomes.	6

GENERIC SKILLS:	Communication, Collaboration, Problem solving, Organisation, Applying technologies

All - Assessment Task 3: Course summary and critical evaluation

GOAL:	To assess your ability to synthesise and critically evaluate the course's core concepts, demonstrating a sophisticated and integrated understanding of its main ideas, their interrelationships, and broader implications.
PRODUCT:	Activity Participation
AUTHORSHIP STATEMENT:	
FORMAT:	Presentation and defence.

CRITERIA:

No.		Learning Outcome assessed
1	Synthesis & Critical Evaluation: Integrated and insightful critiques of core course concepts and their interrelationships.	7
2	Clarity & Communication: Well-organised, engaging, and clear presentation, effectively using visuals to enhance understanding.	7
3	Engagement & Understanding: Accurate and thoughtful responses to questions, demonstrating deep understanding and critical thinking.	7

GENERIC SKILLS:	Communication, Problem solving

7. Directed study hours

A 12-unit course will have total of 150 learning hours which will include directed study hours (including online if required), self-directed learning and completion of assessable tasks. Student workload is calculated at 12.5 learning hours per one unit.

8. What resources do I need to undertake this course?

Please note: Course information, including specific information of recommended readings, learning activities, resources, weekly readings, etc. are available on the course Canvas site– Please log in as soon as possible.

8.1. Prescribed text(s) or course reader

There are no required/recommended resources for this course.

8.2. Specific requirements

Not applicable

9. How are risks managed in this course?

Risk assessments have been performed for all studio and laboratory classes and a low level of health and safety risk exists. Some risk concerns may include equipment, instruments, and tools; as well as manual handling items within the laboratory. It is your responsibility to review course material, search online, discuss with lecturers and peers and understand the risks associated with your specific course of study and to familiarise yourself with the University's general health and safety principles by reviewing the online induction training for students, and following the instructions of the University staff.

10. What administrative information is relevant to this course?

10.1. Assessment: Academic Integrity

Academic integrity is the ethical standard of university participation. It ensures that students graduate as a result of proving they are competent in their discipline. This is integral in maintaining the value of academic qualifications. Each industry has expectations and standards of the skills and knowledge within that discipline and these are reflected in assessment.

Academic integrity means that you do not engage in any activity that is considered to be academic fraud; including plagiarism, collusion or outsourcing any part of any assessment item to any other person. You are expected to be honest and ethical by completing all work yourself and indicating in your work which ideas and information were developed by you and which were taken from others. You cannot provide your assessment work to others. You are also expected to provide evidence of wide and critical reading, usually by using appropriate academic references.

In order to minimise incidents of academic fraud, this course may require that some of its assessment tasks, when submitted to Canvas, are electronically checked through Turnitin. This software allows for text comparisons to be made between your submitted assessment item and all other work to which Turnitin has access.

10.2. Assessment: Additional Requirements

Eligibility for Supplementary Assessment

Your eligibility for supplementary assessment in a course is dependent of the following conditions applying:
(a) The final mark is in the percentage range 47% to 49.4%; and
(b) The course is graded using the Standard Grading scale

10.3. Assessment: Submission penalties

Late submissions may be penalised up to and including the following maximum percentage of the assessment task's identified value, with weekdays and weekends included in the calculation of days late:
(a) One day: deduct 5%;
(b) Two days: deduct 10%;
(c) Three days: deduct 20%;
(d) Four days: deduct 40%;
(e) Five days: deduct 60%;
(f) Six days: deduct 80%;
(g) Seven days: A result of zero is awarded for the assessment task.

The following penalties will apply for a late submission for an online examination:
Less than 15 minutes: No penalty
From 15 minutes to 30 minutes: 20% penalty
More than 30 minutes: 100% penalty

10.4. Links to relevant University policy and procedures

For more information on Academic Learning & Teaching categories including:

- Assessment: Courses and Coursework Programs
- Review of Assessment and Final Grades
- Supplementary Assessment
- Central Examinations
- Deferred Examinations
- Student Conduct
- Students with a Disability

For more information, visit https://www.usc.edu.au/explore/policies-and-procedures#academic-learning-and-teaching

10.5. Student Charter

UniSC is committed to excellence in teaching, research and engagement in an environment that is inclusive, inspiring, safe and respectful. The Student Charter sets out what students can expect from the University, and what in turn is expected of students, to achieve these outcomes.

10.6. General Enquiries

For course-specific questions, contact your teaching staff or Course Coordinator.

For other enquiries or to access support, please contact Student Central:

- UniSC Student Central
- UniSC Adelaide Student Central