COURSE OUTLINE

CIV200 Structural Analysis and Computer Modelling

School: School of Science, Technology and Engineering

2023 | Semester 2

UniSC Sunshine Coast
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.

Please go to usc.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

Civil engineers design solutions to complex problems that satisfy client needs and meet regulatory standards. In this course you will learn fundamental skills for your professional work as an engineer including: classical theory of structures and the design approach required by the Australian Standards; problem solving techniques and computer modelling skills to compute the structural responses of linear elastic structures to loads and predict structural behaviours; and the application of design codes to the determination of loads and load combinations for service and ultimate limit states.

1.2. How will this course be delivered?

ACTIVITY	HOURS	BEGINNING WEEK	FREQUENCY
BLENDED LEARNING			
Tutorial/Workshop 1 – Online workshop	2hrs	Week 1	13 times
Tutorial/Workshop 2 – On campus practical workshop	2hrs	Week 1	13 times
Laboratory 1 – On campus computer lab	2hrs	Week 1	13 times

1.3. Course Topics

Analysis of statically determinate structures, and Limit States Design incl. loads, load combinations, and load combination arrangements; Computer modelling fundamentals.

Analysis of statically determinate structures, and Limit States Design incl. wind effects on buildings; Computer modelling – analysis of statically determinate beams.

Analysis of statically determinate structures, and Limit States Design incl. wind actions on structures; Computer modelling – analysis of statically determinate beams (deflection).

Analysis of statically determinate trusses and frames; Computer modelling – analysis of statically determinate compound beams; Computer modelling – analysis of statically indeterminate beams.

Indeterminacy, analysis of statically indeterminate structures; Computer modelling – analysis of statically determinate and indeterminate trusses.

Deflection by double integration method; Computer modelling – group project.

Principle of Work incl. Virtual Work (deformation); Computer modelling – group project.

Principle of Virtual work (Integration table); Computer modelling – group project.

Force method (beams); Computer modelling – group project.

Force method (frames & trusses); Computer modelling – group project.

Influence lines (beams); Computer modelling – group project.

Influence lines (trusses); Computer modelling – group project.

2. What level is this course?

200 Level (Developing)

Building on and expanding the scope of introductory knowledge and skills, developing breadth or depth and applying knowledge and skills in a new context. May require pre-requisites where discipline specific introductory knowledge or skills is necessary. Normally, undertaken in the second or third full-time year of an undergraduate programs.

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 Interpret and apply Australian Standards: AS/NZS 1170.0, 1170.1 & 1170.2 for structural analysis.	Knowledgeable	1.1, 2.1, 2.2
2 Determine adequate loads, load combinations and load combination arrangements acting on structures arising from the actions of gravity, occupation and use, and wind.	Empowered	1.1, 2.1, 2.2
3 Apply structural analysis methods, including qualitative analysis, to compute the design actions and deformations of statically indeterminate structures.	Empowered	1.1, 1.2, 2.1, 2.2
4 Develop and use computer models of structures to determine the design actions and deformations of structures.	Engaged	2.1, 2.2
5 Work collaboratively in teams to undertake structural analysis and computer modelling	Engaged	3.2, 3.6
6 Communicate problems, methods, and solutions effectively in written and oral formats	Empowered	3.2

* Competencies by Professional Body

CODE	COMPETENCY
ENGINEERS AUSTRALIA STAGE 1 PROFESSIONAL ENGINEER COMPETENCY STANDARDS	
1.1	Knowledge and Skill Base: Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.
1.2	Knowledge and Skill Base: Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.
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.
3.2	Professional and Personal Attributes: Effective oral and written communication in professional and lay domains.
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

MEC221 and must be enrolled in Program SC410 or SC425.

5.2. Co-requisites

Not applicable

5.3. Anti-requisites

Not applicable

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

A solid working knowledge of Engineering Statics and Mechanics of Materials is required for this course.

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

The engagement in weekly formative tutorial and workshop problems will demonstrate the level of proficiency and understanding of the course material.

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	40%	Equivalent to max. 200 words each.	Refer to Format	In Class
All	2	Oral and Written Piece	Group	10%	Max. 500 words and max. 15 minutes	Week 13	In Class
All	3	Examination - Centrally Scheduled	Individual	50%	2 hours	Exam Period	Exam Venue

All - Assessment Task 1: Structural analysis methods and computer modelling

GOAL:	These assignments (take-home tasks) develop your understanding of core theory and its application to practical problems and enable you to identify and address gaps in your skills and knowledge.
PRODUCT:	Written Piece
FORMAT:	You will use the material presented in the Learning Material and Workshops, and applied in the Tutorials to complete your assignment. You may collaborate with peers to complete Task 1 although your submissions will be assessed individually. This assignment helps you to test your knowledge to ensure that you understand the basic concepts of load theory and helps you to prepare you undertake the Task 2 project. You will hand sections of this task progressively on the indicated weeks to ensure you receive early, regular, and timely feedback on the progress of your work. Due Weeks 3, 4, 7, 8, 11 & 12.
CRITERIA:	

No.		Learning Outcome assessed
1	Interpretation and application of Australian Standards	1
2	Determination of load, load combinations, and load combination arrangements	2
3	Application of advanced structural analysis methods,	3
4	Development and use of computer models of structures, and	4
5	Documentation and communication of solutions in a written format.	5 6

All - Assessment Task 2: Structural analysis project

GOAL:	This project enables you to advance your skills and understanding of structural analysis and computer modelling, working towards meeting your Engineers Australia competencies.
PRODUCT:	Oral and Written Piece
FORMAT:	Engineers regularly work in teams on 'complex' structures! Task 2 is a structural analysis project that will allow you to develop and demonstrate your abilities by competently analysing a structure using and applying first engineering principles and computer modelling techniques. In doing so, you will advance structural analysis skills and, develop and advance your collaborative competencies (Professional soft skills). In your group (max. 4 members, TBC), you will collaborate professionally to model and analyse a structure. Your team will develop a structural solution and develop its computer model; determine all relevant loads, load combinations and load combination arrangements to apply on your model; and explain interpret your analysis and solution. Note further details will be provided on Canvas and/or in class. Your group will produce a brief synopsis of your solution (max. 500 words) and deliver an oral presentation of your solution (max. 15 minutes). As part of your group assignment, you will also be required to actively participate to Peer Assessment, review, feedback and debriefing activities

CRITERIA:

No.		Learning Outcome assessed
1	Interpretation and application of Australian Standards	1
2	Determination of loads, load combinations, and load combination arrangements	2
3	Application of advanced structural analysis methods	3
4	Development and use of computer models of structures	4
5	Written and oral presentation of solutions	5
6	Collaboration in teams demonstrated by your contribution to the deliverables and feedback activities	6

All - Assessment Task 3: Final Exam

GOAL:	The final exam will build your skills to analyse statically indeterminate structures by first principles independently and with confidence within a set time limit and with limited access to additional resources.
PRODUCT:	Examination - Centrally Scheduled
FORMAT:	The final exam assesses the material covered in the course (workshops, tutorials and assignments) and the self-study material (e.g. prescribed reading). You will be required to analyse indeterminate structures. With your solutions you will demonstrate your understanding and ability to apply advanced methods of structural analysis. The exam will be partially open book. Full details of what may be taken into the exam venue will be explained in class during the semester and posted on Canvas.

CRITERIA:

No.		Learning Outcome assessed
1	Interpretation and application of Australian Standards	1
2	Application of advanced structural analysis methods	2 3 4
3	Effective communication of analysis and solutions in a written format	6

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.

7.1. Schedule

PERIOD AND TOPIC	ACTIVITIES
Week 1	Analysis of statically determinate structures, and Limit States Design incl. loads, load combinations, and load combination arrangements; Computer modelling fundamentals.
Week 2	Analysis of statically determinate structures, and Limit States Design incl. wind effects on buildings; Computer modelling – analysis of statically determinate beams.
Week 3	Analysis of statically determinate structures, and Limit States Design incl. wind actions on structures; Computer modelling – analysis of statically determinate beams (deflection).
Week 4	Analysis of statically determinate trusses and frames; Computer modelling – analysis of statically determinate compound beams; Computer modelling – analysis of statically indeterminate beams.
Week 5	Indeterminacy, analysis of statically indeterminate structures; Computer modelling – analysis of statically determinate and indeterminate trusses.
Week 6	Deflection by double integration method; Computer modelling – group project.
Week 7	Principle of Work incl. Virtual Work (deformation); Computer modelling – group project.
Week 8	Principle of Virtual work (Integration table); Computer modelling – group project.
Week 9	Force method (beams); Computer modelling – group project.
Week 10	Force method (frames & trusses); Computer modelling – group project.
Week 11	Influence lines (beams); Computer modelling – group project.
Week 12	Influence lines (trusses); Computer modelling – group project.
Week 13	Revision

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

Please note that you need to have regular access to the resource(s) listed below. Resources may be required or recommended.

REQUIRED?	AUTHOR	YEAR	TITLE	EDITION	PUBLISHER
Required	Russell C. Hibbeler	0	Structural Analysis in SI Units	n/a	n/a
Required	AS/NZS	0	AS/NZS 1170.0 Structural design actions - General principles	n/a	n/a
Required	AS/NZS	0	AS/NZS 1170.1 Structural design actions - Permanent, imposed and other actions	n/a	n/a
Required	AS/NZS	0	AS/NZS 1170.2 Structural design actions - Wind actions	n/a	n/a

8.2. Specific requirements

Not applicable

9. How are risks managed in this course?

Health and safety risks for this course have been assessed as low. It is your responsibility to review course material, search online, discuss with lecturers and peers and understand the health and safety 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:

The final mark is in the percentage range 47% to 49.4%
The course is graded using the Standard Grading scale
You have not failed an assessment task in the course due to academic misconduct

10.3. Assessment: Submission penalties

Late submission of assessment tasks may be penalised at the following maximum rate:
- 5% (of the assessment task's identified value) per day for the first two days from the date identified as the due date for the assessment task.
- 10% (of the assessment task's identified value) for the third day - 20% (of the assessment task's identified value) for the fourth day and subsequent days up to and including seven days from the date identified as the due date for the assessment task.
- A result of zero is awarded for an assessment task submitted after seven days from the date identified as the due date for the assessment task. Weekdays and weekends are included in the calculation of days late. To request an extension you must contact your course coordinator to negotiate an outcome.

10.4. SafeUniSC

UniSC is committed to a culture of respect and providing a safe and supportive environment for all members of our community. For immediate assistance on campus contact SafeUniSC by phone: 07 5430 1168 or using the SafeZone app. For general enquires contact the SafeUniSC team by phone 07 5456 3864 or email safe@usc.edu.au.

The SafeUniSC Specialist Service is a Student Wellbeing service that provides free and confidential support to students who may have experienced or observed behaviour that could cause fear, offence or trauma. To contact the service call 07 5430 1226 or email studentwellbeing@usc.edu.au.

10.5. Study help

For help with course-specific advice, for example what information to include in your assessment, you should first contact your tutor, then your course coordinator, if needed.

If you require additional assistance, the Learning Advisers are trained professionals who are ready to help you develop a wide range of academic skills. Visit the Learning Advisers web page for more information, or contact Student Central for further assistance: +61 7 5430 2890 or studentcentral@usc.edu.au.

10.6. Wellbeing Services

Student Wellbeing provide free and confidential counselling on a wide range of personal, academic, social and psychological matters, to foster positive mental health and wellbeing for your academic success.

To book a confidential appointment go to Student Hub, email studentwellbeing@usc.edu.au or call 07 5430 1226.

10.7. AccessAbility Services

Ability Advisers ensure equal access to all aspects of university life. If your studies are affected by a disability, learning disorder mental health issue, injury or illness, or you are a primary carer for someone with a disability or who is considered frail and aged, AccessAbility Services can provide access to appropriate reasonable adjustments and practical advice about the support and facilities available to you throughout the University.

To book a confidential appointment go to Student Hub, email AccessAbility@usc.edu.au or call 07 5430 2890.

10.8. 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

10.9. 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.

10.10. General Enquiries

In person:

- **UniSC Sunshine Coast** - Student Central, Ground Floor, Building C, 90 Sippy Downs Drive, Sippy Downs
- **UniSC Moreton Bay** - Service Centre, Ground Floor, Foundation Building, Gympie Road, Petrie
- **UniSC SouthBank** - Student Central, Building A4 (SW1), 52 Merivale Street, South Brisbane
- **UniSC Gympie** - Student Central, 71 Cartwright Road, Gympie
- **UniSC Fraser Coast** - Student Central, Student Central, Building A, 161 Old Maryborough Rd, Hervey Bay
- **UniSC Caboolture** - Student Central, Level 1 Building J, Cnr Manley and Tallon Street, Caboolture

Tel: +61 7 5430 2890

Email: studentcentral@usc.edu.au