School of Engineering

CIVL6110: Advanced Structural Analysis

Callaghan
Semester 1 - 2024

COURSE OUTLINE

OVERVIEW

Course Description

This course introduces students to higher-level Theory of Structures. Emphasis is placed upon students gaining a real understanding of elementary plastic theory of structures with application for slab analysis and design; dynamics of structures; stability of structural elements and structural systems. The topics are linked to requirements of Australian Standards. The course also revises the most common software used in the workforce for Advanced Structural Analysis.

Academic Progress Requirements

Nil

Requisites

This course has similarities to CIVL4110. If you have successfully completed CIVL4110, you cannot enrol in this course.

Assumed Knowledge

There are no formal pre-requisites for studying this course. However, it is assumed that students have competence in structural analysis (equivalent of having completed CIVL2130 and CIVL3180) and familiarity with structural design codes for loading on structures. Competence in reinforced concrete design and steel design will be an advantage (equivalent of having completed CIVL3160 and CIVL3170).

Contact Hours

Callaghan

Computer Lab

Face to Face On Campus
2 hour(s) per week(s) for 13 week(s) starting Week 1
Please note that students will use the computer lab most weeks but on occasions a tutorial room will be required. The academic will contact the Timetable Officer in the Faculty when a tutorial room is specifically required.

Lecture

Face to Face On Campus
2 hour(s) per week(s) for 13 week(s) starting Week 1
No repeat lectures

Unit Weighting Workload

10
Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

CONTACTS

Course Coordinator

Callaghan
Dr Robert Petersen
Robert.Petersen@newcastle.edu.au
(02) 4921 6960
Consultation: Open door policy. EA127.

Teaching Staff

Other teaching staff will be advised on the course Canvas site.

School Office

School of Engineering
EAG02
EA Building
Callaghan
SENG-ADMIN@newcastle.edu.au
9.00am-1.00pm and 2.00pm-5.00pm (Monday to Friday)

SYLLABUS

Course Content

GEOMETRICALLY NON-LINEAR STRUCTURESPLASTIC THEORY OF STRUCTURES
- Structural analysis and design philosophy
- Upper bound theorem
- Yield line method for slab analysis
- Lower bound theorem
- Hillerborg strip method for slab design

STRUCTURAL DYNAMICS
- Basic dynamic theory
- Design principles for dynamic loading
- Specific dynamic loadings
- Effect of vibrations on humans
- Computer methods for dynamic analysis

STABILITY OF STRUCTURES
- Basic theory of stability
- Stability of structural members
- Stability functions
- Stability of framed systems
- Computer methods for structural stability

Course Learning Outcomes

On successful completion of this course, students will be able to:
1. Identify the terminology of higher-level Theory of Structures at a professional level

2. Apply Plastic Theory, Structural Dynamics Theory, and Stability Theory to solve structure-related problems

3. Identify the major requirements of relevant Australian Standards

4. Describe features and limitations of common software used in professional practice for advanced structural analysis

Course Materials

Required Text:
- Course notes are available in electronic format for download from the Canvas site for this course.

ASSESSMENTS

This course has 3 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Plastic Analysis	Friday 5 pm in Week 6	Individual	30%	1, 2, 3
2	Structural Dynamics	Friday 5 pm in Week 10.	Individual	35%	1, 2, 3, 4
3	Stability of Frames	Friday 5 pm in week 13.	Individual	35%	1, 2, 3, 4

Late Submissions The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Plastic Analysis

Assessment Type Written Assignment
Description Formulate and solve plastic analysis problems based on the problem descriptions provided.
Weighting 30%
Due Date Friday 5 pm in Week 6
Submission Method Online
The assignment question will be posted on Canvas at least two weeks prior to the submission date. You are required to submit your assignment online through Canvas. Your submission must show your NAME and STUDENT NUMBER, CLEARLY, at the top of the first sheet. Please write legibly and show all calculation steps. It is expected that you will submit work that is your own. This does not preclude you consulting your colleagues or tutors. However, plagiarism and copying are not acceptable. Neither are they helpful to your academic progress. Individual difficulties should be discussed with the tutors or lecturer.
Assessment Criteria Marks for questions will be weighted according to time taken/steps involved. part marks will be awarded for correct working even if final answer is incorrect.
Return Method Online
Feedback Provided Online - Two weeks after due date.

Assessment 2 - Structural Dynamics

Assessment Type Written Assignment
Description Formulate and solve structural dynamics problems based on the problem descriptions provided.
Weighting 35%
Due Date Friday 5 pm in Week 10.
Submission Method Online
The assignment question will be posted on Canvas at least two weeks prior to the submission date. You are required to submit your assignment online through Canvas. Your submission must show your NAME and STUDENT NUMBER, CLEARLY, at the top of the first sheet. Please write legibly and show all calculation steps. It is expected that you will submit work that is your own. This does not preclude you consulting your colleagues or tutors. However, plagiarism and copying are not acceptable. Neither are they helpful to your academic progress. Individual difficulties should be discussed with the tutors or lecturer.
Assessment Criteria Marks for questions will be weighted according to time taken/steps involved. part marks will be awarded for correct working even if final answer is incorrect.
Return Method Online
Feedback Provided Online - Two weeks after due date.

Assessment 3 - Stability of Frames

Assessment Type	Written Assignment
Description	Formulate and solve stability of frames problems based on the problem descriptions provided.
Weighting	35%
Due Date	Friday 5 pm in week 13.
Submission Method	Online The assignment question will be posted on Canvas at least two weeks prior to the submission date. You are required to submit your assignment online through Canvas. Your submission must show your NAME and STUDENT NUMBER, CLEARLY, at the top of the first sheet. Please write legibly and show all calculation steps. It is expected that you will submit work that is your own. This does not preclude you consulting your colleagues or tutors. However, plagiarism and copying are not acceptable. Neither are they helpful to your academic progress. Individual difficulties should be discussed with the tutors or lecturer.
Assessment Criteria	Marks for questions will be weighted according to time taken/steps involved. part marks will be awarded for correct working even if final answer is incorrect.
Return Method	Online
Feedback Provided	Online - Two weeks after due date.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Communication Methods

Communication methods used in this course include:

- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.

Course Evaluation

Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement.

Oral Interviews (Vivas)	As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the Oral Examination (viva) Procedure. In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the Student Conduct Rule.
Academic Misconduct	All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to https://policies.newcastle.edu.au/document/view-current.php?id=35 .
Adverse Circumstances	The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where: 1. the assessment item is a major assessment item; or 2. the assessment item is a minor assessment item and the Course Co-ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system; 3. you are requesting a change of placement; or 4. the course has a compulsory attendance requirement. Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at: https://policies.newcastle.edu.au/document/view-current.php?id=236
Important Policy Information	The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures that support a safe and respectful environment at the University.

Graduate Profile Statements

This course builds students' capacity in the following University of Newcastle Bachelor of Engineering Graduate Profile Statements (based on 2011 Engineers Australia revised Stage 1 Competency Standards for Professional Engineers):

UON Att.	University of Newcastle Bachelor of Engineering Graduate Profile Statements/ Engineers Australia Stage 1 competency statements	Taught	Practised	Assessed	Skill Level (1-4)
	Professional Attributes				
11	3.1. Ethical conduct and professional accountability				
12	3.2. Effective oral and written communication in professional and lay domains.		x	x	4
13	3.3. Creative, innovative and pro-active demeanour.		x	x	4
14	3.4. Professional use and management of information.				
15	3.5. Orderly management of self, and professional conduct.				
16	3.6. Effective team membership and team leadership.		x	x	4
	Engineering Ability				
7	2.1. Application of established engineering methods to complex engineering problem solving.	x	x	x	4
8	2.2. Fluent application of engineering techniques, tools and resources.	x	x	x	4
9	2.3. Application of systematic engineering synthesis and design processes.				
10	2.4. Application of systematic approaches to the conduct and management of engineering projects.				
	Knowledge Base				
1	1.1. Comprehensive, theory-based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline.	x	x	x	4
2	1.2. Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline.				
3	1.3. In-depth understanding of specialist bodies of knowledge within the engineering discipline.	x	x	x	4
4	1.4. Discernment of knowledge development and research directions within the engineering discipline.				
5	1.5. Knowledge of contextual factors impacting the engineering discipline.				
6	1.6. Understanding of the scope, principles, norms, accountabilities and bounds of contemporary engineering practice in the specific discipline.				

This course outline was approved by the Head of School on the 19/01/2024. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.