UNSW Course Outline

CODE2121 Computational Design 2 (Structure) - 2024

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General Course Information

Course Code : CODE2121
Year : 2024
Term : Term 1
Teaching Period : T1
Is a multi-term course? : No
Faculty : Faculty of Arts, Design and Architecture
Academic Unit : School of Built Environment
Delivery Mode : In Person
Delivery Format : Standard
Delivery Location : Kensington
Campus : Sydney
Study Level : Undergraduate
Units of Credit : 6

Useful Links

Handbook Class Timetable

Course Details & Outcomes

Course Description

Computational Design 2 (Structure) is the second of five computational design courses that introduce you to parametric design. You will investigate, develop, and apply computational thinking and methods in the context of the engineering discipline and practice to generate,

analyse, and evaluate a structurally sound design. You will participate in weekly activities to research, design, model, simulate, analyse and evaluate the performance of structural systems.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Demonstrate theoretical knowledge of computational structural and civil engineering.
CLO2 : Evaluate and critique case studies of computational structural and civil engineering.
CLO3 : Apply advanced skills in a visual programming language interfaces and intermediate skills in a text based programming language.
CLO4 : Create and evaluate structural and civil engineering outcomes using computational design thinking and methods.
CLO5 : Apply relevant verbal and multimedia communication skills.

Course Learning Outcomes	Assessment Item
CLO1 : Demonstrate theoretical knowledge of computational structural and civil engineering.	• Research and Parametric Design of a Spatial Structure • Structural Analysis and Optimisation of a Spatial Structure
CLO2 : Evaluate and critique case studies of computational structural and civil engineering.	• Research and Parametric Design of a Spatial Structure
CLO3 : Apply advanced skills in a visual programming language interfaces and intermediate skills in a text based programming language.	• Structural Analysis and Optimisation of a Spatial Structure • Research and Parametric Design of a Spatial Structure
CLO4 : Create and evaluate structural and civil engineering outcomes using computational design thinking and methods.	• Structural Analysis and Optimisation of a Spatial Structure
CLO5 : Apply relevant verbal and multimedia communication skills.	• Research and Parametric Design of a Spatial Structure • Structural Analysis and Optimisation of a Spatial Structure

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

This course will be delivered through weekly lectures and activity-based tutorial sessions.

Tutorial sessions will build on the concepts introduced in the lectures and you will be actively

engaged through activities, discussion, and presentations, connected to the topics, assigned readings and assessments. You will upload evidence of in-class activities to the course learning management system as required.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Research and Parametric Design of a Spatial Structure Assessment Format: Individual	40%	Due Date: Week 7: 25 March - 31 March
Structural Analysis and Optimisation of a Spatial Structure Assessment Format: Individual	60%	Due Date: Week 12: 29 April - 05 May

Assessment Details

Research and Parametric Design of a Spatial Structure

Assessment Overview

You will research a spatial structure typology to understand and examine systemic relationships between structural behaviour, design morphology, and materiality. Using parametric software, you will apply this knowledge to create a parametric model of the structural system for any given boundary. You will submit your parametric script and present your work in a report format and as dynamic video-simulation of the structural system and its components.

Feedback will be given through the learning management system and the level of achievement will be indicated against the assignment criteria rubric as well as a section for additional comments. Feedback will also be given verbally in class where applicable.

Course Learning Outcomes

- CLO1 : Demonstrate theoretical knowledge of computational structural and civil engineering.
- CLO2 : Evaluate and critique case studies of computational structural and civil engineering.
- CLO3 : Apply advanced skills in a visual programming language interfaces and intermediate skills in a text based programming language.
- CLO5 : Apply relevant verbal and multimedia communication skills.

Detailed Assessment Description

Assessment Brief available in Moodle

Structural Analysis and Optimisation of a Spatial Structure

Assessment Overview

You will use parametric structural engineering software to create a script to analyse and optimize the structural system of a spatial grid/shell modelled in Assessment 1, to meet the objectives of cost and material resource minimization. You will reflect on and evaluate the performance of the script and the results of its analysis and optimization and present the outcomes in a structural report and as a dynamic video-simulation format.

Feedback will be given through the learning management system and the level of achievement will be indicated against the assignment criteria rubric as well as a section for additional comments. Feedback will also be given verbally in class where applicable.

Course Learning Outcomes

- CLO1 : Demonstrate theoretical knowledge of computational structural and civil engineering.
- CLO3 : Apply advanced skills in a visual programming language interfaces and intermediate skills in a text based programming language.
- CLO4 : Create and evaluate structural and civil engineering outcomes using computational design thinking and methods.
- CLO5 : Apply relevant verbal and multimedia communication skills.

Detailed Assessment Description

Assessment Brief available in Moodle

General Assessment Information

Assessment briefs available in Moodle.

Grading Basis

Standard

Requirements to pass course

Achieve a composite mark of at least 50 out of 100.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 12 February - 18 February	Lecture	Structural Design Theory: Basic Structural Concepts and Models. Assessment 1 Brief.
	Studio	Hands-on Workshop: Design, Analysis, Fabrication, and Load Test of Basic Structural Models (Groups)
	Homework	Structural Explorations Report: Develop your Structural Explorations Report by collecting Diagrams of the Structural Analysis, Images of the Physical Models before and after the Load Tests, together with a Comparative Reflection of the Digital and Physical Results.
Week 2 : 19 February - 25 February	Lecture	Lightweight Structures 1: Tension Systems: Cables, Nets, Membranes and Pneumatic Structures.
	Studio	Modelling Workshop: Form-Finding of Tension Systems in Kangaroo: Cables, Nets, Membranes and Pneumatic Structures. Rationalization for Fabrication (Legth of cables and Fabric Patterns).
	Homework	Research Report (A1): Start developing your Research Report based on you Lightweight Structure Typology.
Week 3 : 26 February - 3 March	Lecture	Lightweight Structures 2: Compression Systems: Arches, Shells, Gridshells, and Branched Structures.
	Studio	Modelling Workshop: Form-Finding of Compression Systems in Kangaroo: Arches, Shells, Gridshells, and Branched Structures. Rationalization for Fabrication (Lenght of Ribs and Bars).
	Homework	Research Report (A1): Continue and Finalize developing your Research Report based on you Lightweight Structure Typology.
Week 4 : 4 March - 10 March	Lecture	Lightweight Structures 3: Tension+Compression Systems: Trusses, Braced Vaults and Domes, Geodesic, and Tensegrity Structures
	Presentation	Presentation of WIP Research Report (A1)
	Studio	Modelling Workshop: Start developing the Parametric Model of your Lightweight Structure Typology using Grasshopper. (WIP Consultations Assessment 1).
	Homework	Parametric Model (A1): Continue developing the Parametric Model of your Lightweight Structure Typology using Grasshopper.
Week 5 : 11 March - 17 March	Lecture	Structural Analysis and Optimization 1: Basic Models. Karamba for Finite Element Method (FEM). Assessment 2 Brief.
	Studio	Modelling Workshop: Continue developing the Parametric Model of your Lightweight Structure Typology using Grasshopper. (WIP Consultations Assessment 1).
	Homework	Parametric Model and Video Simulation (A1): Finalize developing the Parametric Model of your Spatial Structure Typology using Grasshopper and Create your Video Simulation.
Week 6 : 18 March - 24 March	Other	Flexibility Week No Lecture. No tutorial. See Homework below.
	Homework	Structural Analysis in Karamba (A2): Start developing the Structural Analysis of your Lightweight Structure using Karamba.
Week 7 : 25 March - 31 March	Other	Public Holiday (Class moved to Week 11) No Lecture. No tutorial. See Submission and Homework below.
	Assessment	Submission Assessment 1
	Homework	Structural Analysis in Karamba (A2): Continue developing the Structural Analysis of your Lightweight Structure using Karamba.
Week 8 : 1 April - 7 April	Lecture	Structural Analysis and Optimization 2: Lightweight Structures. Karamba for Finite Element Method (FEM).
	Studio	Structural Analysis Workshop: Continue developing the Structural Analysis of your Lightweight Structure Typology using Karamba. (WIP Consultations Assessment 2).
	Homework	Structural Analysis in Karamba (A2): Finalize developing the Structural Analysis of your Lightweight Structure using Karamba.
Week 9 : 8 April - 14 April	Lecture	From Digital to Physical Models. Fabrication Techniques and Materials for Structural Models.
	Presentation	Presentation of WIP Structural Analysis Report (A2)
	Studio	Modelling Workshop: Final Digital Model for Fabrication. (WIP Consultations Assessment 2).
	Homework	Physical Model (A2): Start Fabricating the Physical Model of your Lightweight

		Structure Typology with the configuration of materials discussed in class.
Week 10 : 15 April - 21 April	Workshop	Fabrication Workshop: Continue Fabricating the Physical Model of your Lightweight Structure Typology (4 Hours Workshop)
	Homework	Physical Model (A2): Continue and Finalize Fabricating the Physical Model of your Lightweight Structure Typology, and bring it to the next class on W11 for a Load Test.
Week 11 : 22 April - 28 April	Lecture	Structural Topology Optimization Methods.
	Studio	Load Test on Physical Structural Models. Comparative Results Digital vs Physical.
	Homework	Structural Analysis Report and Video (A2): Compile the Structural Analysis Report and develop your Video including: Results of Structural Analysis in Karamba; Fabrication process of Physical Models; Results of Load Test on Physical Models; and Comparative Reflection of Digital and Physical Results.
Week 12 : 29 April - 5 May	Assessment	Submission Assessment 2
	Presentation	Final Exhibition: Bring your Lightweight Structure Physical Model together with your printed Research and Structural Analysis Reports to the Final Exhibition at the BE Galleries.

Attendance Requirements

You are expected to be regular and punctual in attendance at all classes for the School of Built Environment courses in which you are enrolled. If and where individual courses have specific attendance requirements, these will be stated in the course outline.

If you do not attend, engage, or participate in scheduled class activities, including lectures, tutorials, studios, labs, etc, you run the risk of failing a course.

If illness or unexpected and beyond your control circumstances prevent you from completing a task on time, or substantially disturb your assessment performance, you should apply for Special Consideration, as soon as practicable, accompanied by appropriate documentation.

No special consideration will be provided if you miss out on essential course information and materials, or if you miss assessment tasks and deadlines due to unexplained absences or an unapproved lack of attendance.

You may be advised by the Course Convenor to withdraw from the course if significant learning activities are missed.

Course Resources

Prescribed Resources

Published on Moodle

Recommended Resources

Published on Moodle

Additional Costs

Model Making Costs

Course Evaluation and Development

We encourage and support students to maintain regular contact with the course convenor to provide informal feedback throughout the course. For specific issues or detailed feedback, please arrange a meeting with the course convenor via email.

In this course there is an option for students to provide anonymous feedback via the course's Moodle page, which is directly sent to the convenor. As a final step, students are invited to share their insights and experiences by completing the MyExperience survey. The feedback gathered each year is integral to the continuous enhancement and development of the course.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Cristina Ramos Jaime		Anita B. Lawrence Centre (H13), Level 4, Room 4007	0451226744	Appointments via email	No	Yes

Other Useful Information

Academic Information

Due to evolving advice by NSW Health, students must check for updated information regarding online learning for all Arts, Design and Architecture courses this term (via Moodle or course information provided).

Please see: https://www.unsw.edu.au/arts-design-architecture/student-life/resources-support/protocols-guidelines for essential student information relating to:

- UNSW and Faculty policies and procedures;
- Student Support Services;
- Dean's List;
- review of results;

- credit transfer;
- cross-institutional study and exchange;
- examination information;
- enrolment information;
- Special Consideration in the event of illness or misadventure;
- student equity and disability;

And other essential academic information.

Academic Honesty and Plagarism

Plagiarism is using the words or ideas of others and presenting them as your own. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement.

UNSW groups plagiarism into the following categories:

- Copying: Using the same or very similar words to the original text or idea without acknowledging the source or using quotation marks. This includes copying materials, ideas or concepts from a book, article, report or other written document, presentation, composition, artwork, design, drawing, circuitry, computer program or software, website, internet, other electronic resource, or another person's assignment without appropriate acknowledgement.
- Inappropriate paraphrasing: Changing a few words and phrases while mostly retaining the original information, structure and/or progression of ideas of the original without acknowledgement. This also applies in presentations where someone paraphrases another's ideas or words without credit and to piecing together quotes and paraphrases into a new whole, without appropriate referencing.
- Collusion: Working with others but passing off the work as a person's individual work. Collusion also includes providing your work to another student for the purpose of them plagiarising, paying another person to perform an academic task, stealing or acquiring another person's academic work and copying it, offering to complete another person's work or seeking payment for completing academic work.
- Inappropriate citation: Citing sources which have not been read, without acknowledging the "secondary" source from which knowledge of them has been obtained.
- Duplication ("self-plagiarism"): Submitting your own work, in whole or in part, where it has previously been prepared or submitted for another assessment or course at UNSW or another university.

The UNSW Academic Skills support offers resources and individual consultations. Students are also reminded that careful time management is an important part of study. One of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and proper referencing of sources in preparing all assessment items. UNSW Library has the ELISE tool available to assist you with your study at UNSW. ELISE is designed to

introduce new students to studying at UNSW, but it can also be a great refresher during your study.

Completing the ELISE tutorial and quiz will enable you to:

- analyse topics, plan responses and organise research for academic writing and other assessment tasks
- effectively and efficiently find appropriate information sources and evaluate relevance to your needs
- use and manage information effectively to accomplish a specific purpose
- better manage your time
- understand your rights and responsibilities as a student at UNSW
- be aware of plagiarism, copyright, UNSW Student Code of Conduct and Acceptable Use of UNSW ICT Resources Policy
- be aware of the standards of behaviour expected of everyone in the UNSW community
- locate services and information about UNSW and UNSW Library

Use of AI for assessments

As AI applications continue to develop, and technology rapidly progresses around us, we remain committed to our values around academic integrity at UNSW. Where the use of AI tools, such as ChatGPT, has been permitted by your course convener, they must be properly credited and your submissions must be substantially your own work.

In cases where the use of AI has been prohibited, please respect this and be aware that where unauthorised use is detected, penalties will apply.

Use of AI for assessments | UNSW Current Students

Submission of Assessment Tasks

Turnitin Submission

If you encounter a problem when attempting to submit your assignment through Turnitin, please telephone External Support on 9385 3331 or email them on externalteltsupport@unsw.edu.au

Support hours are 8:00am – 10:00pm on weekdays and 9:00am – 5:00pm on weekends (365 days a year). If you are unable to submit your assignment due to a fault with Turnitin, you may apply for an extension, but you must retain your ticket number from External Support (along with any other relevant documents) to include as evidence to support your extension application. If you email External Support, you will automatically receive a ticket number, but if you telephone,

you will need to specifically ask for one. Turnitin also provides updates on their system status on Twitter.

Generally, assessment tasks must be submitted electronically via either Turnitin or a Moodle assignment. In instances where this is not possible, alternative submission details will be stated on your course's Moodle site. For information on how to submit assignments online via Moodle: https://student.unsw.edu.au/how-submit-assignment-moodle

Late Submission Penalty

UNSW has a standard late submission penalty of:

- 5% per calendar day,
- for all assessments where a penalty applies,
- capped at five calendar days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Students are expected to manage their time to meet deadlines and to request Special Consideration as early as possible before the deadline. Support with Time Management is available here.

School Contact Information

beadmin@unsw.edu.au