

TIMBER, MASONRY, AND HYBRID STRUCTURES DESIGN

CIV_ENV 395-0

Fall 2025

Class Hours: Tuesday/Thursday 2:00–3:20 pm, Friday 11:00-11:50am

Room Location: Tuesday/Thursday – Tech M166, Friday – Tech F281

Prerequisites: CIV_ENV 325 Reinforced Concrete Design (or Instructor permission)

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Office Hours: MW 11:00am-11:50am, or by appointment

Course Materials: 1) The Masonry Standards Joint Committee's (MSJC) 2016 or 2022 Building Code for Masonry Structures, (ACI 530.1/ASCE 6/TMS 602), and Commentaries, The Masonry Society. (recommended, not required)
2) 2024 Wood Design Package – including the National Design Specification for Wood Construction (NDS) and NDS supplement: Design values for Wood Construction (American Forest and Paper Association and American Wood Council) – free online viewer ([Resourcehub Filter - American Wood Council \(awc.org\)](https://www.awc.org/resourcehub/filter-american-wood-council))

Course webpage: canvas.northwestern.edu

Catalog Description: This course is an introduction to the design of timber, masonry, and hybrid structures. Design of timber and masonry structural elements: beams, columns, walls, and connections, subject to vertical and lateral structural loads will be covered. Seismic analysis, torsional effects, and design of lateral force resisting systems elements, including diaphragms and shear walls, will also be explored. Students will develop a foundational understanding of hybrid structural systems and its importance in emerging new viable solutions for developing sustainable structures which have lower negative environmental footprint compared to the conventional construction methods.

Course Outcomes: At the completion of this course, students will have the necessary skills to:

1. Design timber structural elements: beams, columns, CLT, connections, diaphragm, shear walls, and tension members.
2. Design reinforced masonry structural elements: beams, columns, shear walls.
3. Analyze structures for seismic base shear.
4. Analyze and classify rigid and flexible diaphragms.
5. Analyze distribution of gravity and lateral loads on a structure.
6. Understand the different variables to be considered when designing a hybrid structure.

Grading Policy: Grades between 0 and 100 are assigned based upon the level of mastery of the subject by the student. Grades will not be curved.

Homework: Weekly homework/quiz assignments. All handwritten assignments must be done on Engineering paper. Neatness and presentation will be evaluated.

Final Grade: The percentage grade is divided as follows:

Student Work	Percentage Contribution to Final Grade
HW/Quiz	60%
Project	40%

The letter grades which correspond to each percentage range are as follows:

Percentage	Letter Grade	Percentage	Letter Grade	Percentage	Letter Grade
95-100%	A	80-82%	B-	67-69%	D+
90-94%	A-	77-79%	C+	63-66%	D
87-89%	B+	73-76%	C	60-62%	D-
83-86%	B	70-72%	C-	0-59%	F

Academic Integrity: Assignments that are turned in must represent the student's own work. Submission of any assignment that is in violation of this policy will result in zero points granted for that specific assignment.

TENTATIVE CLASS SCHEDULE

Date	Day	Week	Topic	Assignment due
09-18	Thursday	1	Designing Buildings + <i>Design Project</i>	
09-19	Friday		Structural Loads	
09-23	Tuesday	2	Structural Loads	
09-25	Thursday		Structural Systems	
09-26	Friday		Structural Systems	
09-30	Tuesday	3	Properties of Wood and Lumbar Grades	
10-02	Thursday		Properties of Wood and Lumbar Grades	
10-03	Friday		<i>Architectural Design Considerations – Design Project</i>	HWQ1 (Loads)
10-07	Tuesday	4	Structural Glued Laminated Timber	
10-09	Thursday		Structural Glued Laminated Timber	
10-10	Friday		<i>Structural Grids – Design Project</i>	HWQ2 (Timber)
10-14	Tuesday	5	Beam Design	
10-16	Thursday		Axial Forces + Combined Bending and Axial Forces	
10-17	Friday		<i>Update – Design Project</i>	
10-21	Tuesday	6	Wood Panels, Diaphragms and Shearwalls	
10-23	Thursday		Timber Connections	
10-24	Friday		Mass Timber Design and Construction	HWQ3 (Timber Design)
10-28	Tuesday	7	Cross-Laminated Timber Design	
10-30	Thursday		Cross-Laminated Timber Design	
10-31	Friday		<i>Hybrid Structure Considerations – Design Project</i>	
11-04	Tuesday	8	Masonry Properties and Construction	
11-06	Thursday		Non-Load Bearing Masonry Elements	HWQ4 (Mass Timber)
11-07	Friday		<i>Design Charette – Design Project</i>	
11-11	Tuesday	9	Non-Load Bearing Masonry Elements	
11-13	Thursday		Load Bearing: Bearing Walls	
11-14	Friday		Load Bearing: Bearing Walls	HWQ5 (Masonry)
11-18	Tuesday	10	Load Bearing: Shear Walls	
11-20	Thursday		Load Bearing: Shear Walls	
11-21	Friday		<i>Update – Design Project</i>	
11-25	Tuesday	11		
11-27	Thursday		Thanksgiving Break	
11-28	Friday			
12-02	Tuesday	12	Strength Design: Comparison and Examples	HWQ6 (Masonry Design)
12-04	Thursday		Work on Design Projects	
12-05	Friday		<i>Presentation – Design Project</i>	
12-11	Thursday		<i>Project Report Due</i>	