THEORY OF STRUCTURES I
CIV_ENV 221-0
Fall 2025

Class Hours: Mon/Wed/Fri 1:00–1:50 pm and Thu 9:30–10:50 am

Room Location: Mon/Wed/Fri – Tech A110 and Thu – Tech F280

Prerequisites: CIV_ENV 216 Mechanics of Materials: analytical and experimental study of stresses and deformations and their application to the design of machine and structural elements subjected to static, dynamic, and repeated loads.

Instructor:
Eric Garcia, PhD, PE
Office: Tech A222
Phone: 8474917232
Email: ericvincent.garcia@northwestern.edu

Office Hours: MWF 9:00am-9:50am, or by appointment

Course Materials: R.C. Hibbeler, Structural Analysis, any edition (recommended).
Bryant Neilson, Structural Analysis, Understanding Behavior, 1st Edition (recommended)
SAP2000 Structural Analysis software. Student version at csiamerica.com .

Course webpage: canvas.northwestern.edu

Catalog Description: Deflections of structures, energy concepts, idealization of structures, truss analysis, column stability, and influence lines. Introduction to indeterminate truss and frame analyses, slope-deflection analysis, and moment distribution. Portal method. Influence Lines. Introduction to matrix analysis, computer analysis.

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

1. Describe what a limit state is in a structure
2. Use tributary area method to determine loads on a structure
3. Use load and resistance factors to conduct a conceptual design
4. Classify a structure as determinate or indeterminate
5. Analyze determinate and indeterminate trusses and frames
6. Determine the deflections of structures under load using virtual work
7. Analyze an indeterminate structure using various methods: consistent displacement, slope deflection, and matrix methods
8. Analyze structures for moving loads and construct influence lines.
9. Determine buckling stability of axial compression members
10. Use SAP2000 to conduct linear-elastic analyses of planar structures

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	30%
Lab/Activities	10%
Project	15%
Midterm Exams (2 @ 12.5%)	25%
Final Exam	20%

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

Percentage	Letter Grade	Percentage	Letter Grade	Percentage	Letter Grade
92-100%	A	80-82%	B-	67-69%	D+
90-91%	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	Assigned	Due
09-17	Wednesday	**1**	Introduction, Review, Structures and Loads		
09-18	Thursday		Structures and Loads	ST & HW1	
09-19	Friday		Structures and Loads		
09-22	Monday	**2**	Structural Analysis of Stat. Det. Structure	HW2	
09-24	Wednesday		Structural Analysis of Stat. Det. Structure		
09-25	Thursday		***Shake Table (ST) Lab***		**HWQ1**
09-26	Friday		Structural Analysis of Stat. Det. Truss		
09-29	Monday	**3**	Structural Analysis of Stat. Det. Truss	HW3	**HWQ2**
10-01	Wednesday		Structural Analysis of Stat. Det. Truss		
10-02	Thursday		***Truss Lab***		**ST&Truss Lab**
10-03	Friday		Internal Loadings Developed in Structural Members	HW4	
10-06	Monday	**4**	Internal Loadings Developed in Structural Members		**HWQ3**
10-08	Wednesday		Exam 1 Review		
10-09	Thursday		**MIDTERM EXAM 1**		**HW4**
10-10	Friday		Cables and Arches	**Project**	
10-13	Monday	**5**	Cables and Arches	HW5	
10-15	Wednesday		Influence Lines for Stat. Det. Structure		
10-16	Thursday		***- SAP2000 / Workshop tutorial -***		
10-17	Friday		Influence Lines for Stat. Det. Structure		
10-20	Monday	**6**	Influence Lines for Stat. Det. Structure	HW6	**HWQ5**
10-22	Wednesday		Influence Lines for Stat. Det. Structure		
10-23	Thursday		***Deflection Lab***		**Defl. Lab**
10-24	Friday		Deflections		
10-27	Monday	**7**	Deflections		
10-29	Wednesday		Deflections Using Energy Methods	HW7	**HWQ6**
10-30	Thursday		***SAP2000 Lab***		**SAP Lab**
10-31	Friday		Deflections Using Energy Methods		
11-03	Monday	**8**	Deflections Using Energy Methods		
11-05	Wednesday		Exam 2 Review		*Project Calcs*
11-06	Thursday		**MIDTERM EXAM 2**		**HW7**
11-07	Friday		Approx. Analysis of Stat. Indeterminate Structures.		
11-10	Monday	**9**	Approx. Analysis of Stat. Indeterminate Structures.	HW8	
11-12	Wednesday		Analysis of Stat. Indet. Structures: Force Method		
11-13	Thursday		***-Work of Project-***		
11-14	Friday		Disp. Method of Analysis: Slope-Deflection		
11-17	Monday	**10**	Disp. Method of Analysis: Slope-Deflection		**HW/Q8**
11-19	Wednesday		Disp. Method of Analysis: Moment Distribution	HW9	
11-20	Thursday		Analysis of Stat. Indet. Structures: Force Method		
11-21	Friday		Analysis of Stat. Indet. Structures: Disp. Method		
11-24	Monday	**11**	***-Work of Project-***		
11-26	Wednesday				
11-27	Thursday		**THANKSGIVING BREAK**		
11-28	Friday				
12-01	Monday	**12**	Stiffness Method		**HW/Q9**
12-03	Wednesday		Stiffness Method		

12-04	Thursday		***Bridge Testing***		
12-05	Friday		**Final Exam Review**		
12-10	Wednesday		**FINAL EXAM**	**9-11am**	