

ARCHITECTURE 314

Structures I

Course Introduction:

Course Syllabus

Course Schedule

Online Resources

Introduction to Structures

Teaching Staff:

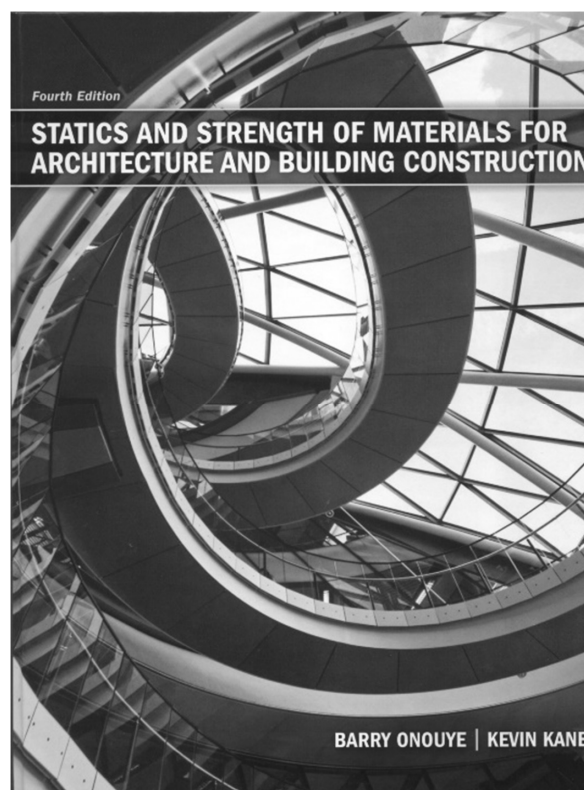
Prof.

Dr.-Ing. Peter von Bülow pvbuelow@umich.edu

GSIs:

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Alireza Fazel arfazel@umich.edu 003 & 6



Course Organization

- Lectures – 2 per week - MW
- Recitation – Friday
- 24 Lecture Quizzes
- 12 Topic Canvas Quizzes
- 14 HW Problems – on website

• Evaluation –

24 lecture quizzes	240
12 topic quizzes	240
14 HW Problems	800
Bridge Project	250
12 Recitation Labs	240
TOTAL	1770

• Text – (required)

Statics and Strength of Materials for Architecture and Building Construction (any edition)
by B. Onouye & K. Kane

• Example Problems – on website

• Website

<https://structures1.tcaup.umich.edu/>

ARCHITECTURAL STRUCTURES I Syllabus

Dr.-Ing. Peter von Bülow
pvbuelow@umich.edu
Office 1205c TCAUP
Phone 763-4931

office hours:
by appointment

Lecture 001 MW 9:30 – 10:30

Recitation Th-F (six sections):

Section 002 F 9:30-10:30

Section 003 F 10:30-11:30

Section 004 Th 1:00-2:00

Section 005 Th 2:00-3:00

Section 006 F 9:30-10:30

Section 007 F 10:30-11:30

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Catalog Description

This course covers the basic principles of architectural structures, including: the influence of geometric, sectional, and material properties related to flexure and shear in beams and framed systems; vector mechanics with application to analysis of trusses, catenaries, and arches; diagrammatic analysis of beams for bending moment, shear, and deflection; and the study of structural framing systems for vertical and lateral loads.

Objectives

Students are introduced to the fundamentals of statics and mechanics, as well as the behavior of structural materials and simple elements and systems subjected to gravity and lateral loads. Diagramming of force distribution in beams as well as topics of stress, strain and stability are covered. Through classroom demonstrations as well as physical construction and testing, aspects of strength and stability of structural systems are examined.

Organization

The course is lecture based, and the concepts and procedures are taught in this context with additional homework problems solved by the students. Weekly recitations provide opportunity for small demonstration labs as well as student-instructor interaction. A group design and construction project (load testing of a bridge) offers a chance to test out concepts covered in the class. Computer facilities, including software, are available for supporting computations. A course web site is used to post all lectures, homework problems, as well as other information for the class (<http://www.structures1.tcaup.umich.edu/>). Weekly topic quizzes will also be posted on the course Canvas site.

Evaluation

Evaluation is based on an accumulated total number of points. Points are earned based on performance in all course activities – lecture quizzes, topic quizzes (Canvas), homework problems, recitation labs, and the bridge project. Grades are based on the total number of points achieved during the semester:

24 lecture quizzes, 10pts each	240
12 topic quizzes, 20pts each	240
14 homework problems, 5 pts / question	800
bridge testing project	250
12 recitation labs, 20 pts each	240
TOTAL	1770

The point scale relates to a full range of letter grades assigned as follows:

A	1652	A-	1593
B+	1534	B	1475
C+	1357	B-	1416
D+	1180	C	1298
		C-	1239
		D	1062
		D-	1061 and below

By University policy the minimum passing grade for undergraduates is a D (1121) and for graduate students it is a C (1298).

Course Schedule

Lectures

Monday & Wednesday
posted on website w/quiz

Recitation

Friday – 12 Labs

Exercise Problems

on course website

Homework

on course website

Topic Quizzes

weekly on Canvas

Course Website

<https://structures1.tcaup.umich.edu/>

DATES	TOPICS	Reading (Onouye 4 th ed.)	HW PROBLEMS
AUG 31 SEP 2 SEP 4	Course Intro. Overview of Forces Vertical Loads Lateral Loads	Ch. 1: pp. 1-14 Ch. 2.1: pp. 15-22	Structures video TA 645.S78
SEP 7 SEP 9 SEP 11	LABOR DAY ***** NO CLASS ***** Force Systems: Vector Addition Recitation 1. Adding Forces	LABOR DAY ***** NO CLASS ***** Ch. 2.2 & 2.3: pp. 23-41	LABOR DAY ***** NO CLASS ***** 1. Dead Load Calculation (9/6)
SEP 14 SEP 16 SEP 18	Force Systems: Moment of a Force Force Systems: Equilibrium Recitation 2. Moment of a Force Topic Quiz 1	Ch.2.3: pp.42-60 Ch.3.6: pp.175-184 Ch. 2.4 – 2.6: pp. 61-95	2. Three Vector Addition (9/13)
SEP 21 SEP 23 SEP 25	Equilibrium of Rigid Bodies Cable Systems Recitation 3. Equilibrium Topic Quiz 2	Ch. 3.2: pp. 111-118 Ch. 3.1: pp. 96-110	3. Moment of a Force (9/20) 4. Parallel Force Systems (9/21)
SEP 28 SEP 30 OCT 2	Catenary Arches and Shells + Bridge Project Introduction Plane Trusses (by Joints) Recitation 4. Truss Stability Topic Quiz 3	Ch. 3.3: pp. 119-127	5. Equilibrium of Rigid Bodies (9/27)
OCT 5 OCT 7 OCT 9	Plane Trusses (by Sections) Plane Trusses (by Graphic Statics) Recitation 5. Graphic Statics Topic Quiz 4	Ch. 3.3: pp. 128-152	6. Cable Systems (10/4)
OCT 12 OCT 14 OCT 16	Pinned Frames Three Hinged Arches Recitation 6. Three Hinged Arches Topic Quiz 5	Ch. 3.4: pp. 153-163 Ch. 3.5: pp. 164-174 (interim bridge report due - 10.16)	7. Truss Systems (10/11)
OCT 19 OCT 21 OCT 23	***** FALL STUDY BREAK ***** Load Tracing & Floor Systems Recitation Topic Quiz 6	FALL STUDY BREAK ***** Ch. 4.1: pp. 195-230	FALL STUDY BREAK ***** 8. Three Hinged Arches (10/25)
OCT 26 OCT 28 OCT 30	Lateral Stability Stress and Strain Recitation 7. Lateral Stability Topic Quiz 7	Ch. 4.2: pp. 231-250 Ch. 5.1: pp. 251-266	9. Floor Systems (11/1)
NOV 2 NOV 4 NOV 6	Elasticity and Deformation <i>Building Big – Bridges</i> (video) Recitation	Ch. 5.2-5.4: pp. 267-293	10. Elastic Deformation (11/8)
NOV 9 NOV 11 NOV 13	***** Bridge Testing ***** Cross-Sectional Properties Recitation 8. Moment of Inertia Topic Quiz 8	***** Bridge Testing ***** Ch. 6.1 – 6.4: pp. 300-331	***** Bridge Testing ***** 11. Moment of Inertia (11/15)
NOV 16 NOV 18 NOV 20	Shear and Bending Forces pt1 Shear and Bending Forces pt2 Recitation 9. Bending Force Topic Quiz 9	Ch. 7.1-7.3: pp. 332-345 Ch. 7.4-7.5: pp. 346-364	12. V & M Diagrams (11/22)
NOV 23 NOV 25 NOV 27	video "When Engineering Falls" ***** THANKSGIVING BREAK ***** ***** THANKSGIVING BREAK ***** No Quizzes this week	***** THANKSGIVING BREAK ***** ***** THANKSGIVING BREAK ***** ***** THANKSGIVING BREAK *****	***** THANKSGIVING BREAK ***** ***** THANKSGIVING BREAK ***** ***** THANKSGIVING BREAK *****
NOV 30 DEC 2 DEC 4	Bending Stresses Shear Stresses Recitation 10. Shear Force Topic Quiz 10	Ch. 8.1-8.2: pp. 365-381 Ch. 8.1-8.2: pp. 365-381	13. Horizontal Shear (12/6)
DEC 7 DEC 9 DEC 11	Deflection of Beams pt1 Deflection of Beams pt2 Recitation 11. Beam Deflection Topic Quiz 11	Ch. 8.3-8.4: pp. 392-401 Ch. 8.5: pp. 402-418	(final bridge report due – 12.7) 14. Deflection of Beams (12/13)

Course Website

<https://structures1.tcaup.umich.edu/>



Structures

Contact

Contact

Schedule

Lectures

Recitation

Bridges1

Bridges2

Problems

Structures I - Arch 314 - Fall 2026

9:30 - 10:30 MW - Rm 2104

Professor Peter von Buelow, Dr.-Ing.

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Recitation Sections



Lectures

M

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Architecture

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Lectures

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Lectures

Recitation

Bridges1

Bridges2

Problems

2025 Lectures



Topic Quizzes

Lectures	Date	w/Quiz	Video	Slides	Notes
Course Intro	Aug 31				
Vertical Loads on Structures	Sep 2				
Lateral Loads on Structures	Sep 4				
Forces and Vector Addition	Sep 9				

Recitation Notes & Labs

M

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Recitation

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Recitation

Bridges1

Bridges2

Problems



Notes & Videos from 2025:

Section Rosters:

	Mohsen Vatandoost	Alireza Fazel
	002,4,5,7	003,6
Recitation Topics: Labs	Notes/Video	Notes
Adding Forces		
Moments of Forces		

Bridge Project

M

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Project

ContactScheduleLecturesRecitationBridges 1Bridges2Problems



Bridge Project Brief 2026

Prelim Report Guidelines 2026

Final Report Guidelines 2026

Scoring Rubric 2026

Examples of Bridge Types

Example Reports

Dr. Frame Software (in Canvas "files")

Dr. Frame Tutorial

Dr. Frame User's Guide

West Point Bridge Designer

Videos of Bridge Testing

Computer Problems

<https://structures1.tcaup.umich.edu/problems/problems.php>

Uniqname

UMID >>Number<< (NOT Kerberos)

M

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Problems

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You must supply a uniqname.

Please login to access this page:

uniqname:

UMID#:

Login

or login with
uniqname = guest
and UMID# = 123

Computer Problems

Problem Menu

Check Grades

Select Problem

Download Instructions

M

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Problems

ContactScheduleLecturesRecitationBridges1Bridges2Problems

Logged in as: Peter von Buelow

Problems
Check Points
Problem FAQ

#	Description	Due Date	Current Scores
- 1 -	Dead Load Calculation PDF	9-06-2026	(1) 15/20 completed (2) 0/20 not completed (3) 0/20 not completed
- 2 -	Three Vector Addition PDF	9-13-2026	(1) 0/50 not completed (2) 0/50 not completed (3) 0/50 not completed
- 3 -	Moment of a Force PDF	9-20-2026	(1) 0/30 not completed (2) 0/30 not completed (3) 0/30 not completed
- 4 -	Parallel Force Systems PDF	9-21-2026	(1) 0/25 not completed (2) 0/25 not completed (3) 0/25 not completed
- 5 -	Equilibrium of Rigid Bodies PDF	9-27-2026	(1) 0/35 not completed (2) 0/35 not completed (3) 0/35 not completed

Computer Problems

M

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1. Dead Load Calculation

For the given member cross-section and length, find the DL in PLF of the joist member, total pounds of the member, and PSF DL of the joist on the floor.

DATASET: 1

-2-

-3-

Width: b

Depth: d

Length: L

On center spacing

Species class

Density

1.5 IN

9.25 IN

7 FT

24 IN

Aspen

25 PCF

#	Question	Your Response	Correct Answer	Score
1	The cross-sectional area: A	IN^2	SUBMIT	
2	Dead load of joist section	PLF	SUBMIT	
3	Dead load of whole joist member	LBS	SUBMIT	
4	Dead load of joists on floor	PSF	SUBMIT	

Current Score: 0 / 20

Structures

