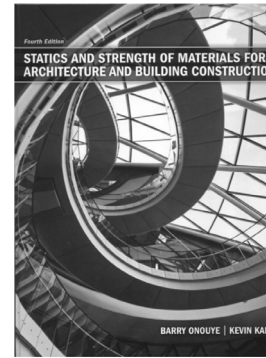


ARCHITECTURE 324

STRUCTURES II

Course Introduction:

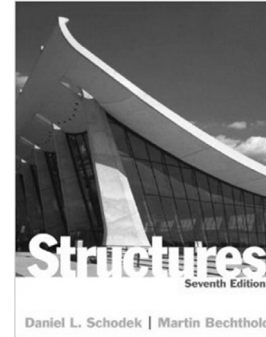
Course Syllabus
 Course Format
 Online Resources



Teaching Staff:

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

GSI's:
 002 Faezeh Choobkar faezehch@umich.edu
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 006 Mohsen Vatandoost mohsenv@umich.edu



Course Syllabus

Organization

- Lecture – Monday & Wednesday
- Recitation – Friday
- HW Problems – on web
- Topic Quiz - weekly

Evaluation

- 24 Lecture Quizzes 240
- 12 Topic Quizzes 240
- 11 HW Problems 790
- Tower Project 250
- 9 Recitation Labs 180

Text

- *Structures* by Schodek
- *Statics and Strength of Materials* by Onouye
- Code material on Canvas
- Web site
<https://structures.tcaup.umich.edu/>

Architecture 324
 3 credit hours

<http://www.structures.tcaup.umich.edu/>
 Winter 2025

ARCHITECTURAL STRUCTURES II Syllabus

Prof. Peter von Buelow
 pvbuelow@umich.edu
 Office 1205c TCAUP
 Phone 763-4931
 office hours:
 by appointment

Section 001 9:30-10:30 MW
 Recitation Sections F
 Section 002 9:30-10:30
 Section 003 10:30-11:30
 Section 004 9:30-10:30
 Section 005 10:30-11:30
 Section 006 9:30-10:30

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CATALOG DESCRIPTION

This course covers the basic principles of elastic behavior for different materials such as wood, steel, concrete and composite materials, and compares the properties and applications of materials generally. It investigates cross sectional stress and strain behavior in flexure and in shear, and torsion as well as the stability of beams and columns. The qualitative behavior of combined stresses and fracture in materials is also covered. Prerequisite: ARCH 314

OBJECTIVES

Students are introduced to the fundamentals of analysis and design of simple structural members in wood, steel, concrete and masonry. Basic code requirements of strength, stability and serviceability are discussed. Both vertical and lateral loads based on ASCE-7 are considered. Principles of composite materials design, and structural continuity are covered.

ORGANIZATION

The course is comprised of lectures (Monday & Wednesday) and a recitation (Friday). The lectures will be posted on the course website and may be watched asynchronously if you cannot attend in person. Lecture attendance is not required, however there is a quiz with each lecture. The lectures cover structural concepts and procedures of design using the primary building materials of wood, steel, concrete and masonry. Each Friday the class is broken into smaller recitation sections in which the GSI's review analysis procedures of the various structural elements discussed in the lectures. Recitations may also include an in-class lab assignment. Solutions to homework problems are entered online through the course website. Topics are summarized weekly through Canvas Topic Quizzes. In addition, a construction/testing project gives students an opportunity to apply concepts to a physical design. Computer facilities, including software, are available on machines in the building, for supporting computations.

EVALUATION

Evaluation is based on an accumulated total number of points. Points are earned based on performance in all course activities – 24 lecture quizzes, 12 Canvas topic quizzes, 11 homework problems, 9 recitation labs, and the tower project. Grades are assigned according to the number of points achieved during the semester:

24 lecture quizzes 10 pts each	240
12 topic quizzes 20 pts each	240
11 homework problems, 5pts/question	790
tower testing project	250
9 recitation labs, 20 pts each	180
TOTAL	1700

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

A+ 1643	A 1587	A- 1530
B+ 1473	B 1417	B- 1360
C+ 1303	C 1247	C- 1190
D+ 1133	D 1077	D- 1020
	E 1015 and below	

By University policy the minimum passing grade is a D (1077). The highest recorded grade in Architecture is an A. For graduate students C- (1190) is required to pass.

Course Schedule

Lectures

Monday & Wednesday
video recorded and posted

Recitation

Friday with GSI
online signup – see emailed link

Homework

On course website "Problems"

Quizzes

Lecture Quizzes – in class or in Canvas video
Canvas (weekly Topic Quiz)

Project

tower
weight and load

DATE	TOPIC	Text Reading	PROBLEMS (due dates online)
JAN 8	Course Intro	Onouye, Schodek	
JAN 13	1 - Wood Properties	NDS	
JAN 15	2 - Wood Beam Analysis	Schodek 6.4.2	
JAN 17	Recitation [1-Wood Beams]	Topic Quiz 1	1. Wood Beam Analysis
JAN 20	Martin Luther King Day **** No Class ****		**** Martin Luther King Day **** No Class
JAN 22	3 - Wood Beam Design	Onouye 8	
JAN 24	Recitation	Topic Quiz 2	2. Wood Beam Design
JAN 27	4 - Wood Column Analysis	Onouye 9.1-9.2 & 9.4, Schodek 7.4.3	
JAN 29	5 - Wood Column Design	NDS	Tower Intro
JAN 31	Recitation [2-Wood Columns]	Topic Quiz 3	3. Wood Column Analysis
FEB 3	6 - Cross Laminated Timbers	CLT Handbook	
FEB 5	7 - Steel Properties	AISC, Onouye 8.7	
FEB 7	Recitation – Tower Project	Topic Quiz 4	
FEB 10	8 - Steel Beam Analysis	Schodek 6.4.3	
FEB 12	9 - Steel Beam Analysis	Schodek 6.4.3	
FEB 14	Recitation [3-Steel Beams]	Topic Quiz 5	Prelim. Tower Report Due 4 Steel Beam Analysis
FEB 17	10 - Steel Beam Design	Schodek 6.4.3	
FEB 19	11 - Steel Column Analysis	Onouye 9.3, Schodek 7.4.4	
FEB 21	Recitation [4-Steel Columns]	Topic Quiz 6	5. Steel Beam Design
FEB 24	12 - Steel Column Design	Onouye 9.3, Schodek 7.4.4	
FEB 26	"Skyscrapers" David Macaulay video		
FEB 28	Recitation	Topic Quiz 7	6. Steel Column Analysis
MAR 3	WINTER RECESS **** NO CLASS ****		**** WINTER RECESS **** NO CLASS ****
MAR 5	WINTER RECESS **** NO CLASS ****		**** WINTER RECESS **** NO CLASS ****
MAR 7	WINTER RECESS **** NO CLASS ****		**** WINTER RECESS **** NO CLASS ****
MAR 10	13 - Continuous Beams	I Engel Ch. 17, Schodek 8	
MAR 12	14 - Gerber Beams	Schodek 8.4.4	
MAR 14	Recitation [5-Continuous Beams]	Topic Quiz 8	7. Three Moment Theorem
MAR 17	15 - Intro to Concrete – PCA video.		
MAR 19	16 - Concrete Beams	Schodek 6.4.4 – 6.4.6	
MAR 21	Recitation [6-Stress vs Strain]	Topic Quiz 9	
MAR 24	Tower Testing **** Tower Testing ****	I Engel Ch. 15	**** Tower Testing ****
MAR 26	17 - Concrete Beams		
MAR 28	Recitation	Topic Quiz 10	8. Concrete Beam Analysis
MAR 31	18 - Concrete Beam Design	Schodek 7.4.5	
APR 2	19 - Concrete Columns		
APR 4	Recitation [7-Concrete Reinforcing]	Topic Quiz 11	
APR 7	20 - Composite Sections		
APR 9	21 - Composite Sections		
APR 11	Recitation [8-Composite Sections]	Topic Quiz 12	10. Composite Sections
APR 14	22 - Masonry Intro.	TMS 402	
APR 16	23 - Masonry Walls	TMS 402	
APR 18	Recitation [9-Lateral Stability]	Topic Quiz 13	Final Tower Report Due 11. Masonry Walls
APR 21	24 - Masonry Walls	TMS 402	

Course Web Site

<http://www.structures.tcaup.umich.edu/>



MICHIGAN

Architecture

Structures

Contact

Contact
Schedule
Lectures
Recitation
Towers1
Towers2
Problems

Structures II Website - ARCH 324

Professor Peter von Buelow, Dr.-Ing.

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Recitation Sections



Where is your GSI



Lectures

M
MICHIGAN
Architecture
Structures
Lectures

Contact Schedule Lectures Recitation Towers1 Towers2 Problems



2024 Lectures 

Canvas 


Date	Lectures	Video w/Quiz	Video	Slides	Notes
Jan 8	Course Intro				


Recitation










M
MICHIGAN
Architecture
Structures
Recitation

Contact Schedule Lectures Recitation Towers1 Towers2 Problems

GSIs2025 width=

More Example Problems 

Recitation Sections 

		Faezeh Choobkar 002 / 003	Alireza Fazel 004 / 005	Mohsen Vatandoost 006	old1	old2
Recitation Topics	Labs	Notes	Notes	Notes	Video	Notes
Wood Beam Analysis 1/19	 					
Wood Beam Design 1/26	none					
Wood Columns 2/2						

Recitation Sign Up

Arch 324 Recitation Sign Up

This form is to allow you the option to try to choose a certain section for your recitation. If you have a course conflict with certain times, be sure to list it

A section will be filled by the first 20 students to choose that section. Or if you have a time conflict that requires a certain section (like 10:30 - 11:30) the last one in will get bumped out. So if you have a time conflict you must enter the section(s) you can attend even if they are full.

Here is the list of Sections with GSIs:

002 Faezeh Choobkar	Friday	9:30-10:30	rm TBD	✓
003 Faezeh Choobkar	Friday	10:30-11:30	rm TBD	
004 Alireza Fazel	Friday	9:30-10:30	rm TBD	
005 Alireza Fazel	Friday	10:30-11:30	rm TBD	
006 Mohsen Vatandoost	Friday	9:30-10:30	rm 2104	

pvbuelow@umich.edu [Switch account](#)

* Indicates required question

Email *

Record pvbuelow@umich.edu as the email to be included with my response

Section 1st choice

Choose

Section 2nd choice

Choose

Tower Test

M MICHIGAN Architecture

Structures Project

Contact Schedule Lectures Recitation **Towers 1** Towers2 Problems



- Testing Signup Sheet
- Tower Project Brief 2024
- Prelim Report Guidelines 2024
- Final Report Guidelines 2024
- Score Sheet 2024
- Study of Tower Types
- Example Reports
- Dr. Frame Software (download)
- Dr. Frame Tutorials
- STAAD example
- Videos of Old Tower Tests

Tower Test

M MICHIGAN Architecture Structures Project

Contact Schedule Lectures Recitation Towers 1 Towers 2 Problems

Test Score Formula: $(4\text{weight OZ}) + (\text{load LBS}/50) + (\text{load LBS}/\text{weight OZ}) \times 1.5$ Score

2024 Tower Test Video Photos from testing

Click on a team to view details.

Sort by Views Descending

Team Name	Score	Load	Load/Weight	Views
Borim Bridge Co.	127.7	320 lbs	80.2	61
Beam Team	112.1	290 lbs	70.22	21
Group 1	97.9	220 lbs	55	26
lower patch kids	89.17	220 lbs	55.84	31
Skibidi Tower	95.6	210 lbs	60.17	17
PV8 Fan Club	78.28	190 lbs	48.97	23
Tower Power	73.72	160 lbs	46.24	21
Group 2	64.2	160 lbs	40	9
Power Tower	57.95	140 lbs	36.08	22

Computer Problems

Uniqname

UM ID Number

M MICHIGAN Architecture Structures Problems

Contact Schedule Lectures Recitation Project Problems

You must supply a uniqname.

Please login to access this page:

uniqname: pvbuelow

ID#: *****

Login

or login with
uniqname = guest
and
UMID# = 123

Computer Problems

Problem Menu

Check Grades

Problem [FAQ](#)

Select Problem

Download Instructions

Work Problem (best of 3 versions)

M MICHIGAN Architecture Structures Problems

Contact Schedule Lectures Recitation Project Problems

Logged in as: PvB

Problems
Check Points
Problem FAQ

#	Description	Due Date	Current Scores
-1-	Wood Beam Analysis	1-31-2021	(1) 15/85 not completed (2) 0/85 not completed (3) 0/85 not completed
-2-	Wood Beam Design	2-07-2021	(1) 0/100 not completed (2) 0/100 not completed (3) 0/100 not completed
-3-	Wood Column Analysis	2-14-2021	(1) 0/75 not completed (2) 0/75 not completed (3) 0/75 not completed
-4-	Steel Beam Analysis	2-21-2021	(1) 0/85 not completed (2) 0/85 not completed (3) 0/85 not completed
-5-	Steel Column Analysis	2-28-2021	(1) 0/45 not completed (2) 0/45 not completed (3) 0/45 not completed
-6-	Three Moment Theorem	3-07-2021	(1) 0/60 not completed (2) 0/60 not completed (3) 0/60 not completed
-7-	Composite Sections	3-21-2021	(1) 0/55 not completed (2) 0/55 not completed (3) 0/55 not completed

Computer Problems

Problem Page

Choose Data Set

Enter Answers

Submit

Read Score

Correct if Necessary

M MICHIGAN Architecture Structures Problems

Contact Schedule Lectures Recitation Project Problems

Logged in as: PvB

1. Wood Beam Analysis

Analyze the given 4x dimensioned lumber beam to determine if it passes or fails the NDS code criteria. The beam carries both dead and live floor load plus its own selfweight. Check the actual shear and bending stresses against the factored allowable stresses including all applicable factors from the NDS. Load duration is based on the live load (CD = 1.0). Assume normal temperature, and no incising (Cl = Cl = 1.0). Find the beam selfweight including the given moisture content. The beam is braced at the ends and the C.L. (meets criteria in 4.4.1) so CL = 1.0.

Diagram: 4x4 Wood Beam, SPAN B = 12', SPAN A = 16', Section 4, Load Diagram with P, w, Span B.

DATASET: 1 2 3

Wood Species	HEM-FIR
Wood Grade	Select Structural
Span A	16 FT
Span B	12 FT
Nominal Depth of Beam, d	12 IN
Moisture Content, m.c.	15 %
Floor DL	7 PSF
Floor LL	35 PSF

#	Question	Your Response	Correct Answer	Score
1	Tabulated Allow. Bending Stress, Fb	1400 PSI	1400 PSI	5
2	Tabulated Allow. Shear Stress, Fv	150 PSI	150 PSI	5
3	Tabulated Wood Dry Density (specific gravity)	0.43	0.43	5
4	Total Actual Applied Point Load, P			
5	Wood Density (including M.C.)			
6	Beam Selfweight (including M.C.), w			
7	Actual Beam Bending Moment, M			
8	Actual Maximum Shear Force (at reaction), V			
9	Size Factor, CF			
10	Wet Service Factor for Fb, CM_b			
11	Wet Service Factor for Fv, CM_v			
12	Factored Allow. Bending Stress, Fb			
13	Factored Allow. Shear Stress, Fv			
14	Actual Bending Stress, fb_actual			
15	Actual Shear Stress, fv_actual			
16	Bending Stress Passing: enter "1" for pass or "0" for fail	(1 or 0)		
17	Shear Stress Passing: enter "1" for pass or "0" for fail	(1 or 0)		

Tips on how engineering students study for exams

