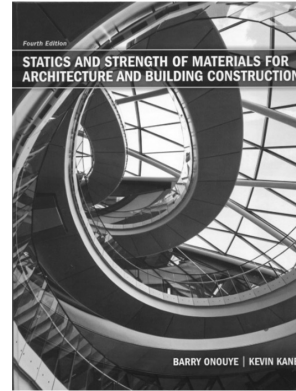


ARCHITECTURE 324

STRUCTURES II

Course Introduction:

Course Syllabus
Course Format
Online Resources

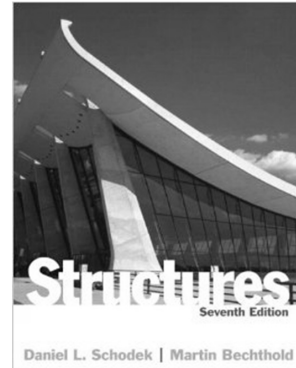


Teaching Staff:

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

GSI's:

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Course Syllabus

Organization

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

Evaluation

24 Lecture Quizzes	240
13 Topic Quizzes	260
12 HW Problems	820
Tower Project	250
10 Recitation Labs	200

Text

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

Architecture 324
3 credit hours

structures.tcaup.umich.edu/
Winter 2026

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	10:30-11:30
Section 007	9:30-10:30

GSI's

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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 GSIs 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
13 topic quizzes 20 pts each	260
12 homework problems, 5pts/ question	820
tower testing project	250
10 recitation labs, 20 pts each	200
TOTAL	1770

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

A+ 1711	A 1652	A- 1593
B+ 1534	B 1475	B- 1416
C+ 1357	C 1298	C- 1239
D+ 1180	D 1121	D- 1062
	E 1061 and below	

By University policy the minimum passing grade is a D (1121). For graduate students C- (1239) is required to pass. The highest recorded grade in Architecture is an A.

Course Schedule

Lectures

Monday & Wednesday
video recorded and posted on Canvas

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 7 JAN 9	Course Intro 1 - Wood Properties	Onouye, Schodek NDS	
JAN 12 JAN 14 JAN 16	2 - Wood Beam Analysis 3 - Wood Beam Design Recitation [1-Wood Beams]	Schodek 6.4.2 Onouye 8	
JAN 19 JAN 21 JAN 23	Martin Luther King Day **** No Class **** 4 - Wood Column Analysis Recitation	Topic Quiz 1 Onouye 9.1-9.2 & 9.4, Schodek 7.4.3	1. Wood Beam Analysis **** No Class
JAN 26 JAN 28 JAN 30	5 - Wood Column Design 6 - Cross Laminated Timbers Recitation [2-Wood Columns]	Topic Quiz 2 NDS Tower Intro CLT Handbook	2. Wood Beam Design
FEB 2 FEB 4 FEB 6	7 - Steel Properties 8 - Steel Beam Analysis Recitation – Tower Project	Topic Quiz 3 AISC, Onouye 8.7 Schodek 6.4.3	3. Wood Column Analysis
FEB 9 FEB 11 FEB 13	9 - Steel Beam Design 10 - Steel Column Analysis Recitation [3-Steel Beams]	Topic Quiz 4 Schodek 6.4.3 Onouye 9.3, Schodek 7.4.4 Prelim. Tower Report Due	4 Steel Beam Analysis
FEB 16 FEB 18 FEB 20	11 - Steel Column Design 12 - Continuous Beams Recitation [4-Steel Columns]	Topic Quiz 5 Onouye 9.3, Schodek 7.4.4 I. Engel Ch. 17, Schodek 8	5. Steel Beam Design
FEB 23 FEB 25 FEB 27	13 – 3-Moment Theorem “Tower without Ends” Tony Fitzpatrick video Recitation [5-Continuous Beams]	Topic Quiz 6	6. Steel Column Analysis
MAR 2 MAR 4 MAR 6	WINTER RECESS **** NO CLASS **** WINTER RECESS **** NO CLASS **** WINTER RECESS **** NO CLASS ****	Topic Quiz 7	**** NO CLASS **** **** NO CLASS **** **** NO CLASS ****
MAR 9 MAR 11 MAR 13	14 - Gerber Beams 15 - Intro to Concrete – PCA video Recitation [6-Flexural Strain]	Schodek 8.4.4	
MAR 16 MAR 18 MAR 20	16 - Concrete Beam Analysis 17 - Concrete Beam Design Recitation [7-Concrete Reinforcing]	Topic Quiz 8 Schodek 6.4.4 – 6.4.6 I. Engel Ch. 15	7. Three Moment Theorem
MAR 23 MAR 25 MAR 27	Tower Testing **** Tower Testing **** 18 - T-Beams Recitation	Topic Quiz 9 Schodek 7.4.5	8. Concrete Beam Analysis **** Tower Testing ****
MAR 30 APR 1 APR 3	19 - Concrete Columns 20 - Pre-Stressing Recitation [8 – Pre-Stressing]	Topic Quiz 10	9. Concrete Beam Design
APR 6 APR 8 APR 10	21 - Composite Sections Recitation [9-Composite Sections]	Topic Quiz 11	10. Pre-Stress
APR 13 APR 15 APR 17	22 - Masonry Intro. 23 - Masonry Walls Recitation [10-Lateral Stability]	TMS 402 TMS 402	11. Composite Sections
APR 20	24 - Masonry Vaults & Shells	Final Tower Report Due Sunday Topic Quiz 13	12. Masonry Walls (due Tues.)

Course Web Site

structures.tcaup.umich.edu



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ContactScheduleLecturesRecitationTowers1Towers2Problems

Structures II Website - ARCH 324

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Recitation Sections

Lectures

M

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2025 Lectures



Canvas

Date	Lectures	Video w/Quiz	Video	Slides	Notes
Jan 7	Course Intro				✓
Jan 13	Wood Properties				

Recitation

M

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Recitation

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More Example Problems

Recitation Sections

Abdallah Kamhawi

Amely Wackerbauer

Hui Zhu

Mohsen Vatandoost

002 / 003

004

005

006 / 007

old

old

Recitation Topics

Labs

Notes

Notes

Notes

Notes/Video

Video

Notes

Wood Beam Analysis
1/16







Recitation Sign Up

https://forms.gle/8Fvx2L257JGXdHs9

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	Abdallah Kamhawi	Friday	9:30-10:30	rm ARR
003	Abdallah Kamhawi	Friday	10:30-11:30	rm ARR
004	Amely Wackerbauer	Friday	9:30-10:30	rm ARR
005	Hui Zhu	Friday	10:30-11:30	rm ARR
006	Mohsen Vatandoost	Friday	10:30-11:30	rm 2104
007	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

Section 3rd choice

Choose

I have a time conflict at this time and cannot attend a recitation at this time

☐ 9:30-10:30

☐ 10:30-11:30

A copy of your responses will be emailed to pvbuelow@umich.edu.

Submit

Clear form

Tower Test

M

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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

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Test Score Formula: (4*weight OZ) + (load LBS/50) + (load LBS*weight OZ) x 1.5

2025 Tower Test VideoPhotos from testing

Click on a team to view details.

Sort by ViewsDescending

A. ALFRED TAUBMAN WING

TBD1 - Score: 62.63
Load: 375 lbs - Load/Weight: 53.5 - Views: 28

A. ALFRED TAUBMAN WING

Tower in Power - Score: 111.86
Load: 280 lbs - Load/Weight: 70.18 - Views: 12

A. ALFRED TAUBMAN WING

Tipthy (Lippy) - Score: 99.1
Load: 240 lbs - Load/Weight: 62.18 - Views: 7

A. ALFRED TAUBMAN WING

TBD5 - Score: 95.81
Load: 225 lbs - Load/Weight: 60.16 - Views: 30

A. ALFRED TAUBMAN WING

Frank's Tower of Power - Score: 116.5
Load: 210 lbs - Load/Weight: 73.94 - Views: 48

A. ALFRED TAUBMAN WING

The Real Slim Shaky - Score: 87.7
Load: 210 lbs - Load/Weight: 54.97 - Views: 18

A. ALFRED TAUBMAN WING

Going Up? Falling Down - Score: 85.16
Load: 210 lbs - Load/Weight: 53.3 - Views: 16

A. ALFRED TAUBMAN WING

The Real (Ashlynn) Tower - Score: 82.35
Load: 200 lbs - Load/Weight: 51.55 - Views: 13

A. ALFRED TAUBMAN WING

Pe Tower von Bulow - Score: 92.11
Load: 200 lbs - Load/Weight: 57.97 - Views: 15

Computer Problems

Uniqname
UM ID Number

M MICHIGAN Architecture

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ContactScheduleLecturesRecitationProjectProblems

You must supply a uniqname.

Please login to access this page:

uniqname:pvbuelow

UM 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

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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

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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 (CI = 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.

DATASET: 1-2-3-

Wood SpeciesHEM-FIR

Wood GradeSelect Structural

Span A16 FT

Span B12 FT

Nominal Depth of Beam, d12 IN

Moisture Content, m.c.15 %

Floor DL7 PSF

Floor LL35 PSF

4x4 Wood Beam

SPAN B

SPAN A

B/2

B/2

Section 4

d

Load Diagram

P

w

Span B

#	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

