ARCH 2615 Building Technology II: Structural Elements

Spring 2020

157 E. Sibley Hall

Tuesdays and Thursdays 10:10 am – 11:25 am

Instructor: Jonathan Ochshorn, 221 W. Sibley Hall, jo24@cornell.edu, 607-255-1194

Office hours: Fridays 9:00 am – 10:00 am; see
http://www.ochshorndesign.com/cornell/officeHours/officeHours.html

Grading: Letter grades only for architecture distribution credit; 3 credits [rev. 1/21/2020]

I. Rationale: This purpose of this course is to understand concepts and procedures for the design, manufacture, and construction of structural components (e.g., walls, columns, beams, slabs) in steel, concrete, masonry, and timber.

II. Course Aims and Objectives:

Aims

A. Students learn how to design structural elements, according to the following matrix:

	Wood	**Steel**	**Reinforced concrete**
Tension	*Not considered*	Steel hangers and threaded rods	*Not considered*
Compression	Wood columns	Steel columns	Reinforced concrete columns
Bending	Wood joists and beams	Steel beams and girders	Reinforced concrete T-beams

B. Students learn about the manufacture and construction of wood, steel, reinforced concrete, and masonry structural elements.

Specific Learning Objectives (NAAB criteria):

B.5	**Structural Systems**	*Ability* to demonstrate the basic principles of structural systems and their ability to withstand gravitational, seismic, and lateral forces, as well as the selection and application of the appropriate structural system.

III. Format and Procedures:

Lecture format.

IV. My assumptions:

I teach the material based on current codes promulgated by relevant industry organizations: American Institute of Timber Construction, American Institute of Steel Construction, and the American Concrete Institute. The course looks at determinate structures in wood and steel, and at indeterminate framed structures in reinforced concrete for which moment values can be found. I use the allowable stress design method for wood, the available strength design method for steel, and the strength design method (a version of LRFD) for reinforced concrete.

V. Course Requirements:

1. Class attendance and participation policy: Individuals with flu-like illnesses need to stay out of circulation. For those well enough to attend class, attendance is required (with notes from text submitted for each missed class).

2. Course readings:

Required text: Ochshorn, *Structural Elements for Architects and Builders*, *Second Edition*

3. How many credits? 3

4. Additional requirements: n/a

VI. Grading Procedures: Grades will be based on three prelims, a final exam (or project), and 6 homework assignments (of which 3 are graded). Because attendance is required, **a grade penalty may be assessed for *excessive* absences**. Notes from the text must be submitted for any missed class; doing so may reduce, but not eliminate, the grade penalty for excessive absences.

IMPORTANT: *Homework assignments must be turned in on time, in class. Late assignments will not be accepted, since solutions are posted online immediately after the deadline.*

The course grade is based on the following:

1. Homework assignments (15% grade)

2. Prelims, as follows:

- I. Wood (21% grade)
- II. Steel (21% grade)
- III. Masonry and reinforced concrete (21% grade)

3. Final exam (22% grade)

VII. Academic Integrity: Each student in this course is expected to abide by the Cornell University Code of Academic Integrity. Any work submitted by a student in this course for academic credit will be the student's own work, except in the cases of projects that are specifically structured as group endeavors.

You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an email, an e mail attachment file, a diskette, or a hard copy.

Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Code can also be extended to include failure of the course and University disciplinary action.

During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any

collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.

VIII. Accommodations for students with disabilities

In compliance with the Cornell University policy and equal access laws, I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances, so arrangements can be made. Students are encouraged to register with Student Disability Services to verify their eligibility for appropriate accommodations.

IX. Course Schedule

Week 1
Jan 21 Overview
Jan 23 Wood properties

Week 2
Jan 28 Wood systems
Jan 30 Load combinations

Week 3
Feb 4 Structural design of wood compression elements **Assignment #1 issued**
Feb 6 Structural design of wood beams (bending)

Week 4
Feb 11 Structural design of wood beams (shear and deflection) **Assignment #1 due**; **Assignment 2 issued (not collected)**
Feb 13 Review

Week 5
Feb 18 Steel properties and systems
Feb 20 **Prelim 1 (wood)**

Week 6
Feb 25 February break
Feb 27 Structural design of steel columns

Week 7
Mar 3 Structural design of steel tension elements **Assignment #3 issued**
Mar 5 Structural design of steel beams

Week 8
Mar 10 Structural design of steel beams (shear and deflection) **Assignment #3 due ; Assignment #4 issued (not collected)**
Mar 12 Review

Week 9
Mar 17 **Prelim 2 (steel)**
Mar 19 Masonry properties

Week 10
Mar 24 Masonry systems
Mar 26 Reinforced concrete properties

Week 11
Mar 31 Spring break (no class)
Apr 2 Spring break (no class)

Week 12
April 7 Reinforced concrete systems
April 9 Reinforced concrete (Structural design of columns) **Assignment #5 issued**

Week 13
April 14 Reinforced concrete (Moment values and rectangular beams)
April 16 Reinforced concrete (T beams) **Assignment #5 due; Assignment #6 issued**

Week 14
April 21 review
April 23 **Prelim 3 (reinforced concrete and masonry)**

Week 15
April 28 Case study and course evaluations
April 30 No class

Week 16
May 5 Final project issued
May 7 Study period (no class)

Exam week
Final exam/project: Saturday, May 9, 2020, 9:00 am (room TBD)

X. Course text: Ochshorn, *Structural Elements for Architects and Builders*, 2nd Edition

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