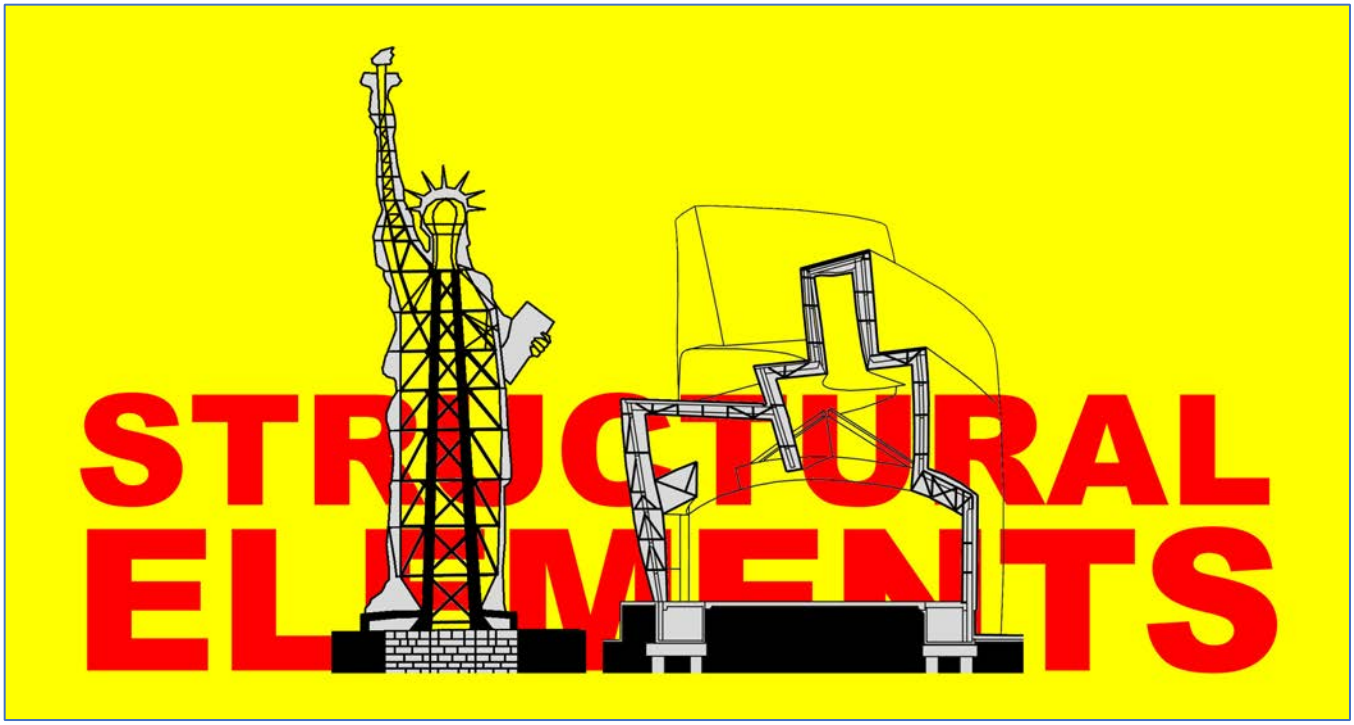

BUILDING TECHNOLOGY II: STRUCTURAL ELEMENTS

SPRING 2021 LECTURE | Arch 2615–5615

MONDAYS AND WEDNESDAYS 2:45 PM – 4:00 PM ONLINE

INSTRUCTOR: JONATHAN OCHSHORN

Concepts and procedures for the design, manufacture, and construction of structural components (e.g., walls, columns, beams, slabs) in steel, concrete, masonry, and timber.

Revised April 4, 2021

I. Rationale: The purpose of this course is to provide an overview of the construction of structural systems, included discussion of design methods—at an appropriate level for architecture students—as well as properties of structural materials and strategies for producing, configuring, and assembling structural systems.

II. Course Aims and Objectives:

Aims

A. Students learn how to design structural elements in timber, steel, and reinforced concrete using principles of allowable stress design (wood), available strength design (steel) and strength design (reinforced concrete) as well as free online calculators.

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, online.

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: The expectation is that students attend this course synchronously, provided the scheduled class time falls between 8 a.m. and 10:30 p.m. in their local time zone, which mirrors the span of in-person class meeting times on campus. Students outside these time zones take the course asynchronously by watching recorded videos.

2. Course readings: Required text: Ochshorn, *Structural Elements for Architects and Builders*, Third Edition, available as low-cost paperback, free pdf, or web version (https://jonochshorn.com/structuralelements/)

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 (TBD), 5 homework assignments, and class participation. Because attendance is required, a grade penalty may be assessed for excessive absences.

IMPORTANT: Homework assignments must be turned in on time, uploaded through the CANVAS interface. A grace period of two days (where assignments are accepted without penalty) applies to all assignments but should not be abused.

Late assignments will not be accepted, since solutions may be posted online.

The course grade is based on the following:
1. Homework assignments (30% grade)
2. Prelims (30%)
3. Final exam (20% grade)
4. Participation (20%)

VII. Academic Integrity
The University Faculty Senate requires that the following statement be attached to each course syllabus:

"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." See: http://cuinfo.cornell.edu/Academic/AIC.html

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 e mail, 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.

Pursuant to ***Title 17 of the U.S. Copyright Act*** and **Cornell University Policy 4.15**, faculty own the copyright to all original course content – their copyright embodies course lectures as well as notes summarizing or capturing the lecture content. Students may take and use lecture notes solely for personal scholarship, and may share lecture notes only with others enrolled in the subject course. Students may ***not*** *post, copy, republish, distribute or share lecture, course, or class content in any form or medium* with anyone not enrolled in the subject course absent the express written permission of the faculty copyright holder. This prohibition applies to any platform or medium to which course lectures or notes are posted for the purpose of further distribution, whether for-profit or fee-free. Impermissible uses of copyrighted content constitute acts of copyright infringement and may further subject the student to violation(s) of the *Code of Academic Integrity*.

VIII. Diversity and Inclusion

We believe that design is a principal instrument of positive social change, and that progress and innovation are driven by a commitment to inclusion across race, class, ethnicity, gender, age, religion, ability and identity. For this reason, we explicitly confirm our resolute commitment to accelerate Cornell University's actions to be a diverse and inclusive institution. We embrace the responsibilities of ongoing internal critical reflection, dialogue, and action as individuals and as a community. We support the Cornell teaching community—our faculty, staff, and students—in their efforts to act with an ethos of inclusivism and antiracism in creating and sustaining diverse teaching and learning environments.

IX. Bias-related Incident Reporting System

Cornell University is committed to fostering a safe, respectful, and inclusive living, learning, and working environment for our entire community. The bias-related incident reporting system is one step toward promoting that we, as an institution, live out these values. The reporting system allows for you to safely and anonymously report an incident you may have experienced or witnessed, receive support, and explore options for resolution.

To report an incident, individuals can use one of the following methods:

- *By submitting an incident report online at https://www.biasconcerns.cornell.edu/ (non-emergency)*
- *By contacting the Cornell University Police Department (CUPD) at (607) 255-1111 or 911 for emergency assistance*

X. Academic Accommodations

The Center for Learning and Teaching recommends that the following statements be attached to each course syllabus:

" 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."

XI. Religious Holidays

Cornell University is committed to supporting students who wish to practice their religious beliefs. Students are advised to discuss religious absences with their instructors well in advance of the religious holiday so that arrangements for making up work can be resolved before the absence.

The New York State Legislature (since July 1, 1992) requires all institutions (public and private) of higher education not to discriminate against students for their religious beliefs. Accordingly, the pertinent parts of Sections 3 and 4 of the law state:

"3. It shall be the responsibility of the faculty and of the administrative officials of each institution of higher education to make available to each student who is absent from school, because of his or her religious beliefs, an equivalent opportunity to . . . make up any examination, study or work requirements which he or she may have missed because of such absence on any particular day or days…"

"4. If . . . classes, examinations, study or work requirements are held on Friday after four o'clock post meridian or on Saturday, similar or makeup classes, examinations, study or work requirements shall be made available on other days, where it is possible and practicable to do so."

A list of religious holidays can be found here: https://scl.cornell.edu/identity-resources/office-spirituality-and-meaning-making/services-cornell-united-religious-work/religious-holidays

XII. Course schedule (tentative)

PART I. Wood
Week 1
Mon., Feb. 8: Overview: loads
Wed., Feb. 10: Review of statics and strength of materials

Week 2
Mon., Feb. 15: Wood properties
Wed., Feb. 17: Wood systems

Week 3
Mon., Feb. 22: Wood beam design principles
Wed., Feb. 24: Design of other wood elements

Week 4
Mon., March 1: Mass timber
Wed., March 3: Review

Week 5
Mon., March 8: Prelim #1 (wood)
Wed., March 10: No class

PART II. Steel
Week 6
Mon., March 15: Steel properties
Wed., March 17: Steel systems

Week 7
Mon., March 22: Steel beam design principles
Wed., March 24: Design of other steel elements

Week 8
Mon., March 29: Steel building details
Wed., March 31: Review

Week 9
Mon., April 5: Prelim #2 (steel)

PART III. Masonry, reinforced concrete
Week 9 (continued)
Wed., April 7: Load-bearing masonry properties and systems

Week 10
Mon., April 12: Reinforced concrete beam design principles
Wed., April 14: Design of other reinforced concrete elements

Week 11
Mon., April 19: Reinforced concrete properties
Wed., April 21: Reinforced concrete systems

Week 12
Mon., April 26: No class
Wed., April 28: Review

Week 13
Mon., May 3: Prelim #3 (reinforced concrete)
Wed., May 5: Case study

PART IV. Last week and finals
Week 14
Mon., May 10: TBD
Wed., May 12: TBD
Final exam: Date and time TBD