Arch 523aL Structural Design and Analysis
Units: 3
Spring 2018
Tuesdays & Thursdays @ 11:00 – 12:20pm
Location: VKC 101

Instructor: Anders Carlson, SE, PhD
Office: WAH 3rd Floor, MBS corner
Office Hours: 1 – 3pm on Thursdays
Contact Info: andersca@usc.edu
Course Description
This course is intended for graduate architecture students. It covers:

- History of structures and their integration with architecture.
- Analysis of simple structures for loading using statics and equilibrium.
- Calculation of structural behavior including stresses and deflections.
- Material behavior of steel and wood considering strength and stiffness.
- Structural components and simple systems, including cables, columns, beams, arches, foundations and trusses.

Learning Objectives
Develop informed intuition for structural behavior and abilities of different structural components and basic structural systems. Understand the basic mechanics of loads, stresses, and reactions. Learn methods to calculate forces, stresses and deformations. Understand structural materials including their pros and cons for different structural components. Appreciate the synergy of form, function and utility.

Prerequisite(s):
Physics or calculus, or approval of instructor

Course Notes
Copies of lecture slides will be available on Blackboard will be available by the day after the lecture.

Required Readings and Supplementary Materials
Required readings and supplementary materials will be made available on Blackboard prior to being individually assigned.

Required Text

Resource Books

Description and Assessment of Assignments
Students are expected to parallel lectures with related readings, homework assignments and a term project. Exercises in class or lab recitation will reinforce the concepts in class to be used in the homework. There will also be Midterm and Final Exams.
Grading Breakdown

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Points</th>
<th>% of Grade</th>
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</thead>
<tbody>
<tr>
<td>Homework</td>
<td>varies</td>
<td>25</td>
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<tr>
<td>Exercises</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>100</td>
<td>20</td>
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<tr>
<td>Term Project</td>
<td>100</td>
<td>20</td>
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<tr>
<td>Final Exam</td>
<td>100</td>
<td>25</td>
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<tr>
<td><strong>TOTAL</strong></td>
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<td><strong>100</strong></td>
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Grading Scale

Course final grades will be determined using the following scale

- A  93-100
- A-  90-92
- B+  87-89
- B   83-86
- B-  80-82
- C+  77-79
- C   73-76
- C-  70-72
- D+  67-69
- D   63-66
- D-  60-62
- F   59 and below

Assignment Submission Policy

For homework, submit in class at the beginning of class or lab, as assigned. For in-class assignments, turn in at designated time in class.

Grading Timeline

Assignments will be returned during the following lab section.

Additional Policies

To pass the course students must pass the Final Exam and miss not more than two classes without valid written excuses.
### Course Schedule: A Weekly Breakdown

Reminder: For each unit of in-class contact time, the university expects two hours of out of class student work per week over a semester.

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics/Daily Activities</th>
<th>Readings and Homework</th>
<th>Deliverable / Due Dates</th>
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</thead>
<tbody>
<tr>
<td></td>
<td><strong>History of Structures</strong></td>
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<tr>
<td>Week 1</td>
<td>Introduction to course objectives, historical review of the development of building structural types, materials, and technologies</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<tr>
<td></td>
<td>Introduction to structural components and systems and the concept of loading and load path</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<td></td>
<td><strong>Analysis</strong></td>
<td></td>
<td></td>
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<tr>
<td>Week 3</td>
<td>Structural mechanics and equilibrium, load types</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<tr>
<td>Week 4</td>
<td>Force and moment equilibrium, reactions, free body diagrams</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
</tr>
<tr>
<td>Week 5</td>
<td>Shear and moment distributions, force analysis of trusses</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<td></td>
<td><strong>Behavior</strong></td>
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<tr>
<td>Week 6</td>
<td>More on trusses, force vs. stress: tension, compression, shear, bending, torsion</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<td>Week 7</td>
<td>Stress vs. strain: material behavior</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<td>Week 8</td>
<td>Geometric properties: centroid, moment of inertia, section modulus</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<td><strong>Structural Components</strong></td>
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<td>Week 9</td>
<td>Midterm Exam Axially loaded structures: Cables, columns, arches, trusses</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<tr>
<td>Week 10</td>
<td>Bending structures: Beams, continuous beams, cantilevers</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<tr>
<td>Week 11</td>
<td>Deflections</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<tr>
<td>Week 12</td>
<td>Combined stress structures: Arches, foundations, columns, simple walls</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<td></td>
<td><strong>Structural Design</strong></td>
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<td>Week 13</td>
<td>Wood structures</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<tr>
<td>Week 14</td>
<td>Steel structures</td>
<td>TBD</td>
<td>Reading BEFORE this class Assignments due next week</td>
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<tr>
<td>Week 15</td>
<td>Term Project Due</td>
<td>TBD</td>
<td>Term Project Review time to be determined</td>
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<td></td>
<td>No class</td>
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<td>TUESDAY, May 8, 11am – 1pm</td>
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</tbody>
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FINAL
Statement on Academic Conduct and Support Systems

Academic Conduct:
Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, http://policy.usc.edu/scientific-misconduct.

Support Systems:
Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.
Provides overall safety to USC community. dps.usc.edu