

**USC**School  
of Architecture

**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 3<sup>rd</sup> Floor, MBS corner**  
**Office Hours: 1 – 3pm on Thursdays**  
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## 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

Schodek, D., Bechthold, M. (2008) *Structures, 7th Edition*, Pearson Prentice Hall.

## Resource Books

ASCE 7 (2010) *Minimum Design Loads for Buildings and Other Structures*, ICC  
Sandaker, B., Egen, A., Cruvellier, M. (2011) *The Structural Basis of Architecture, Second Edition*, Routledge  
Schierle (2008) *Structure and Design*, Cognella.

## 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

Assignment	Points	% of Grade
Homework	varies	25
Exercises	10	10
Midterm Exam	100	20
Term Project	100	20
Final Exam	100	25
<b>TOTAL</b>		<b>100</b>

## 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.

	Topics/Daily Activities	Readings and Homework	Deliverable / Due Dates
<b>History of Structures</b>			
<b>Week 1</b>	Introduction to course objectives, historical review of the development of building structural types, materials, and technologies	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Week 2</b>	Introduction to structural components and systems and the concept of loading and load path	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Analysis</b>			
<b>Week 3</b>	Structural mechanics and equilibrium, load types	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Week 4</b>	Force and moment equilibrium, reactions, free body diagrams	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Week 5</b>	Shear and moment distributions, force analysis of trusses	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Behavior</b>			
<b>Week 6</b>	More on trusses, force vs. stress: tension, compression, shear, bending, torsion	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Week 7</b>	Stress vs. strain: material behavior	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Week 8</b>	Geometric properties: centroid, moment of inertia, section modulus	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Structural Components</b>			
<b>Week 9</b>	<i><b>Midterm Exam</b></i> Axially loaded structures: Cables, columns, arches, trusses	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Week 10</b>	Bending structures: Beams, continuous beams, cantilevers	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Week 11</b>	Deflections	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Week 12</b>	Combined stress structures: Arches, foundations, columns, simple walls	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Structural Design</b>			
<b>Week 13</b>	Wood structures	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Week 14</b>	Steel structures	<b>TBD</b>	Reading BEFORE this class Assignments due next week
<b>Week 15</b>	<i>Term Project Due No class</i>		Term Project Review time to be determined
<b>FINAL</b>			<b>TUESDAY, May 8, 11am – 1pm</b>

## 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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://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](http://dps.usc.edu)