

**COURSE DESCRIPTION****A. GENERAL**

1. Course: Architecture 523aL, 3 units
2. Title: Structural Design and Analysis
3. Lecture: Two 1.5 hour lectures and one 1 hour lab per week
4. Lectures TuTh 11:00-12:20pm VKC101, Lab time and location TBD
5. Examinations: Midterm and Final Exam
6. Student hours: 3 hours class, 6 hours non-class per week
7. Prerequisite: one-semester college-level course in physics or calculus

**B. 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.

**C. SUBJECT MATTER**

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.

**D. ASSIGNMENTS**

Students are expected to parallel lectures with related readings, homework assignments and a term project. Quizzes (two worth 5 points or 1.25% of grade each) and exercises in class or lab recitation will reinforce the concepts in class to be used in the homework. There will also be a Final Exam.

**E. BASIS FOR COURSE GRADE**

Subject	Percentage of grade
Homework	20% (80 points)
Quizzes & Exercises	10% (40 points)
Midterm Exam	25% (100 points)
Term Project	20% (80 points)
Final Exam	25% (100 points)
Total	100% (400 points)

**To pass the course students must pass the Final and miss not more than two classes without valid written excuses.**

**F. COURSE OUTLINE****History of Structures**

- Week 1 Introduction to course objectives, historical review of the development of building structural types, materials, and technologies (HW1, 5 points / EX1, 2 points)
- Week 2 Introduction to structural components and systems and the concept of loading and load path (HW2, 5 points / EX2, 2 points)

**Analysis**

- Week 3 Structural mechanics and equilibrium, load types (HW3, 5 points / EX3, 2 points)
- Week 4 Force and moment equilibrium, reactions, free body diagrams (HW4, 5 points / EX4, 2 points)
- Week 5 Shear and moment distributions, force analysis of trusses (HW5, 6 points / EX5, 2 points)

	<b>Behavior</b>
Week 6	More on trusses, force vs. stress: tension, compression, shear, bending, torsion (HW6, 6 points / EX6, 2 points)
Week 7	Stress vs. strain: material behavior (HW7, 6 points / EX7, 2 points)
	<i>Midterm Exam</i>
Week 8	Geometric properties: centroid, moment of inertia, section modulus (HW8, 6 points / EX8, 2 points)
	<b>Structural Components</b>
Week 9	Axially loaded structures: Cables, columns, arches, trusses (HW9, 6 points / EX9, 2 points)
Week 10	Bending structures: Beams, continuous beams, cantilevers (HW10, 6 points / EX10, 2 points)
Week 11	Deflections (HW11, 6 points / EX11, 2 points)
Week 12	Combined stress structures: Arches, foundations, columns, simple walls (HW12, 6 points / EX12, 2 points)
	<b>Structural Design</b>
Week 13	Wood structures (HW13, 6 points / EX13, 2 points)
Week 14	Steel structures (HW14, 6 points / EX14, 2 points)
	<i>Term Project Due</i>
Week 15	Design process considering behavior and analysis (EX15, 2 points)

Study Week

<b>Final Exam, Tuesday, May 10, 11am – 1pm</b>
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**G. REQUIRED TEXT** Schodek, D., Bechthold, M. (2013) *Structures, 7<sup>th</sup> 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.

## H. UNIVERSITY STANDARDS

### Statement for Students with Disabilities

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

### 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 Section 11, *Behavior Violating University Standards* <https://scampus.usc.edu/1100-behavior-violating-university-standards-and-appropriate-sanctions/>. 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/>.

Discrimination, sexual assault, and harassment are not tolerated by the university. You are encouraged to report any incidents to the *Office of Equity and Diversity* <http://equity.usc.edu/> or to the *Department of Public Safety* <http://capsnet.usc.edu/department/department-public-safety/online-forms/contact-us>. This

is important for the safety whole USC community. Another member of the university community – such as a friend, classmate, advisor, or faculty member – can help initiate the report, or can initiate the report on behalf of another person. *The Center for Women and Men* <http://www.usc.edu/student-affairs/cwm/> provides 24/7 confidential support, and the sexual assault resource center webpage [sarc@usc.edu](mailto:sarc@usc.edu) describes reporting options and other resources.

### **Support Systems**

A number of USC's schools provide support for students who need help with scholarly writing. Check with your advisor or program staff to find out more. Students whose primary language is not English should check with the *American Language Institute* <http://dornsife.usc.edu/ali>, which sponsors courses and workshops specifically for international graduate students. *The Office of Disability Services and Programs* [http://sait.usc.edu/academicsupport/centerprograms/dsp/home\\_index.html](http://sait.usc.edu/academicsupport/centerprograms/dsp/home_index.html) provides certification for students with disabilities and helps arrange the relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* <http://emergency.usc.edu/> will provide safety and other updates, including ways in which instruction will be continued by means of blackboard, teleconferencing, and other technology.

### **Statement on Academic Integrity**

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus*, the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appx A:

<http://www.usc.edu/dept/publications/SCAMPUS/gov/>

Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at:

<http://www.usc.edu/studentaffairs/SJACS/>