USC SCHOOL OF ARCHITECTURE
COURSE DESCRIPTION

ARCH 213A, Fall 2017
Prof. Schierle schierle@usc.edu
CA**s** http://uscarch.com/structures/Arch213A/CA.pdf

A. GENERAL

1. Course: Architecture 213a, 3 units, Harris 101
2. Title: Structure systems and seismic design
3. Class meetings: Two 1-1/2 hour lectures/workshop plus one 1-hour lab per week
4. Examinations: Midterm, Quizzes, and Final
5. Time required: 9 hours per week, including class time

B. OBJECTIVES

To develop informed intuition for structures by emphasizing underlying concepts and synergy of form and structure to encourage creative design integration. To convey material sufficiently rigorous for effective communication with engineers, and analyzing of basic structures

C. SUBJECT MATTER

Historic evolution of structures, the influence of cultural, economic, and resource factors
The four S's for required for architectural structures: **S**ynergy, **S**trength, **S**tiffness and **S**tability. Study of existing structures: synergy and load paths. Load on buildings: dead- and live load; static, dynamic and thermal loads; structural responses to loads. Static equilibrium as basis of analysis; strength of materials and mechanics; stress, strain, and stress-strain relations. Numeric and graphic analysis of statically determinate beams and columns, and computer analysis of statically indeterminate beams and frames. Lateral force design.

D. STUDENT ASSIGNMENTS

Students are expected to parallel lectures with related readings, experiments, homework assignments, lab sessions, and term projects.
Handouts and homework are posted on the web http://uscarch.com/structures/ **bring handouts to class**

E. TEACHING METHODS

Lectures are augmented by lab sessions and reinforced by visual presentations and demonstration models. The material is consecutive; thus no lectures should be missed

F. BASIS FOR COURSE GRADE

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

Grade scale
A = 90 -100%
B = 80 - 89%
C = 70 - 79%
D = 60 - 69%

A passing grade requires to miss not more than two classes without valid written excuse.

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* Section 11, *Behavior Violating University Standards.* 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 incident to the *Office of Equity and Diversity* http://equity.usc.edu/ or to the *Department of Public Safety*. 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 https://engemannshc.usc.edu/rsvp/* provides 24/7 confidential support, and the sexual assault resource center webpage https://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 (306 Watt Way, 213-740-0776)* provides certification for students with disabilities and helps to arrange relevant accommodations. If an officially declared emergency makes travel to campus infeasible, *USC Emergency Information* http://emergency.usc.edu/ will provide safety updates, including means how to provide information by means of blackboard, teleconferencing, or any other technology.

G. READING LIST

Required reading: Schierle (2008) *Structure and Design,* Cognella, http://www.cognella.com/titles/schierle/

Recommended reading

Cowan (1985) *Master Builders*, Elsevier, http://www.amazon.com/Master-Builders-Henry-J-Cowan/dp/0898748046

IBC *International Building Code,* International Code Council, http://shop.iccsafe.org/

ASCE 7 *Minimum Design Loads for Buildings and Other Structures,* http://ascelibrary.org/doi/book/10.1061/9780784412916

H. COURSE OUTLINE

August

Tu 22 Evolution of Structures and introduction to course objectives

Th 24 Loads: dead load (DL), live load (LL), static, dynamic, impact, and thermal loads

Tu 29 Structure material: wood, steel, concrete, masonry, fabric; energy use and rupture length

Th 31 Structure system overview: vertical/lateral systems: wall, cantilever, moment frame, braced frame; horizontal one-way and two-way systems: truss, arch, vault, dome, shell, cable stayed, suspended, membrane

September

Tu 05 Tributary load and load path (slab, beam, girder) and vertical members (post, wall, footing); load path; Design for 4 S: Synergy, Strength, Stiffness, and Stability

Th 07 Forces vs. stress: tension, compression, shear, bending, torsion; symbols and notations; force and stress

Tu 12 Stress/strain relations (Hooke's Law): Modulus of Elasticity, linear and non-linear materials, elastic, plastic, and elastic-plastic materials; Poisson's Ratio

Th 14 Thermal stress and strain: effect on building structures and architectural systems and elements; expansion joints to prevent thermal stress

Tu 19 Graphic vector analysis: parallelogram, force polygon, resultant, equilibrant, components; numeric method

Th 21 Graphic truss analysis by graphic vector method: Maxwell diagrams (Bow's Notation)

Tu 26 Force and moment: static equilibrium; external reactions to load; free-body diagrams

Th 28 Geometric properties: Centroid; Moment of Inertia for irregular sections by *Parallel Axis Theorem*

October

Tu 03 Determinacy for beams, trusses, and frames; implications for computation and structural performance

Th 05 Bending and shear: method of balancing moments and free-body diagrams

Tu 10 Area method for shear and bending

Th 12 Flexure formula: Moment of Inertia, Section Modulus

Tu 17 Review for midterm

Th 19 Shear stress in beams, general formula; shear stress an wood and steel beams

Tu 24 Midterm Exam

Th 26 Deflection: area-moment method and standard formulas

Tu 31 Indeterminate beams: fixed-end and continuous beams, portals

November

Th 02 Buckling: Euler formula; "Kern" and rule of inner third; design and analysis of wood columns

Tu 07 Steel Buckling: axial stress and combined axial and bending stress

Th 09 Term project review, 2 - 4:30 pm

Tu 14 Lateral force design - *LDG: Lateral Design Graph* introduced

Th 16 Seismic failure

Nov 20-25 Thanksgiving recess

Tu 28 Review for Final Exam

December

Th 07 Final Exam 2:00 to 4:00 pm in Harris 101