UNIVERSITY OF SOUTHERN CALIFORNIA
SCHOOL OF ARCHITECTURE

ARCH 213A, Fall 2007
Prof. Schierle

COURSE DESCRIPTION

A. GENERAL

1. Course:	Architecture 213a, 3 units
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: Synergy, Strength, Stiffness and Stability. 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. Design for lateral forces.

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://www.usc.edu/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	Grade scale
Homework	100	25%	A = 90 -100%
Term Project	60	15%	B = 80 - 89%
Quizzes	40	10%	C = 70 - 79%
Midterm Exam	100	25%	D = 60 - 69%
Final Exam	100	25%	
Total	400	100%	

A passing grade requires passing the final and miss not more than two classes without valid written excuse.
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 assure the letter is delivered to your professor during the first 3 weeks of the semester. DSP is located in STU 301 and is open 8:30 am to 5:00 pm, Monday to Friday. The DSP phone is 213-740-0776. The university recognizes the diversity of our community and the potential for conflicts involving academic activities and personal religious observation. The university provides a guide to such observances for reference and suggests that any concerns about lack of attendance or inability to participate fully in the course activity be fully aired at the start of the term. As a general principle students should be excused from class for these events if properly documented and if provisions can be made to accommodate the absence and make up the lost work. Constraints on participation that conflict with adequate participation in the course and cannot be resolved to the satisfaction of the faculty and the student must be identified prior to the drop/add date for registration. After the drop / add date the University and the School of Architecture shall be the sole arbiter of what constitutes appropriate attendance and participation in a given course.

G. READING LIST

Required reading

- Schierle (2006): ***Structures in Architecture***

Recommended reading

- Cowan (1977): *The Master Builders*, Elsevier
- IBC (2003):: *International Building Code (IBC),* International Code Council
- Lagorio (1990): *Earthquakes an Architect's Guide to Nonstructural Seismic Hazards*, Wiley

H. COURSE OUTLINE

August

Tu 28 Evolution of Structures and introduction to course objectives

Th 30 Loads: dead load (DL), live load (LL), static, dynamic, impact, and thermal loads

September

Tu 4 Structure material: wood, steel, concrete, masonry, fabric; energy use and rupture length

Th 6 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

Tu 11 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 13 Forces vs. stress: tension, compression, shear, bending, torsion; symbols and notations; force and stress

Tu 18 Stress/strain relations (Hooke's Law): Modulus of Elasticity, linear and non-linear materials, elastic, plastic, and elastic-plastic materials; Poisson's Ratio

Th 20 Thermal stress and strain: effect on building structures and architectural systems and elements; expansion joints to prevent thermal stress

Tu 25 Graphic vector analysis: parallelogram, force polygon, resultant, equilibriant, components; numeric method

Th 27 Graphic truss analysis by graphic vector method: Maxwell diagrams (Bow's Notation)

October

Tu 2 Force and moment: static equilibrium; external reactions to load; free-body diagrams

Th 4 Determinacy for beams, trusses, and frames; implications for computation and structural performance

Tu 9 Review for Midterm Exam

Th 11 Midterm Exam

Tu 16 Bending and shear: method of balancing moments and free-body diagrams

Th 18 Area method for shear and bending

Tu 23 Flexure formula: Moment of Inertia, Section Modulus

Th 25 Geometric properties: Centroid; Moment of Inertia for irregular sections by *Parallel Axis Theorem*

Tu 30 Shear stress in beams, general formula; shear stress an wood and steel beams

November

Th 1 Deflection: area-moment method and standard formulas

Tu 6 Indeterminate beams: fixed-end and continuous beams, portals

Th 8 Term project first review, 2 - 4:30 pm

Tu 13 Bending review

Th 15 Buckling: Euler formula; "Kern" and rule of inner third; design and analysis of wood columns

Tu 20 Steel Buckling: axial stress and combined axial and bending stress

Th 22 Thanksgiving

Tu 27 Seismic design

Th 29 Term project final review and grading 2-4:30 pm

December

Tu 4 Seismic failure

Th 6 Review for Final Exam

Th 13 Final Exam 2:00 to 4:00 pm, Harris 101