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. 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://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

<table>
<thead>
<tr>
<th>Subject</th>
<th>Points</th>
<th>Percentage of grade</th>
<th>Grade scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>80</td>
<td>20%</td>
<td>A = 90 -100%</td>
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<tr>
<td>Term Project</td>
<td>80</td>
<td>20%</td>
<td>B = 80 - 89%</td>
</tr>
<tr>
<td>Quizzes &amp; Exercises</td>
<td>40</td>
<td>10%</td>
<td>C = 70 - 79%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>100</td>
<td>25%</td>
<td>D = 60 - 69%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100</td>
<td>25%</td>
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<tr>
<td>Total</td>
<td>400</td>
<td>100%</td>
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A passing grade requires passing the final and miss not more than two classes without valid written excuse.

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 my TA) as early in the semester as possible. DPS is located in STU 301 and is open 8:30AM-5PM, Monday through Friday. The phone number for DSP is (213) 740-0776.

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 Appendix 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/student-affairs/SJACS/

G. READING LIST
Required reading

Recommended reading
- Cowan (1977) The Master Builders, Elsevier
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, equilibrant, components; numeric method
Th 27  Graphic truss analysis by graphic vector method: Maxwell diagrams (Bow's Notation)

October
Tu 02  Force and moment: static equilibrium; external reactions to load; free-body diagrams
Th 04  Geometric properties: Centroid; Moment of Inertia for irregular sections by Parallel Axis Theorem
Tu 09  Review for Midterm Exam
Th 11  Midterm Exam
Tu 16  Determinacy for beams, trusses, and frames; implications for computation and structural performance
Th 18  Bending and shear: method of balancing moments and free-body diagrams
Tu 23  Area method for shear and bending
Th 25  Flexure formula: Moment of Inertia, Section Modulus
Tu 30  Shear stress in beams, general formula; shear stress an wood and steel beams

November
Th 01  Deflection: area-moment method and standard formulas
Tu 06  Indeterminate beams: fixed-end and continuous beams, portals
Th 08  Buckling: Euler formula; "Kern" and rule of inner third; design and analysis of wood columns
Tu 13  Steel Buckling: axial stress and combined axial and bending stress
Th 15  Term project review, 2 - 4:30 pm
Tu 20  Seismic failures
Th 22  Thanksgiving recess
Tu 27  Lateral force design
Th 29  Fabric structures

December
Tu 04  Structure systems
Th 06  Review for Final Exam
Th 13  Final Exam 2:00 to 4:00 pm in Harris 101