COURSE DESCRIPTION

A GENERAL
1. Course: Architecture 513, 4 units
2. Title: Advanced Structures
3. Class meetings: One three hour seminar per week
4. Student hours: 12 hours per week, including class time

B OBJECTIVES
To develop informed intuition for structures, their response to natural forces (gravity, seismic, thermal, wind) and interaction with other design issues. To identify strategies for structure system selection, design development, optimization and system integration. Identify research topics and research methodologies.

C SUBJECT MATTER
Study of building structures with emphasis on integration with other building systems; fit and synergy of form and structure. The study of loads acting on structures, gravity and lateral loads and load path, response of structures to loads. Study of computer aided design and analysis and static simulation models. Topics are posted at: http://uscarch.com/structures/

D TEACHING METHODS
Weekly lecture presentations and reading assignments on building material, systems and components, structural behavior, design integration and optimization. Assigned reading, seminar discussions, computer workshops, lab model testing, field trips.

E BASIS FOR COURSE GRADE
Assigned projects: 60%; class participation: 40%

F 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 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 https://sarc.usc.edu describes reporting options and other resources.

G 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.

H READING LIST

Resource books

I  SEMINAR OUTLINE

August
Tu 27  Introduce seminar objectives, teaching method, and expected results.
       Synergy of form and structure: historic and significant contemporary examples, structural and formal correlation; integration with architectural design objectives

September
Tu 03  Design for gravity and lateral forces (wind and seismic)
       Introduce graphic vectors, Portal Method, LDG: Lateral Design Graph
       Review chapter 9, 159-186
Tu 10  Selection criteria for structure systems: fit of structure and program
       Morphology, resources, economy, technology, load.
       Introduce static simulation models.
       Read pages 187-190 & 207-214
Tu 17  Horizontal span systems: one and two-way systems; beam and girder, Gerber beam, Vierendeel girder, truss, space truss, tree, arch, dome, vault, hp shell, rotational, cylindrical and free-form shell, folded plate, cable-stayed systems
       Read pages 187-190
Tu 24  Tensile structures: suspension system, cable truss, anticlastic membrane and cable net, grid shell, pneumatic structure
       Read pages 308-352

October
Tu 01  Case Study review
       Introduction of Multiframe computer program
       Read pages 215-217
Tu 08  Design and analysis of suspension structures
       Introduction of SDG: Structure Design Graph
       Read pages 194-195 & 269-271
Tu 15  Design and analysis of arch, vault, dome
       Introduction of PDG: Post Design Graph
       Read pages 192, 210-211, 297-352
Tu 22  Design and analysis of anticlastic membranes
       Read pages 196-197, 210-211, 297-352
Tu 29  Design and analysis of beam and truss structures
       Read pages 193 & 244-263

November
Tu 05  Design and analysis of cable truss, stayed and propped structures
       Read 308-317
Tu 12  Design and analysis of Vierendeel girder & frame structures
       Read pages 191& 230-234
Tu 19  Design and analysis of folded plate and shell structures
       Read pages 235-243 & 270-271
Tu 26  Term project design review

December
Tu 10  Term Project Final Review including test results, 4:30- 6:30 PM