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. 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
Reference books:
Borrego (1968) Space Grid Structures, MIT Press
Davies (1988) High Tech Architecture, Rizzoli
Donin (1982) Renzo Piano, Piece by Piece, Casa del Libro Editrice
Huxtable (1960) Pier Luigi Nervi, Brazilier
I \hspace{1em} \textbf{SEMINAR OUTLINE}

\textbf{August}

Tu 22 \hspace{1em} 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

Tu 29 \hspace{1em} Design for gravity, wind and seismic load
Review chapter 9, 159-186

\hspace{1em} Introduction of \textit{LDG: Lateral Design Graph}

\textbf{September}

Tu 5 \hspace{1em} Selection criteria for structure systems: fit of structure and program
Read pages 187-190 & 207-214
Morphology, resources, economy, technology, load. Introduce vectors and static simulation models.
Read pages 187-190

Tu 12 \hspace{1em} Horizontal span systems: one and two-way systems; beam and girder, \textit{Gerber} beam, \textit{Vierendeel} girder, truss, space truss, tree, arch, dome, vault, \textit{hp} shell, rotational, cylindrical and free-form shell, folded plate, cable-stayed systems
Read pages 218-352

Tu 19 \hspace{1em} Tensile structures: suspension system, cable truss, anticlastic membrane and cable net, grid shell, pneumatic structure
Read pages 308-352

Tu 26 \hspace{1em} Case Study review
Introduction of \textit{Multiframe} computer program
Read pages 215-217

\textbf{October}

Tu 03 \hspace{1em} Design and analysis of suspension structures
Introduction of \textit{SDG: Structure Design Graph}
Read pages 194-195 & 269-271

Tu 10 \hspace{1em} Design and analysis of arch, vault, dome
Introduction of \textit{PDG: Post Design Graph}
Read pages 192, 269-296, 272-307

Tu 17 \hspace{1em} Design and analysis of anticlastic membranes & wood structures
Read pages 196-197 & 230-352

Tu 24 \hspace{1em} Design and analysis of beam and truss structures
Read pages 193 & 244-263

Tu 31 \hspace{1em} Design and analysis of cable truss, stayed and propped structures
Read pages 308-317

\textbf{November}

Tu 07 \hspace{1em} Design and analysis of \textit{Vierendeel} girder & frame structures
Read pages 191 & 230-234

Tu 14 \hspace{1em} Design and analysis of folded plate and shell structures
Read pages 235-243 & 270-271

Tu 21 \hspace{1em} Term project design review

Tu 28 \hspace{1em} Field trip

\textbf{December}

Tu 12 \hspace{1em} Term Project Final Review 4:30- 6:30 PM