USC School of Architecture **Arch. 513, Fall 2017**

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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

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

Reference books:

AISC (2011) *Manual of Steel Construction*, American Institute of Steel Construction

Arnold/ Reitherman (1982) *Building Configuration and Seismic Design,* Wiley

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*, Brazillier

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
Natterer,et al (1989) *Timber Design and Construction Handbook*, McGraw Hill

Schierle (1968) *Lightweight Tension Structures*, UCB

Schueller (1983) *Horizontal Span Structures*, Wiley

I SEMINAR OUTLINE

August

Tu 22	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	Design for gravity, wind and seismic load Introduction of ***LDG: Lateral Design Graph***	Review chapter 9, 159-186

September

Tu 5	Selection criteria for structure systems: fit of structure and program Morphology, resources, economy, technology, load. Introduce vectors and static simulation models.	Read pages 187-190 & 207-214 Read pages 187-190
Tu 12	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	Review pages 218-352
Tu 19	Tensile structures: suspension system, cable truss, anticlastic membrane and cable net, grid shell, pneumatic structure	Read pages 308-352
Tu 26	Case Study review Introduction of ***Multiframe*** computer program	 Read pages 215-217

October

Tu 03	Design and analysis of suspension structures Introduction of ***SDG: Structure Design Graph***	Read pages 194-195 & 269-271
Tu 10	Design and analysis of arch, vault, dome Introduction of ***PDG: Post Design Graph***	Read pages 192, 269-296, 272-307
Tu 17	Design and analysis of anticlastic membranes & wood structures	Read pages 196-197 & 230-352
Tu 24	Design and analysis of beam and truss structures	Read pages 193 & 244-263
Tu 31	Design and analysis of cable truss, stayed and propped structures	Read pages 308-317

November

Tu 07	Design and analysis of Vierendeel girder & frame structures	Read pages 191 & 230-234
Tu 14	Design and analysis of folded plate and shell structures	Read pages 235-243 & 270-271
Tu 21	Term project design review	
Tu 28	Field trip	

December

Tu 12 Term Project Final Review 4:30- 6:30 PM