USC School of Architecture

Arch. 513, Fall 2019
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Office hours

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

Required: Schierle (2008) ***Structure and Design*** ,Cognella

Resource books

AISC (1991) *Manual of Steel Construction*, American Institute of Steel Construction

ASCE 7, Design Loads for Buildings and Other Structures, http://www.asce.org/asce-7/

IBC *International Building Code*, https://www.techstreet.com/standards/icc-ibc-2018?product_id=1999609

Schierle (2008) http://uscarch.com/structures/seismic/files/Seismic%20Design-pro.pdf

Schierle (1968) *Lightweight Tension Structures*, UCB

Schierle (1970) Prestressed Trusses

Ambrose / Vergun (1991) *Design for Earthquakes*, Wiley

Arnold / Reitherman (1992) *Building Configuration and Seismic Design,* Wiley

Crawley / Dillon (1997) *Steel Buildings: Analysis and Design*, Wiley

Engel (1967) *Structure Systems*, Praeger Publishers

Schueller (1983) *Horizontal Span Structures*, Wiley

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 Read pages 187-190
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	Review pages 218-352
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