

**ARCH 511: Building Systems: Materials and Construction****Units: 4 Units****2019/20****Day: Mondays****Time: 6:30 to 9:50pm****Location: Tutor Hall (RTH) 105 and DEN@Viterbi****Website: D2L****Instructor: Dr Bhavna Sharma****Office: TBC****Office Hours: By appointment.****Contact Info: bhavnas@usc.edu****Course Description**

The course focuses on the studies of construction system development within the architectural design context; processes and issues of selection, evaluation, optimization, integration, design control, and innovation. Department approval required.

Learning Objectives and Outcomes

During the course, students will learn the following:

1. Concept Design: Ability to communicate design and details in the conceptual phase.
2. Technical Design: Develop concept design and details, to illustrate the assembly of materials, systems, and components appropriate for a building design through clear sketches and models.
3. Site Design: Ability to respond to site characteristics such as site, construction and environmental constraints in the development of a project design.
4. Building Materials and Assemblies: Understanding of the basic principles utilized in the appropriate selection of construction materials, products, components, and assemblies based on their inherent characteristics and performance, including their environmental impact and reuse.

Course Notes

1. Students will be required to attend all lectures, complete all reading assignments, participate in the discussion relating to each week's lectures and activities. See attached course outline for details.
2. Students will be expected to perform as if they are an employee of an architecture / engineering design firm and will participate in classroom discussions and will communicate with their classmates as if in an office setting where working as a team is always expected. Each student will be responsible for their own project but will be expected to enhance their decision making through team communication.
3. Absences can be excused with prior approval in writing via email. Two absences will result in a reduction of the final class grade.
4. All electronic devices shall be turned to silent mode during class and texting and phone calls are not appropriate.

Technological Proficiency and Hardware/Software (Optional)

1. Rhinoceros and Grasshopper
2. AutoCAD / Revit or similar software
3. SketchUp or similar
4. Adobe Creative Suite (Photoshop, Illustrator, In-Design, Acrobat, etc.) or similar

Description and Assessment of Assignments

Reading Assignments

1. Reading assignments will be confirmed and posted on D2L.
2. It is important to read the assigned material the week that it is assigned in order to participate in the discussions and complete the assignments.

Assignments: Will Count for 50% of the Final Grade

1. Assignments are listed in the attached course outline. Additional information will be provided.
2. The goal of the assignments is to provide practical experience in design, detailing, materials methodology, etc. based on the course learning objectives.
3. The method of turning in assignments will be discussed for each assignment. The goal is to submit assignments on D2L.
4. Late assignments will receive partial credit based on the time they are turned in.

The Final Project Report (40%) and Final Presentation (10%)

1. The final project will reflect the compilation of the semester's studies. Each student will be asked to choose a building from a curated list. The report will present:
 - An introduction to the structure.
 - Description of the structural form and hierarchy.
 - The building relationship to its environment.
 - The choice of structural materials and built form, discussing if the selection contributes to or mitigates climate change.
 - The structural form and choice of structural materials, and how the selection influenced the architecture and performance of the project.
2. The final project will be presented with sketches and drawings, photos, analysis of research, charts and graphs, etc. The goal is to provide a full understanding of how the building functions and how it was constructed.
3. Each student will make a presentation to the class in which feedback will be provided. The feedback can be then incorporated in the final report. Each student will submit a digital copy of their presentation and project for grading.

Field Trip

1. Field trip(s) will be arranged during the semester to observe various phases of the design process and to understand the process of specification and construction.
2. The visit(s) will be scheduled outside of class time. Every effort will be made to work with the schedules of each class member.
3. The field trip schedule will be estimated in the class outline but may change.

Grading Scale

The grading breakdown is by percentage of total points.

A 100 - 90% Work exceeds expectations, student always attends class.

B 80 - 89% Very good work, almost always attends class.

C 70 - 79% Good work, good attendance

D 60 - 69% Late, incomplete or sloppy work, infrequent attendance

F 59% or less Missing or poor work, poor attendance.

Weekly Readings and Assignments

1. Jordan et al. (2013) Material driven design for a chocolate pavilion. *Computer-Aided Design*, 61:2-12.
 - a. **Assignment 1:** Provide a one-page summary on the design process utilizing the structure in Jordan et al. (2013) as a case study. Due September 15th.
2. Jabi, Wassim. *Parametric Design for Architecture*. London: Laurence King Publishing; 2013. Read the Introduction and Part I.
3. Jabi, Wassim. *Parametric Design for Architecture*. London: Laurence King Publishing; 2013. Read Part II. Tutorial exercises are optional.
 - a. **Assignment 2:** Provide a one-page summary on the use of computational and parametric design in design and engineering. Comment on the drivers for the use of the parametric design, discussing the advantages and disadvantages of the use of the technology in architecture, engineering and construction. Due September 29th.
4. Suffian S, et al. Future directions for nonconventional and vernacular material research and applications. In: *Nonconventional and Vernacular Construction Materials*, Elsevier, Read Chapter 3, pages 63-80.
5. Kibert, Charles J. *Sustainable Construction : Green Building Design and Delivery*. Fourth edition. Hoboken, New Jersey: John Wiley & Sons Incorporated; 2016. Read Chapter 11 *Closing Materials Loops*, Pages 367-399.
 - a. **Assignment 3:** Provide a one-page summary on the importance of material supply chain in the design and construction of green buildings. Due October 13th.
6. Beghini, Lauren L., Beghini, Alessandro, Katz, Neil, Baker, William F., Paulino, Glaucio H. Connecting architecture and engineering through structural topology optimization. *Engineering Structures*. 2014;59.
7. Patterson, Michael. *Structural Glass Facades and Enclosures*. Hoboken, N.J: Wiley; 2011. Read Chapter 6 *Glass as a Structural Material*, Pages 101-118.
 - a. **Assignment 4:** Provide a one-page summary on the advantages and disadvantages of the use of glass in design and engineering. Due November 10th.
8. Kibert, Charles J. *Sustainable Construction : Green Building Design and Delivery*. Fourth edition. Hoboken, New Jersey: John Wiley & Sons Incorporated; 2016. Read Chapter 9 *Low Energy Building Strategies*, Pages 269-323.
9. Meyer Boake, Terri. *Architecturally Exposed Structural Steel Specifications, Connections, Details*. Basel/Berlin/Boston: Birkhäuser; 2015. Read Chapter 1 to 3, pages 13-62.
10. Meyer Boake, Terri. *Architecturally Exposed Structural Steel Specifications, Connections, Details*. Basel/Berlin/Boston: Birkhäuser; 2015. Read Chapter 4, pages 63-74.
 - a. **Assignment 5:** Provide a one-page summary on the importance of construction detailing for transport and assembly. Due November 24th.

Supplementary Reading

See D2L course page.

Course Schedule: A Weekly Breakdown

1. A class schedule broken down into weekly assignments will be provided. The first draft will be included and updates will be provided as schedules are confirmed.
2. For each unit of in-class contact time, the university expects two hours of out of class student work per week over a semester.
3. Weekly breakdown of reading and assignments to follow and will be updated on a regular basis as needed.

Week	Date	Topic Daily Activity	Completed Reading	Deliverables Due Dates
1	Aug 26	Introduction	--	--
2	Sept 2	Holiday		
3	Sept 9	Design: Process	Design Process Reading #1	--
4	Sept 16	Design: Methods	Computational Design Reading #2	Assignment 1 September 15th
5	Sept 23	Design: Lab	Parametric Design Reading #3	--
6	Sept 30	Design: Life Cycle	Life-cycle Design Reading #4	Assignment 2 September 29th
7	Oct 7	TBC	TBC	--
8	Oct 14	Construction: Materials	Conventional and Non- conventional materials Reading #5	Assignment 3 October 13th
9	Oct 21	Construction: Building Fabric	Structural Systems Reading#6	--
10	Oct 28	Construction: Envelope	Structural Glass Reading #7	Assignment 4 November 10th
	Nov 1	Field Trip to SCGMA (TBC)	SCGMA Architectural Glass Boot Camp	--
11	Nov 4	Construction: Low Energy	Green Design Strategies Reading #8	--
12	Nov 11	Construction: Detailing	Architectural Structural Detail Reading #9	
13	Nov 18	Construction: Delivery	Project Delivery and Commissioning Reading #10	--
14	Nov 25	Guest Speaker	TBC	Assignment 5 November 24th
15	Dec 2	Final Presentations	Final Presentations	Final Presentation December 1st
FINALS	Dec 16	No class	--	Final Project Report December 16 th by 9pm

Statement on Academic Conduct and Support Systems

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 in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

Support Systems:

Student Health Counseling Services - (213) 740-7711 – 24/7 on call

engemannshc.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call

suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-4900 – 24/7 on call

engemannshc.usc.edu/rsvp

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office of Equity and Diversity (OED) | Title IX - (213) 740-5086

equity.usc.edu, titleix.usc.edu

Information about how to get help or help a survivor of harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants. The university prohibits discrimination or harassment based on the following protected characteristics: race, color, national origin, ancestry, religion, sex, gender, gender identity, gender expression, sexual orientation, age, physical disability, medical condition, mental disability, marital status, pregnancy, veteran status, genetic information, and any other characteristic which may be specified in applicable laws and governmental regulations.

Bias Assessment Response and Support - (213) 740-2421

studentaffairs.usc.edu/bias-assessment-response-support

Avenue to report incidents of bias, hate crimes, and microaggressions for appropriate investigation and response.

The Office of Disability Services and Programs - (213) 740-0776

dsp.usc.edu

Support and accommodations for students with disabilities. Services include assistance in providing readers/notetakers/interpreters, special accommodations for test taking needs, assistance with architectural barriers, assistive technology, and support for individual needs.

USC Support and Advocacy - (213) 821-4710

studentaffairs.usc.edu/ssu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity at USC - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.