Architecture 572
Advanced Building Skins: Designing High Performance Façades

Units: 3
Term: Fall   Day: Thu   Time: 4pm-6:50pm
Location: tbd
Instructor: Sanjeev Tankha, AIA (USC MBS ’95), Mic Patterson, Ph.D (USC)
Office: tbd
Office Hours: 1 hr per week (on line via zoom - time tbd)
Contact Info: Sanjeev.Tankha@USC.edu
Mpatters@USC.edu

Course Description for 572

Architecture 572 is proposed as a 3-unit course that meets once a week for 3 hours. The following describes the basic 572 course.

The 572 course will concentrate on providing students with a fundamental technical skillset applicable to the design and delivery of high-performance façade systems. The predominant focus will be the design of contemporary glazed curtainwalls and rainscreen systems in their many forms.

The building façade system uniquely combines elements of performance and architectural expression like nothing else in architecture. It is a highly complex system that requires a detailed and comprehensive exploration of myriad, often competing, variables that converge at the building skin. Increasingly, architectural practice demands expert knowledge of the complexities of the façade system to realize building performance and budget goals. The façade system plays a defining role in a building’s appearance, a pivotal role in resilience and sustainability outcomes, and is critical to the health, wellness and productivity of building occupants. In addition, it typically represents 15-25% of a project’s construction budget. Façade system skills are vital for the successful practice of architecture in producing healthy, cost-effective, resilient and sustainable buildings and urban habitat.

This course intends to provide the student this basic skillset, including the fundamental building physics and performance criteria that each façade system design must accommodate involving the performative behaviors of thermal mechanics, water vapor and air transport in various materials, moisture and condensation management, and airflow and rainwater control. The course content will familiarize the student with the basic building physics,
tools and techniques required to successfully design and deliver a responsive high-performance façade system. Upon completion of this class, students will be able to develop façade system performance parameters for a given project, explore materials that meet the prescribed parameters, and develop a basic façade system design and details of construction to realize the design aspirations and technical requirements of the project.

**Learning Objectives**

LO-1: basic building physics and environmental performance concepts as they relate to the façade system
LO-2: the development of façade system performance parameters for a given project.
LO-3: selection criteria and methods, for materials that meet prescribed parameters for façade system performance.
LO-4: basic analytical tools and techniques that facilitate building physics evaluation and assessment for facade systems.
LO-5: basic system detailing for glazed curtain walls and multiple rain screen systems.

**Prerequisite(s):** Course can be taken by undergraduate or graduate students of upper division standing

**Co-Requisite(s):** None

**Concurrent Enrollment:** None

**Recommended Preparation:** None

**Course Notes**

**The Class Ethos**

This is a broad-based survey course on the critically important building façade system. There is a scarcity of good textual material on this subject. The course will rely heavily on in-class presentations by the instructor and on visiting lecturers.

In addition to the required readings a general (non-required) reading list is also suggested above. There will be a short class discussion on the weeks required readings so it is important that you have read the material and engage in the discussion.

At its core, this is a class in critical thinking and creative problem solving. Not only will conventional façade design and delivery practices be reviewed, they will be challenged. The instructor asks that the class operate under the belief of a shared equality of intelligence and that all ideas deserve consideration. The instructor asks you to be empathetic toward your peers and to acknowledge everyone’s contribution with kindness. And he encourages you to speak up for your ideas and try out new ones. Take outrageous positions. Fall on your face. Be wrong. Respectfully challenge and critique each other. Have fun!

**Technological Proficiency and Hardware/Software Required**

Zoom for online learning classes with video capability
Rhino or AutoCAD for 2D detail drawing
Therm, a free building physics program from LBNL
Required Materials

Required readings listed below will be available in the department library. If any reading is not available the required reading will be provided as a handout. You do not need to buy the books listed in the readings for this course.


Suggested Additional Readings:
- Ayon, Angel, *Reglazing Modernism: Intervention Strategies for 20th-century Icons*

Description and Assessment of Assignments

**In-Class Work:**
Participation in classroom exercises and in class presentations is an important element of the education this class offers. These classroom exercises and presentations will be comprised largely of critical discourse and debate. You cannot receive credit for this in-class work if you are not present. Attendance is the precondition for receiving credit for the work that will be done in class and for in-class presentations.

**In-Class Presentations**
To begin developing the research skills as well as hone your oral speaking skills, you will be charged with delivering brief oral presentations of (5 to 10 minutes or less) to the class involving your research. These presentations, which will be directed by a prompt (that can be as broadly or narrowly construed as you like), ask you to explore the subject we are studying. These presentations provide context for the class’s discussion of the topic. The study of
architecture, after all, is in no way narrowly limited to technology, but also includes cultural and political
dimensions. Possible topics and sources will be suggested. In your research, you are expected to go beyond the
sources provided. The class instructor is looking for critical thinking in all aspects of your work. Audiovisuals are
encouraged and the graphic quality of your presentations should reflect your aspirations to a highly visual
profession.

Participation:
Class attendance and participation are critical. The grading structure (below) reflects this. The instructor will be
looking for your active engagement and participation in the dialogue that will span this semester.

Assignments
Assignments will be made on a weekly basis. The instructor asks you to arrive at class having completed the
assignment—and having thought through the significance and implications—in advance, and be prepared to
discuss, ask questions, express opinions, and respond to the comments of your classmates with considered respect
and intelligence. Upon successful completion of the assignments the students will learn the basics of development
of a façade performance criteria for various materials and systems as well as the basic analysis of the thermal
performance of a typical façade assembly.

Reading Assignments
Reading assignments will be made on a weekly basis. It is important that you have read the material before class as
there will be a discussion in class on the readings as well as the topic of the lectures will be based on the reading
material. The readings will teach the students the basic building physics and environmental performance concepts
as they relate to the façade system.

Final Project
The final project will involve the development of a conceptual design for a façade system. A detailed context will
be defined. The deliverables for this assignment can take the form of a term paper, a narrative or a graphic
novelette. The final project will be discussed in class at the beginning of the semester. Upon completion of the final
project assignment students will be able to complete basic system detailing for basic façade systems.

Grading Breakdown

<table>
<thead>
<tr>
<th>Assignment</th>
<th>% of Grade</th>
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<tbody>
<tr>
<td>Assignments and In Class Presentations (8)</td>
<td>70%</td>
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<tr>
<td>Final Project (1)</td>
<td>30%</td>
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<td>Total</td>
<td>100</td>
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Grading Scale
Course final grades will be determined using the following scale
A   95-100
Course-specific Policies

Assignment Submission

Unless otherwise stated, all assignments should be double-spaced, typed in 10-point Arial font with one-inch margins. Works cited should employ Chicago format. Pages should be numbered in the upper right corner and have the following information:

Your Name:
Arch 572a: Semester/Year
Instructors name:
Date:
Assignment Name or Number

Grading Timeline

Just as you promise to turn in your papers in a timely fashion to the instructor, the instructor promises to return them with comments to you. Mid and end of semester evaluations will be emailed to each student. Mid-semester evaluations will be provided the week following semester break. End of semester evaluations will be provided during the last two weeks of the semester.

Late work

It is your responsibility to finish each assignment by its due date and time. The instructor is willing to consider giving extensions, but they must be for legitimate medical emergencies, documented by a letter from a doctor indicating that you were too sick to complete the work. If you turn in a paper late without having cleared it with the course instructor first, it will be marked down 1/3 of a grade for each day it is late and will receive no written comments. (Thus, if you hand in a paper on Friday that was due on Tuesday, and it merits a B grade, you will receive, due to the lateness penalty, a C).

Technology in the classroom
Rhino software is required for drawing and any modeling. Therm, a free Building physics program from LBNL will be required for the course. This is freeware and available on the LBNL site at the following location: https://windows.lbl.gov/tools/therm/software-download The location has access to the software, documentation, tutorials, and a link to forums.

Also, instructor asks that you check your email every twenty-four hours of the school/work week, as they will communicate with you through it. The instructor will provide his contact information to you.

**Academic integrity**

Taking the words of another author and passing them off as your own undermines both your learning process and the academic community of which you are now a member. If you are caught plagiarizing, you will receive a failing grade for this course, and you may also be dismissed from USC. Generally, to avoid plagiarism you must do the following: give credit to the proper sources for any ideas you reference that are not your own; avoid turning in papers written for another class; and be careful when you work with tutors, friends, or family members, as if the person helping you alters your work substantially, this is plagiarism as well. For a complete definition of what constitutes plagiarism, see your SCampus Student Guidebook (in Part B, Section 11, “Behavior Violating University Standards” policy.usc.edu/scampus-part-b). If you have further questions, don’t hesitate to ask the instructor.

**Attendance**

The instructor wants you to succeed in this course. If you need accommodations for documented medical reasons, or religious reasons or other accommodations, please contact the instructor during office hours. For medical absences a letter from your doctor explaining the medical situation(s) is required. The instructor will work with you to plan reasonable accommodations. Please discuss with the instructor as early as possible any other support you may need.

**Classroom norms**

While The instructor is happy to have you use laptops, tablets, and other electronic reading/writing devices in class, they ask that you please restrict your usage to only materials relevant to class and to please keep your phones silent and away for the duration of class.

**Course evaluation**

Two surveys will gather student opinions about the course: the mid-semester evaluation and the standard USC course evaluation survey at the end of the semester. Your opinion is valued and can make a difference in how this course is conducted; please give your honest and constructive recommendations.

**Course Schedule: A Weekly Breakdown**

<table>
<thead>
<tr>
<th>Week 1 LO-1</th>
<th>Topics/Daily Activities</th>
<th>Readings/Preparation</th>
<th>Deliverables</th>
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<tbody>
<tr>
<td></td>
<td>Course Introduction and Lecture 1: Defining the Design Problem for Facades</td>
<td>Section I: Feedback Loops of Form and Performance.</td>
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<tr>
<td>LO-1 &amp; 2</td>
<td>Reading Discussion Class project Introduced and discussed</td>
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<td>Week 3</td>
<td>Lecture 3: Building Physics and Facades Thermal, Acoustics, Air and Water, Solar performance Reading Discussion Introduction to Therm Homework: Do Tutorials for Therm</td>
<td>Therm Tutorials</td>
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<td>LO-1 &amp; 2</td>
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<td>LO-4</td>
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<td>Assignment 1 pdf and class presentation</td>
<td>Assignment 2 pdf and class presentation</td>
<td>Assignment 3 pdf and class presentations</td>
<td>Assignment 4 pdf and class presentation</td>
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<td>Assignment 6: Polymer and Manufactured material facade Case Study</td>
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<td>Assignment 5 pdf and class presentation</td>
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<td>Assignment 6: Polymer and Manufactured material facade Case Study</td>
<td>Assignment 6: Polymer and Manufactured material facade Case Study</td>
<td>Assignment 6 pdf and class presentation</td>
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<td>Assignment 7: earth materials material facade Case Study</td>
<td>Assignment 7: earth materials material facade Case Study</td>
<td>Assignment 7 pdf and class presentation</td>
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<td>Final Project: Final project discussion</td>
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<td>Assignment 7 pdf and class presentation</td>
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<td>Assignment 8: System Study – break down a façade system into its components and explain each component in the assembly.</td>
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<td>Assignment 8 pdf and class presentation</td>
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<td></td>
<td>Final Project ideas – come with your proposed ideas to discuss in class</td>
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<td>Assignment 8 pdf and class presentation</td>
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<tr>
<td>Week 14 LO-5</td>
<td>Workshop 2: Final Project Development and crits, detailing reviews, system design reviews, possible guest reviewers</td>
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</table>
| Week 15 LO-5 | Project Presentations | Project Presentations | Project Due + Presentations  
Refer to the final exam schedule in the USC Schedule of Classes at [classes.usc.edu](http://classes.usc.edu). |
| FINAL |  |  |  |
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, http://policy.usc.edu/scientific-misconduct.

Support Systems:
Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call
Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention. engemannshc.usc.edu/counseling

National Suicide Prevention Lifeline – 1 (800) 273-8255
Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. www.suicidepreventionlifeline.org

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call
Free and confidential therapy services, workshops, and training for situations related to gender-based harm. engemannshc.usc.edu/rsvp

Sexual Assault Resource Center
For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: sarc.usc.edu

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086
Works with faculty, staff, visitors, applicants, and students around issues of protected class. equity.usc.edu

Bias Assessment Response and Support
Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. studentaffairs.usc.edu/bias-assessment-response-support

The Office of Disability Services and Programs
Provides certification for students with disabilities and helps arrange relevant accommodations. dsp.usc.edu

Student Support and Advocacy – (213) 821-4710
Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. studentaffairs.usc.edu/ssa

Diversity at USC
Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. diversity.usc.edu

USC Emergency Information
Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. emergency.usc.edu

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.
Provides overall safety to USC community. dps.usc.edu