



USC University of Southern California

Architecture 518

Advanced Surface Tectonics: Methods in Materials and Enclosure

Units: 2

Term: Spring **Day:** Thursday **Time:** 4pm-5:50pm

Location:

Instructor: Mic Patterson, PhD (USC 2017); Sanjeev Tankha, AIA (USC MBS 1995)

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Course Description

Architecture 518 is a 2-unit course that meets once a week for 2 hours.

This is a broad-based survey course focused on façade system technology and explores the potent leverage of the building skin in the realization of intelligent and sustainable buildings and urban habitat.

The building skin combines performative, aesthetic and social dimensions like nothing else in architecture, making it a predominant focus for the skilled architect. The performance of the building façade will be pivotal in achieving critical resilience and sustainability goals in buildings and urban habitat over the next three decades. The *Façade Zone* is an envelope surrounding the building perimeter, and the nexus of myriad, often competing considerations that must be balanced in the unique context of each individual building project. People spend 90 percent of their time indoors. The façade zone mediates the indoor and outdoor environment to provide a safe, healthy, comfortable and productive interior environment. The quality of the indoor environment has been definitively linked to human health and productivity.

The architect is challenged with managing limited resources and meeting performance objectives in the face of escalating climate stresses and the evolving context of indeterminacy and uncertainty as the climate crisis unfolds. The need for substantial operational carbon emission reductions has already impacted the current generation of building skins. Emerging considerations of embodied carbon bring urgency to the task of developing and applying the next generation of building skin technology. The design of building envelopes has rapidly become uniquely interdisciplinary, integrating new types of expertise into the professional design process.

Active, responsive, intelligent building skins could improve performance in the face of escalating natural and manmade disasters. Architects are designing increasingly complex building skins using new materials and processes that were not imaginable just a few years ago. This course is intended to provide a solid foundation of building envelope design issues and technology while exposing students to some of the most advanced building skins today.

The basic understanding of façade system art, science and technology provided by this course will empower the student and contribute significantly to their studio work and, later, to their professional practice.

Learning Objectives (LOs)

The following LOs are keyed to the weekly schedule below.

In this class you will:

- LO-1: learn basic research skills, critical thinking and how to present your thoughts.
- LO-2: discover the pervasive relevance of the façade system in architecture.
- LO-3: identify different types of façade systems and their component parts.
- LO-4: understand the materials and processes characteristic of façade system design and delivery.
- LO-5: become acquainted with the typical design development process of a façade program.
- LO-6: develop an understanding of architectural glass products as a façade system material ubiquitous in buildings and urban habitat.
- LO-7: understand the contribution of buildings and their façade systems to the climate crisis, and the reciprocal impacts of climate change on buildings and their façade systems.
- LO-8: recognize the potential for the façade system to act as the lynchpin in achieving critical goals for resilience and sustainability in buildings and urban habitat.

Prerequisite(s): None

Co-Requisite (s): none

Concurrent Enrollment: none

Recommended Preparation: none

Course Notes

This course will include online learning strategies and at least some of the course content will be delivered virtually. Virtual lectures will be recorded and posted to Blackboard. Building tours or field trips may be arranged if circumstances permit, or virtual tours may be substituted.

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 the student 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 the student be empathetic toward their peers and to acknowledge everyone's contribution with kindness. And the instructor 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

Required Readings

Required readings are listed in the weekly course schedule below. The student is responsible for readings by class time of the week for which they are listed in the weekly course schedule. There will be a 15-minute discussion of the reading material during the class. There may be additional review materials as the classes progress. Assigned reading materials will be available from the library or otherwise made available.

Recommended Readings

The following books will be available in the library. **There are no required textbooks for this course.**

- Aksamija, Ajla. *Sustainable facades: Design methods for high-performance building envelopes*. John Wiley & Sons, 2013.
- Boswell, Keith. *Exterior building enclosures: design process and composition for innovative façades*. John Wiley & Sons, 2013.
- Brand, Stewart. *How buildings learn: What happens after they're built*. Penguin, 1995.
- Compagno, Andrea. *Intelligent glass facades: Material, practice, design*. Birkhauser, 1999.
- Herzog, Thomas, Roland Krippner, and Werner Lang. *Facade construction manual*. Basel: Birkhauser, 2008.
- Knaack, Ulrich, Tillmann Klein, Marcel Bilow, and Thomas Auer. *Façades: principles of construction*. Birkhäuser, 2014.
- Murray, Scott, and Scott Charles Murray. *Contemporary curtain wall architecture*. Princeton Architectural Press, 2009.
- Patterson, Mic. *Structural glass facades and enclosures*. 2011. New York: Wiley, 2011.
- Robinson, Kim Stanley. *New York 2140*. Fanucci Editore, 2017.
- Schittich, Christian, Gerald Staib, Dieter Balkow, Matthias Schuler, and Werner Sobek. *Glass construction manual*. Basel: Birkhauser, 2012.
- Wigginton, Michael, and Monica Pidgeon. *Glass in architecture*. London: Phaidon, 1996.
- Wigginton, Michael, and Jude Harris. *Intelligent skins*. Routledge, 2013.

Description and Assessment of Assignments

In-Class (virtual or in-person) Work

Participation in classroom exercises is an important element of the education this class offers. These exercises 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. More than three unexcused absences will result in receiving a 0 for this category. (For more information on Attendance, please see the heading below).

Late Work

It is the student's 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 the student turns in a paper

late without having cleared it with the 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).

Assignments

Assignments will be made on a weekly basis. The instructor asks the student 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.

Reading Assignments

Reading assignments are made on a weekly basis as indicated in the weekly class schedule below. There may be pop quizzes on the required readings intended to assess your progress on relevant LOs.

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 (10 minutes or less) to the class involving outside research. These presentations, which will be directed by an assignment (that can be as broadly or narrowly construed as you like), ask you to explore some aspect of a subject being studied. Some are intended to allow you to indulge in interests that predate this course or to explore a novel area of inquiry. These presentations provide context for the class discussion. The study of architecture and the façade system is not to be narrowly limited to technology but must also include cultural and political dimensions. Possible topics and sources will be suggested. In your research, you are expected to go beyond the sources provided. Presentations are to demonstrate 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. These assignments and presentations generally embrace LO 1, along with other LOs as the class progresses through the weekly schedule.

Final Project

The final project will involve the analysis, critical assessment and case study of the façade system of an existing building. The deliverables for this assignment will be discussed and will contain graphical presentation, drawings and or narrative as required to fully document your analysis and assessment.

Assessment and Learning Objectives (LOs)

Assessment of assignments, readings and presentations are keyed to LOs as indicated in the weekly course schedule.

Grading Timeline

Assignments will be graded and returned within a week's time.

Grading Breakdown (points or percentage)

- Presentations 15
- Quizzes and assignments 20
- Mid-Term Proposal 25
- Final Project report and board 40

Grading Scale

Course final grades will be determined using the following scale

<u>A</u>	<u>95-100</u>
<u>A-</u>	<u>90-94</u>
<u>B+</u>	<u>87-89</u>
<u>B</u>	<u>83-86</u>
<u>B-</u>	<u>80-82</u>
<u>C+</u>	<u>77-79</u>
<u>C</u>	<u>73-76</u>
<u>C-</u>	<u>70-72</u>
<u>D+</u>	<u>67-69</u>
<u>D</u>	<u>63-66</u>
<u>D-</u>	<u>60-62</u>
<u>F</u>	<u>59 and below</u>

Course-specific Policies

Assignment Submission

Formatting

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 472: Semester/Year

Instructors names:

Date:

Assignment Name or Number (e.g. Take-Home Mid-Term)

Grading Timeline

Just as the student promises 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 the student's responsibility to finish each assignment by its due date and time. The instructor is willing to consider giving extensions, but the student must be for legitimate medical emergencies, documented by a letter from a doctor indicating that he/she was too sick to complete the work. If the student turns 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 student hands 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

A notebook computer with basic software is desirable. The instructor asks that the student check email every twenty-four hours of the school/work week, as they will communicate with through it. The instructor will provide his contact information.

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

	Topics/Daily Activities	Readings/Preparation	Deliverables
Week 1 LO-2	Course Introduction and Lecture: Why skins: Building sustainability and the relevance of the façade zone Assignment 1: Personal ecofootprint exercise	none	none
Week 2 LOs 2&3	Lecture: Introduction to Curtainwall Reading discussion Assignment 2: Personal ecofootprint exercise (remix)	Summary for Policymakers: IPCC Special Report SR15 https://www.ipcc.ch/sr15/chapter/spm/	Assignment 1 written and class presentation
Week 3 LOs 2&3	Lecture: Introduction to Curtainwall (cont.) Reading Discussion Assignment 3: Façade system types	Chapters 1 & 3: Mic Patterson, Skin fit and retrofit: Challenging the sustainability of curtainwall practice in tall buildings, PhD dissertation, 2017	Assignment 2 written and class presentation
Week 4 LO-3	Lecture: Structural Glass Facades Pt. 1 Reading Discussion Assignment 4: Favorite Skins	Ch 1. Mic Patterson, Structural Glass Facades and Enclosures	Assignment 3 pdf file and class presentation
Week 5 LO-3	Lecture: Structural Glass Facades Pt. 2 Reading Discussion Assignment 5: Favorite Structural Glass Facades Mid-term Assignment: Case Study	Ch 6. Mic Patterson, Structural Glass Facades and Enclosures	Assignment 4 pdf file and class presentation
Week 6 LO-5	Lecture: Façade System Design and Delivery Process Assignment 6: Material and process	Realizing Bespoke Structural Glass Facades: The Denver Art Museum Welcome Center. Kirschbaum et. al. Proceedings, Façade Tectonics World Congress 2020.	Assignment 5 pdf file and class presentation
Week 7 LO-4	Lecture: Material matters: An expanding palette of façade materials. Reading Discussion	Introduction: Blaine Brownell, <i>Material Strategies: Innovative applications in Architecture</i> . Princeton Architectural press, 2012	Assignment 6 pdf file and class presentation
Week 8 LO-4	Lecture: Is glass green? Reflections on architectural glass Reading Discussion	Guardian: Glass Basics + videos on page; Is glass green? Considering the insulating glass unit Glass Section: Blaine Brownell, <i>Material Strategies: Innovative applications in Architecture</i> . Princeton Architectural press, 2012	Mid-term Assignment: pdf file
Week 9 LOs 2,4,7,8	Lecture: Material matters: Durability and embodied carbon Reading Discussion Final Assignment: Façade fiction: Telling the story of a building and its façade system Assignment 7: How long should a building (and its façade system) last?	Chapter 4: Mic Patterson, Skin fit and retrofit: Challenging the sustainability of curtainwall practice in tall buildings, PhD dissertation, 2017	
Week 10	Lecture: Supple skins: Façade system resilience	Chapter 6: Mic Patterson, Skin fit and retrofit: Challenging the sustainability of	Assignment 7 pdf file

LOs 2,4,7,8	Reading Discussion Assignment 8: Post-apocalyptic façade systems	curtainwall practice in tall buildings, PhD dissertation, 2017 Chapters 1 & 3: Mic Patterson, Skin fit and retrofit: Challenging the sustainability of curtainwall practice in tall buildings, PhD dissertation, 2017	pdf file and class presentation
Week 11 LOs 2,4,7,8	Lecture: Vintage skins: Retrofitting the tall face of modernism Reading Discussion	Chapter 7: Mic Patterson, Skin fit and retrofit: Challenging the sustainability of curtainwall practice in tall buildings, PhD dissertation, 2017	Assignment 8 pdf file and class presentation
Week 12 LO-1	Lecture: Skin deep innovation: Design as creative problem solving Reading Discussion Assignment:	<i>Where good ideas come from</i> : Steven Johnson	Assignment Due: Final Project Concept Presentation
Week 13 LOs 7-8	Workshop: Final Project Development and crits, detailing reviews, system design reviews, possible guest reviewers		Assignment Due: Final Project Concept Presentation
Week 14 LOs 7-8	Workshop: Final Project Development and crits, detailing reviews, system design reviews, possible guest reviewers		Work on final project
Week 15 LOs 7-8	Project Presentations		Final Project
FINAL			Refer to the final exam schedule in the USC Schedule of Classes at classes.usc.edu .

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:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.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) 740-9355(WELL), press "0" after hours – 24/7 on call

studenthealth.usc.edu/sexual-assault

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

Office of Equity and Diversity (OED) - (213) 740-5086 | Title IX – (213) 821-8298

equity.usc.edu, titleix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298

usc-advocate.symplcity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office of Equity and Diversity | Title IX for appropriate investigation, supportive measures, 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 Campus Support and Intervention - (213) 821-4710

campussupport.usc.edu

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.