ARCH 518:
Advanced Surface Tectonics

Advanced Surface Tectonics:
Methods in Materials and Enclosures

Syllabus
Thursdays 11:00am – 12:20pm, Harris 101

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Introduction and Purposes
The performance of the building envelope will be critical in defining building performance in the coming century. The building envelope mitigates outdoor conditions and indoor comfort, managing limited resources and meeting performance objectives in the face of climate stresses and the evolving context of indeterminacy and uncertainty. Climate change threatens existing envelopes that were designed in response to historical conditions. The need for substantial energy use reductions is already transforming this generation of building skins and further research is necessary to accelerate this process. The design of building envelopes will be uniquely interdisciplinary, integrating new types of expertise into the professional design process. High-Performance envelopes will significantly increase expectations for facade energy and daylighting performance and will require accurate analytical tools and processes for performance prediction. Active, responsive, intelligent skins could improve performance in the face of 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 while exposing students to a set of some of the most advanced building skins today.

Sample Lectures
Curtainwall 101, Performative Aesthetics, Glass Material Technologies, Structural Glass Facades, Structures in Tension, Double-Skins, Materials for Geometric Complexity

ASSIGNMENTS

Project 1: CASE STUDY (Due 2.25.18)
Working in groups of three, develop a thorough case study of one of the preselected building enclosures located in the Los Angeles area. Document the pertinent features of the facade system at the three scales – macro, meso and micro – as explained on the assignment brief.

Project 2: DESIGN EXERCISE: FAÇADE RETROFIT (Due 4.17.18)
Working in groups of three, design and propose a façade retrofit for your case study. The new design can be approached in multiple ways:

1. Demolish the entire existing façade and propose a retrofit that respects the original design intent, but improves the systems performance to current standards.
2. Demolish a portion of the existing façade and propose a retrofit that respects the original design intent, but improves the systems performance to current standards.
3. Preserve the existing façade and propose a new enclosure that improves the original building, but maintains its design intent.

Required Statement for Students with Disabilities
Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m.–5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Required Statement on Academic Integrity
USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus,* the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A:
http://www.usc.edu/dept/publications/SCAMPUS/gov/
Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS

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COURSE SCHEDULE

WEEK 1 1.09	Introduction: Lecture(s):	Syllabus review Introduction to Case Study Projects; selection (DiMento) Participants in Project Delivery (Vaglio)
WEEK 2 1.16	Lecture:	History and Introduction to Curtain Wall (Vaglio)
WEEK 3 1.23	**Assignment 1:** Lecture:	**Project 1 – Macro DUE** Glass as Material: Performance + Processing (Vaglio)
WEEK 4 1.30	Lecture: **Quiz 1:**	Thin Glass + Emerging Technological Opportunities (Pennetier) **Glass Material and Processes / History** (Take Home)
WEEK 5 2.06	**Assignment 2:** Lecture:	**Project 1 – Meso DUE** Introduction to Forces and System Typologies (DiMento)
WEEK 6 2.13	Lecture:	Curtain Wall 101 (DiMento)
WEEK 7 2.20	**Assignment 3:** **Quiz 2**:	**Project 1 – Micro DUE** **Enclosure Systems and Structures** (In Class)
WEEK 8 2.27	**PROJECT 1 PRESENTATIONS** (see Project 1 Description; <u>due 2.25 midnight</u>)	
WEEK 9 3.06	Lecture:	Increasing Transparency: Structural Glass Facades (SGF) Structures in Tension, Big Glass (Vaglio)
WEEK 11 3.20	Lecture:	Increasing Insulation: Double-skin Facades (DSF) (Vaglio)
WEEK 12 3.27	Lecture: **Quiz 3**:	Increasing Complexity (DiMento, Vaglio) **SGF's, DSF's + Geometry** (Take Home)
WEEK 13 4.03	Lecture:	Architect's perspective on Building Enclosures (DiMento)
WEEK 14 4.10	NO CLASS – Dedicated times for teams to prepare Project 2 Design Exercise	
WEEK 15 4.17	**PROJECT 2 PRESENTATIONS**	
WEEK 16 4.24	**PROJECT 2 PRESENTATIONS**	
FINAL 5.08	Tuesday, May 8, 2018: 11:00 am to 1:00 pm	

GRADING

All homework and assignments are to be turned in on Blackboard by the beginning of class on the due date. In the event Blackboard is down, assignments are to be emailed. Late assignments will receive a 5% deduction for each day it is late.

Participation/Assignments:	10%
Quizzes:	20%
Project 1 (Team):	20%
Project 2 (Team):	30%
Final:	20%

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READINGS

The list below includes **required** and additional readings. Required readings, along with the course lectures, will be the basis of quiz and testing information. All will be made available via BlackBoard. You are expected to read the assignments prior to class and come prepared to discuss the work and to raise questions from your perspective.

Each week that has a reading assignment will have a Blackboard participation requirement in the form of a discussion post. Each discussion post should be a minimum of 75 words.

- At 12 noon on the Monday before each lecture class you are required to post on Blackboard a short question or comment about the readings. This should be on the order of 75+ words. Students are encouraged to respond and comment to one another referencing the readings.

Reading List

WEEK 2 — 1.16 — History and Introduction to Curtain Wall

Readings:

- Schittich, ***inDetail: Building Skins*** **(pp. 9-27)**
- Herzog, Krippner & Lang, ***Facade Construction Manual*****: A 1 Internal and External Conditions (pp. 18-21)**
- Wood & Salib, *CTBUH: Natural Ventilation in High-Rise Office Buildings* (pp. 16-21)
- Pawlitschko, *Best of Detail Glass: Between Experiment and Emotion – Glass Cladding Systems* (pp. 12-14)

WEEK 3 — 1.23 — Glass as Material: Performance + Processing

Readings:

- Herzog, Krippner & Lang, ***Facade Construction Manual*****: B 1.6 Glass (pp. 183-191)**
- Patterson, ***Structural Glass Facades and Enclosures*** **(pp. 22-35, 101-108)**
- Patterson, *Structural Glass Facades and Enclosures* (pp. 48-49)
- Kallenback & Pawlitschko, *Best of Detail Glass: Recent Developments in Transparent and Translucent Materials* (pp. 18-27)

WEEK 6 — 2.06 — Curtain Wall 101

Readings:

- Boswell, ***Exterior Building Enclosures*** **(pp. 365-391)**
- Herzog, Krippner & Lang, ***Facade Construction Manual*****: A 3 Planning Advice For The Performance of the Façade (pp. 53-59)**
- ***Architectural Graphic Standards*** **(pp. 206-213)**
- Watts, *Modern Construction Handbook* (3rd ed) (pp. 116-127)
- Patterson, *Structural Glass Facades and Enclosures* (pp. 36-43)
- Summary of Exterior Building Enclosure Chapter 8 Metal Framing & Glass

WEEK 9 — 3.06 — Increasing Transparency

Readings:

- Patterson, ***Structural Glass Facades and Enclosures*** **(pp. 45-100)**
- Boswell, ***Exterior Building Enclosures*** **(pp. 483-502)**
- ***Architectural Graphic Standards*** **(pp. 262-266)**
- Watts, *Modern Construction Handbook* (3rd ed) (pp. 128-135, 316-319)
- Watts, *Modern Construction Handbook* (3rd ed) (pp. 226-241, 324-331)
- Summary of Exterior Building Enclosure Chapter 9 All Glass Enclosures

WEEK 11 — 3.20 — Increasing Insulation: Double-Skin Facades

Readings:

- Vaglio, ***Aerophysics of Double-Skin Facades*** **(pp. 80-200)**
- Watts, ***Modern Construction Handbook*** **(3rd ed) (pp. 378-383)**
- Vaglio, *Aerophysics of Double-Skin Facades* (pp. 203-240, App. A & C)

WEEK 12 — 3.27 — Increasing Complexity

Readings:

- Watts, ***Modern Construction Handbook*** **(3rd ed) (pp. 8-17)**
- Vaglio & Tucker, ***Parametric Workflows for Complex Enclosure Structures***
- Ronfini & Cohn, ***Managing Complexity: Implementing parametric tools in project management: a case study***