Columbia University
Graduate School of Architecture, Planning and Preservation

Holistic Skins – Integration for Performance

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Course Description

Recent trends in building design have been with a goal of "performance" and system integration as a form driver. While large formal, orientational, and massing gestures can play a large role in attaining particular functional goals in relation to energy use and comfort, assembly and component based moves at the building envelope level can often play a larger role in the overall performance of a particular building.

This course explores the design of building skins to comply with a set of requirements while turning an architectural concept to a finished system product. Potential material and systems will be explored for different areas of the building that satisfy the architectural and functional constraints along with these performance goals. The lectures will focus on case studies of real projects that have utilized integrated envelope design as well as tools to optimize the envelope shape and the material assemblies. The final aim of the course is to teach students the process of defining an envelope strategy while conceiving complex geometry systems and to give an overview of the different parties involved in the decision making process in the New York, American, and overseas markets.

Breakdown of Modules:

- **Step 1- Performances Introduction:** students will be shown processes involved in the selection of the most appropriate skin solutions in line with the Architectural intent and the required performances via in class presentations and site meetings with industry representatives.
- **Step 2 - Analysis and Construction:** students will work in groups and analyze a set of performances on an actual project or a Studio design in order to finalize a set of possible options. These options will be then evaluated via a construction of a physical mock up for constructability or computer generated tools to optimize a set of performance parameters. Students will finally present their strategy and findings.
- **Step 3 – Innovation**: a set of presentations by industry representatives will inform the student design carried out during the second phase of this course. Students will have an option to review their design following the presentations to include for an innovative approach.

Course Outline:

Class No.	Module	Class Topic
1	Step 1 Performances Introduction	Understanding the Design Intent
2		Structural Design
3		Environmental Requirements and Weather Performance
4		Lighting Design
5		Geometry Modeling and Constructability
6		Supply Chain and Budget Costing
7		Fire and Glazing Safety
8		Durability
9	Step 2 Analysis and Construction	Analysis
10		Construction
11		Student presentations
12	Step 3 Innovation	Industry presentations
13		Student presentations

Grading:
Students will receive grades based on the quality of the presentations and additional deliverables assigned at each class. Presentations and class deliverables will carry a 50% weight towards the final grade, while a further 50% will be given for class participation and attendance.

Suggested resources:
The following is a list of optional resources:

- Detail in Contemporary Glass Architecture Publisher: Laurence King Publishing ($35)
- Facades: Principles of Construction Publisher: Birkhauser ($49)
- In Detail: Building Skins: Concepts, Layers, Materials Publisher: Birkhauser ($99)
- Kinetic Architecture:: Designs for Active Envelopes Publisher: Images Publishing ($80)