F22

Building Integration Option Studios

Carnegie Mellon University
School of Architecture

F22 PRAXIS 3

Building Integration Option

Studios

The overarching theme for the semester is that of Materiality and Aesthetics. Each studio will take a different attitude to the intersection of these issues to their studio agenda.

The Architectural Envelope	**Gerard Damiani** (coordinator)
Station re-creation	**Hal Hayes**
XL-M-XS Design-Build	**Steve Lee**
Urban Center for Energy Innovation	**Jill Swenson**

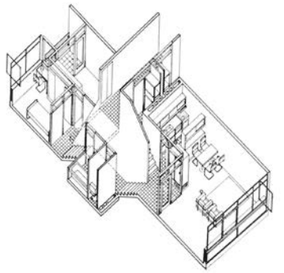
The four Building Integration Option Studios offer the opportunity to develop an architectural project to the level of detail to fulfill the NAAB 2020 accreditation requirements for Student Criterior 6. These studios will take quite different building typologies and scales but all demonstrate integration of a coordination of building envelope systems and assemblies, structural systems, environmental control systems, life safety systems, and the measurable outcomes of building performance.

48:400 students will be sent a form to indicate three F22 BIO studio preferences. Each studio has a differing team structure (from individual to teams of up to four) and we are including a form question for collaborative team preferences. The Design Build studio XL-M-XS with Steve Lee is possible to take as a one or two semester option. Preference forms will ask for a response to your S23 and longer trajectory. To understand the S23 ASOS offerings you should consult the ASOS 22-23 catalogue. Preference forms will need to be returned by Monday August 1st. The studio rosters will be announced on Monday August 15th.

S+/-

GERARD DAMIANI
The Architectural Envelope

The Protagonist of Section and the High Performance Facadé



HAL HAYES
Station re-creation

A new civic gateway and passenger train staion for Pittsburgh.

STEVE LEE
XL-M-XS

A Farmers' Market at Hazlewood Green, year-long design-build studio

JILL SWENSON
Urban Center for Energy Innovation

A Research and Demonstration Laboratory Facility along the Allegheny River

THE ARCHITECTURAL ENVELOPE

The Protagonist of Section and the High Performance FacadÈ

GERARD DAMIANI, ASSOCIATE PROFESSOR

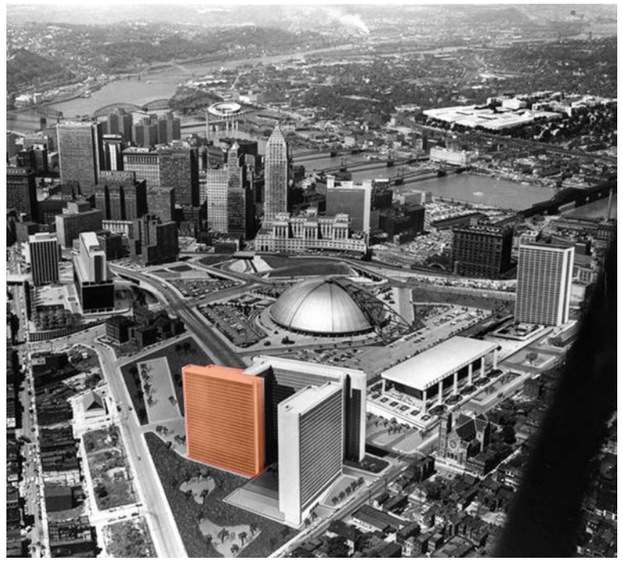
QUESTIONS

This ASO studio will focus on building integration and in particular the role of the architectural envelope. The envelope during the time of the Renaissance suggested the idea of a facadé. The facade was a symbol of the Age of Humanism. With the advent of mechanical development, the building envelope evolved from symbol to a performative separation of environment. This studio will look at the role of the performative envelope as a means to regulate the difference between exterior and interior.

PROMPT

In 1964 Chinese American architect I.M. Pei was commissioned to design a housing project in Pittsburgh that was to be a part of a master plan by another firm called the Center of the Arts. This master plan was to contain an opera house, symphony hall, theaters, an art museum, a hotel, offices and residential apartments. It was promoted that no social loss will occur but, in fact, the incompleteness of the Washington Avenue Apartments did just that.

The area surrounding the former Civic Arena project led to a contentious time of displacement of the African American community in the lower Hill District of Pittsburgh. As part of this plan the Federal Housing Administration had proposed the Washington Avenue apartments to relocate the displaced.

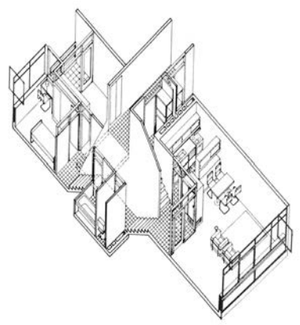


Original massing with proposed project area indicated in orange

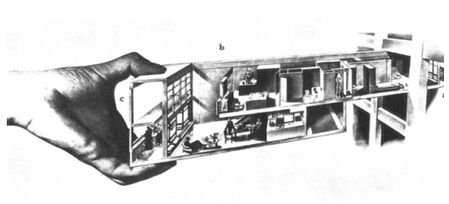
CONTEXT

Conceived as one of the highest residential structures in Pittsburgh, it consisted of 24 floors and a height of nearly three hundred feet. The project was conceived to address the housing needs of the lower Hill but instead was built as a fragment consisting of approximately 1/3 of its proposed area. This incompleteness continued to neglect the needs of the lower Hill and it remains decades later as a fragment of its original intention.

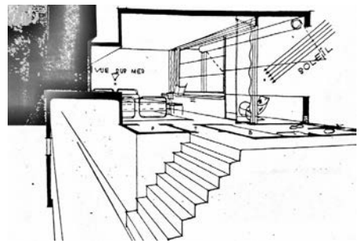
This studio will look to complete a portion of its original intention buy adding a series of residential units to its original massing at the blank wall where construction ceased in 1964. Situated on a nearly north/ south orientation, this project will address the envelope design for such an orientation.



The Corringham, Kenneth Frampton



Unité d'habitation, Le Corbusier



L'hotel Latitude 43, Georges- Henri Pingusson

Robin Hood Gardens, Alison and Peter Smithson

Studio Process:

A series of studio professional consultants will join the studio to provide technical expertise and review throughout the semester.

The studio will be organized similar to an office with four project teams each being responsible for the project and its development. It is important when selecting this studio you consider your team as part of your ASO studio selection. Teams will be given special consideration during the studio selection process.

Gerard Damiani, AIA

PROGRAM

Sectional Protagonists:
Each team will choose from one of the following sectional housing strategies as the starting point of your solution. Site, orientation, region and climate are to act as preliminary form modifiers for the adaptation of the selected sectional strategy.

Unité d'habitation, Le Corbusier
The Corringham (apartment block), Kenneth Frampton
L'hotel Latitude 43, Georges-Henri Pingusson
Robin Hood Gardens, Alison and Peter Smithson

Materiality:
At one time I.M. Pei's office was at the forefront of building envelope design. This studio will look at the evolution of the building envelope starting from the one developed for the Washington Avenue Apartments to the contemporary advancements of the building envelope. Our studio consultants from Heintges, Consulting Architects and Engineers have worked on the enclosure systems of some of the most iconic and innovative buildings in the world.

www.heintges.com/

Methods of Measure: Solar and Ventilation Analysis:
Computational Methods: Climatestudio
Analogue Methods: Daylight simulations via model and lighting studies

LEARNING OUTCOMES

This studio has been developed to provide you the opportunity to make design decisions while demonstrating the integration of building envelope systems and assemblies, structural systems, environmental control systems, life safety systems, and the measurable outcomes of building performance as per NAAB criteria SC.6 Building Integration.

The studio will consist of four teams (teams are to be considered at studio selection and be considered as part of the studio selection process) which will develop a comprehensive design that integrates the following:

Structure - framing and material
Foundation - type, depth, seismic rating
Fenestration/ window types and effectiveness (individual, curtain wall, fixed, operating)
Envelope/ Sun Control/ Daylighting - components as assembly
Heating, Ventilation, Air Conditioning (HVAC)
Utilities - water, electricity, other services
Access/ Egress - doors, stairways, ramps, elevators, loading docks
Emergency - fire suppression, sprinklers, fire dampers, fire-rated assemblies & fire isolation

STATION_re-creation

A new civic gateway and passenger train station for Pittsburgh.

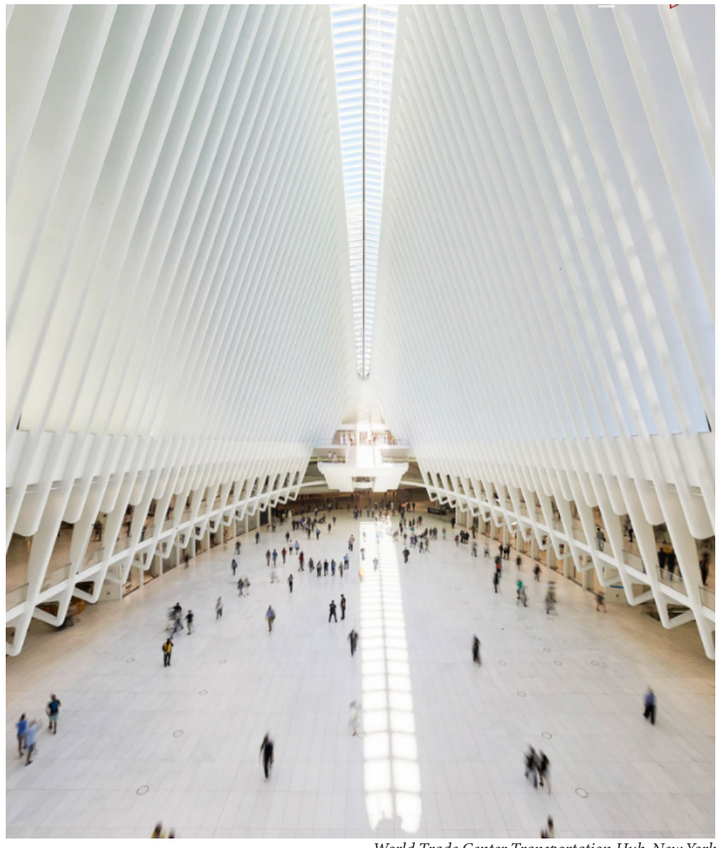
Hal Hayes

QUESTIONS

Rail transport was the first means of long-distance overland travel, and dominated the market for over a century. Train stations became key civic gateways expressing a unique sense of place, while maintaining the common functions of an integrated, distributed system. Rail travel is now experiencing another period of expansion, particularly in Asia, Europe and parts of North America based on the recognition that it is the most sustainable method of long-distance travel. This studio will question qualitative social issues of what makes a civic gateway, and the appropriate identity for one based on its local context and history. We will also question quantitative technical issues of integrated building systems, and how those systems interact with the requirements of the rail system itself.

PROMPT

The studio will address the F22 semester theme of Materiality and Aesthetics by first researching the history of Pittsburgh's Beaux Arts landmark Union Station and rotunda designed by Daniel Burnham, along with the ferro-vitreous train sheds of that period. Pittsburgh is known historically as a city of steel and glass, and yet these extraction-based industries have scarred the city's landscape and damaged its environment. That historic identity and how it is transforming into a model post-industruial knowledge economy will be explored and expressed through the students' design work.

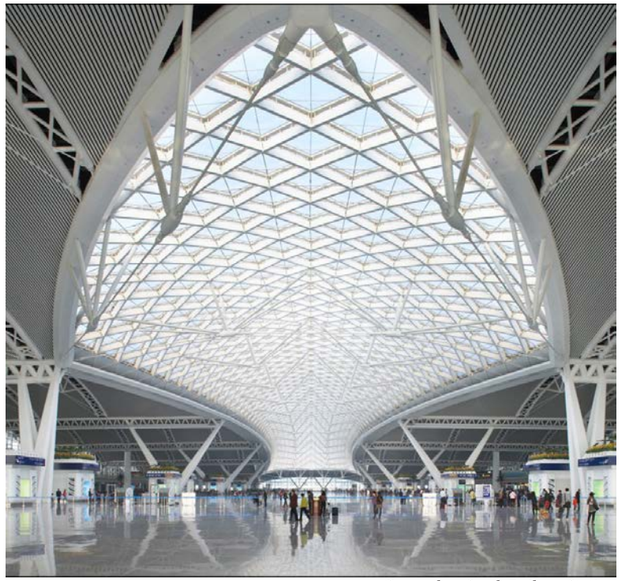


World Trade Center Transportation Hub, New York
Santiago Calatrava, 2016

CONTEXT

Studio readings, media and discussions will include the following.

- Make No Little Plans: Daniel Burnham and the American City (video)
- Daniel H Burnham, Visionary Architect and Planner
- The Late, Great Pennsylvania Station
- Modern Trains and Splendid Stations: Architecture, Design, and Rail Travel for the Twenty-First Century



Guangzhou South Railway Station
Farrells, 2010

Pittsburgh Union Station Rotunda
Daniel Burnham, 1902

Unlike New York's magnificent and bitterly missed Penn Station, Pittsburgh's Union Station survived an urban renewal demolition plan in 1966 through the strong opposition of the recently formed Pittsburgh History & Landmarks Foundation. However the function was still lost, as the station itself was converted into luxury apartments, and rail passengers were banished to a basement, with no access to the grand waiting room and extraordinary rotunda. The studio will examine these episodes and how they impact on social justice, accessibility, privatization of public spaces, and equal access for all.

Hal Hayes, AIA

PROGRAM

The studio will be a semester-long project with students working in teams of three. We will begin with an individual sketch problem that will explore the train station typology in the first week. We will then proceed in the next two weeks with group research into the typology, site, systems as listed below. Research will continue with precedents including recent projects in Asia and Europe that typify the evolution of the train shed typology as the dominant paradigm for modern stationsrounding out the first third of the semester. The remainder of the semester will be devoted to concept development, design and detailing.

We will also be working with a team of professional expert consultants who will participate in work sessions and reviews with the students regularly throughout the semester.

LEARNING OUTCOMES

This studio is the capstone of your undergraduate education and is an opportunity for you to integrate the various technical aspects of your professional degree to date. The learning outcomes are focused on the NAAB Student Criteria 6, Building Integration, which requires "that students develop the ability to make design decisions within architectural projects while demonstrating integration of building envelope systems and assemblies, structural systems, environmental control systems, life safety systems, and the measurable outcomes of building performance." The following items will be drawn as an integrated assembly and isolated as parts that contribute to the whole.

1. Structure - framing and material
2. Foundation - type, depth, seismic rating
3. Fenestration/Windows - types (individual, curtainwall, fixed, operative), effectiveness
4. Envelope/Sund Control/Daylighting - components as assembly
5. Heating, Ventilation, Air Conditioning (HVAC)
6. Utilities - water, electricity, services
7. Access/Egress - doors, stairways, ramps, elevators, loading docks
8. Emergency - fire suppression, sprinklers, fire dampers, fire-rated assemblies & fire isolation

XL - M - XS

A Farmer's Market Building at Hazelwood Green
Semester 1 of a Yearlong Design/ Build Studio

S.Lee

QUESTIONS

According to the USDA National Farmers Market Directory, "the number of markets in the U.S. has grown dramatically between 1994 and 2019, from roughly 1,755 to over 8,700 markets, an astounding 397 percent increase." [1] Farmer's markets have the potential to positively re-configure national, local and regional food eco-systems, to mitigate the effects of food deserts and to improve social and economic justice. A well integrated facility can create community identity and become a much needed social gathering place for a neighborhood.

_How would a new farmer's market facility impact the proposed development at Hazelwood Green (HG) and the Greater Hazelwood neighborhood?

_Can a well integrated building advance the sustainability, resilience and innovation goals of HG?

PROMPT

Farmer's Market buildings have a long tradition around the world and today present a unique challenge for architects. Their design spans the domains of urban design, public space making, neighborhood revitalization, social planning and the food eco-system, in addition to the critical issues of sustainability and resilience. The fall semester of the 4th year in the B.Arch program is focused on issues of building integration. This studio will consider the broader community and urban questions but be laser focused on the issues of building integration. The current generation of market buildings tend to provide greater spatial flexibility than in previous eras to not only support the basic marketing functions but also to support the community - from to performance to gardening. Minimizing internal vertical supports is a good strategy for spatial flexibility, so our form finding concepts will be developed as vector-active or form-active structural concepts to create clear spans integrating efficiency, elegance and economy. Further, our environmental concepts will be focused on maximizing passive conditioning and our constructability concepts will be based on Design for Disassembly (DfD).
The "XS" pavilion will form the basis of the campus Design/ Build Studio in Spring 2023

CONTEXT

The project site is a 178 acre former industrial site known as Hazelwood Green situated along the Monongahela River. In the early 2000's, Almono LP assembled multiple abandoned industrial properties in the Greater Hazelwood neighborhood to have greater control in creating and implementing a comprehensive redevelopment strategy for the site. According to their website, "Hazelwood Green is envisioned as a model for the transformative redevelopment of an urban brown field into a center of innovation that fuels Pittsburgh's new economy while remaining grounded in the principles of sustainability, equity, and inclusive economic opportunity." To the greatest extent possible, we will follow the 30 August 2018 Hazelwood Green Preliminary Land Development Plan.

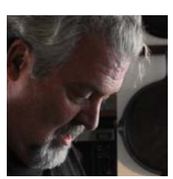
Hazelwood Green Preliminary Land Development Plan
Image Copyright: Depiction LLC 2018

(1) Albright, Kathryn Clarke. Exploring the Architecture of Place in America's Farmers Markets. Cincinnati, Ohio: University of Cincinnati Press, 2020.

Akadamie Mt. Cenis, Herne, DE

Team Structure
Assuming twelve students, we will divide into four three-person teams. The suggested team responsibilities are one person each as project manger for XL, M and XS and one person each as project manger for structure, enclosure and MEP. The project managers are ultimately responsible making team assignments and producing the deliverables.

Field Trips
_East Liberty Farmers Market, Pittsburgh, PA (Saturdays 600-am-1200pm)
_Main Street Farmers Market, Washington PA (Thursday's 300-600pm)
_West Side Market (43,560 ft²), Ohio City, Cleveland, OH
_Lancaster Central Market (87,120 ft²), Lancaster, PA
And maybe the:
_Reading Terminal Market (78,000 ft²), Philadelphia, PA



S.Lee

PROGRAM

The specific project for this studio is the design of a 50,000 sf farmer's market on Block 48 (1.81 acres, 78,847 sf) at Hazelwood Green. We will consider the German concept of "Haus in Haus" by designing the "XL" market building as the outer "Haus" and the "M" services building and the "XS" pavilions as the inner "Häuser".
Program:
XL - 30,000 sf enclosed farmers market with clear span structure ("Haus")
M - 3,000 sf enclosed services building (toilets, mechanical, office, cold storage) ("Haus in Haus")
XS - 300 sf open-air, pavilion-like prototypes for seating, eating, conversation, etc ("Object in Haus")
Work Products:
ArchiCAD BIM, multiple form finding models, environmental testing models and einz-zu-einz prototypes of important details.

LEARNING OUTCOMES

The following criteria will be used to evaluate student work in this studio:
_Aesthetics: The degree to which the proposed building responds to formal issues as articulated in this and prior design studios.
_Experience: The degree to which the design uses a thoughtful narrative and carefully articulated spaces to create meaningful experiences for the user.
_Structure, Enclosure & Materials: The degree to which the set of selected building materials, components and systems and their proposed implementation are appropriate to the intended occupancy, articulate the desired architectural order, and satisfy the physical design requirements.
_Environment: The degree to which the design integrates passive and active strategies to achieve triple bottom line performance.
_Constructability: The degree to which the proposed building is informed and developed in response to an understanding of the processes of construction.
_Presentation: The clarity, craft and completeness of the presentation(s).

Upon successful completion of this studio, you should be able to accomplish the following learning objectives:
_translate a program into a building design that responds to user requirements
_demonstrate the form making implications of structural systems
_demonstrate the energetic implications of materials selection, enclosure systems and building form
_integrate multiple systems to achieve elegance, efficiency and economy in design
_ability to determine the best way to test and measure performance of systems
_develop criteria for evaluating multiple design alternatives
_draw technical documentation for the project using the conventions of architectural representation

URBAN CENTER FOR ENERGY INNOVATION

A Research and Demonstration Laboratory Facility along the Allegheny River

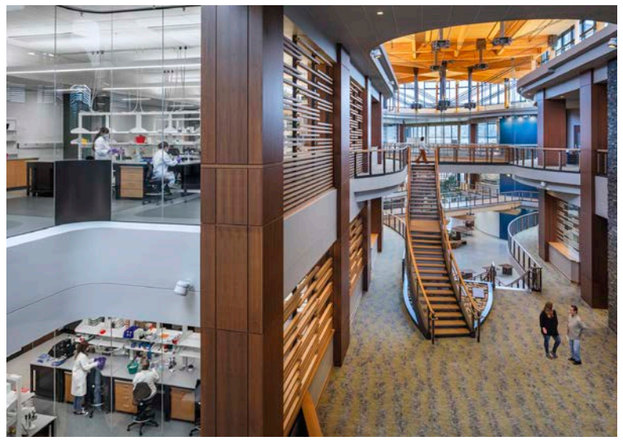
JILL SWENSEN

QUESTIONS

Laboratory facilities are typified as being rational, modular buildings which act as extensions of the activities and instruments they contain. Large consumers of energy to support research and ensure the safety of their human occupants, the buildings require thoughtful arrangement of space and systems. This ASO studio proposes to study building integration through the design of a new energy innovation laboratory facility. We will study the horizontal and vertical impact of various structural systems, the organizational influences of vital air and utility systems, and approaches to create healthy, beautiful, and comfortable environments for building occupants.

PROMPT

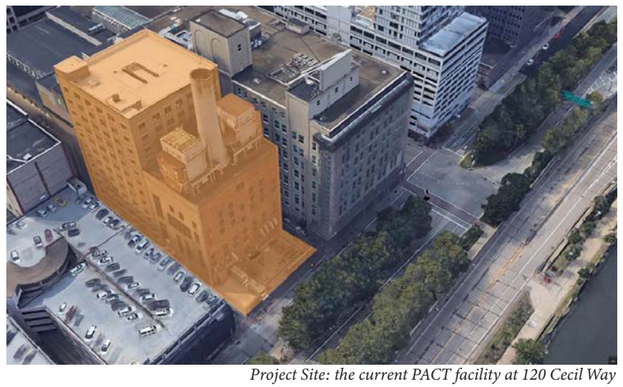
The 20th century was a time of great progress with innovations emerging from science and engineering research. We will analyze landmark laboratory facilities from the 1930's to the 1960's: S.C. Johnson Research Tower (1936, Frank Lloyd Wright), The Mesa Lab (1961, I.M. Pei), Brookhaven National Lab (1960, Marcel Breuer), Richards Research Building (1965, Louis Kahn), and compare them to a set of contemporary laboratory facilities, such as the Howard Hughes Medical Institute at Janelia Farms (2006, Rafeal Vinoly) and The Clark Center at Stanford (2003, Sir Norman Foster), to better understand strengths and weaknesses of design concepts and systems integration approaches. These insights will inform the development of the your project where we will test design development against a series of performance metrics: flexibility, operational efficiency (energy, maintenance), safety, and comfort.



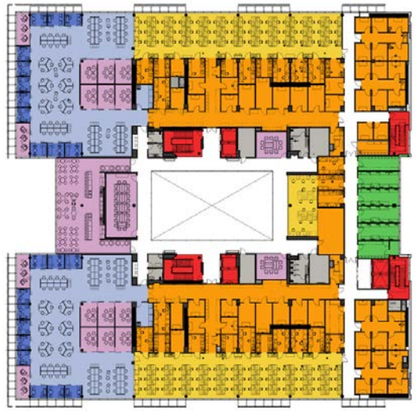
Promega Corporation, Kornberg Center

CONTEXT

The proposed dense, urban project site sits along the Allegheny River in Pittsburgh's Central Business District (CBD). A relic of Pittsburgh's coal power plant days, the existing PACT facility sits atop the city's 4th river. This aquifer, which runs under this location, provides extensive chilled water resources which could provide sustainable district heating and cooling resources to the CBD. This project will replace the old structure with a new facility for energy research, teaching, and demonstration/industry engagement which employs this special resource along with hosting research of other emerging energy technologies.



Project Site: the current PACT facility at 120 Cecil Way

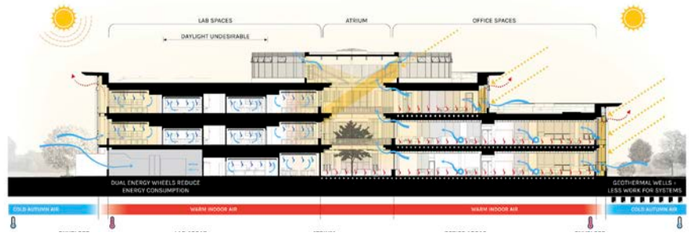


PROGRAM

The proposed building will be an assembly of the following spaces:
- Wet Labs (Hardware development and research)
- Computational Labs (Software development and visualization)
- Classrooms & Conferencing
- Offices
- District Energy HUB prototype – demonstration
- Building Service & Support

Each team will be assigned a structural system and a base mechanical system to employ in the design, along with a lab module "kit of parts". Following the analysis of lab building precedents (see PROMT), teams will prepare and present an overview of their understanding of design implications associated with the assigned structural and mechanical systems. We will then progress into assembling the program with systems organization approaches, studied in plan, section, elevation, and massing.

Work products will be developed using BIM or other 3D software, and will include environmental analysis, renderings, and physical models.



Studio Process:
A series of studio professional consultants from SmithGroup - architects, lab planner, mechanical and electrical engineers, daylighting/lighting, envelope - will join the studio to provide technical expertise and review throughout the semester.

The studio will be organized similar to an office with four project teams each being responsible for the project and its development. **It is important when selecting this studio you consider your team as part of your ASO studio selection.** Teams will be given special consideration during the studio selection process.

Jill Swensen, AIA, NCARB, LEED

LEARNING OUTCOMES

This studio has been developed to provide you the opportunity to learn about a complex building typology from analysis of precedents and subsequent development of design solutions. You will be challenged to create designs which are shaped by the thoughtful integration of building systems and assemblies with measurable outcomes of building performance, as per NAAB criteria SC.6 Building Integration.

The four studio teams will be tasked to develop a comprehensive design that integrates the following:

Structure - framing and material
Foundation - type, depth, seismic rating
Envelope/ Sun Control/ Daylighting - components as assembly
Heating, Ventilation, Air Conditioning (HVAC)
Utilities - water, electricity, other services
Access/ Egress - doors, stairways, ramps, elevators, loading docks
Emergency - fire suppression, sprinklers, fire dampers, fire-rated assemblies & fire isolation