

**Net Zero Housing - A Machine with a Poetic Bias – Tectonic & Performance**  
Fall 2021

## SYLLABUS

### 1. Course Description

**Net Zero Housing - A Machine with a Poetic Bias** introduces building science principles to the tectonic treatment of the massing of an existing residential building in New York City. The course will explore the physical built environment: how the performance factor “energy balance” is influenced by climate conditions, spectral and thermal properties of materials and the human body. The course will introduce tectonic principles as a possibility to express the thermal characteristics of the building skin and relate it back to the human body. This approach to building performance will explore form and geometry, mass and void, light and shadow, art form and core form. The lectures and exercises are organized and paced to provoke questions to search for solutions in a methodical and morphological approach as they relate to the performance of a building.

*“...his conviction increased that architectural manipulation, as a homely art or a fine art must be rendered completely plastic to the mind and the hand of the designer; that materials and forms must yield to the mastery of his imagination and his will...”*

The Autobiography of an Idea, Louis H. Sullivan

**Workshop Project:** Throughout the semester, students will analyze and redesign an existing residential building, into a high performance, net zero ready building. Students will use computer software such as [Ladybug for Rhino](#) and [DesignPH 2.0 EDU](#) to analyze the proposed redesign to achieve net zero. The case study building is located on 733 Park Avenue in New York City. “733 Park Avenue, represents a style of luxuriously exclusive urban living that has all but vanished from the city. It replaces the red brick mansion built in 1904 for Senator Elihi Root. Substituting for it a 30-story building containing only 28 apartments. Each typical unit consists of 9 rooms and 4 1/2 baths.” (Andrew Alpern, New York’s Fabulous Luxury Apartments)

## 2. Class Hours

Content	Date	Location
Presentations, Workshop & Reviews	Mondays 9 AM – 11 AM	300 Buell South
Site Visit(s)		TBD

## 3. Instructors & Critics

Professor: Andreas M. Benzing, [contact@andreasbenzing.com](mailto:contact@andreasbenzing.com)

Critics & Guests: Ryan Lobello ([Handel Architects](#))  
 Jessica Grove-Smith (Managing Director, [Passive House Institute](#))  
 Prof. Hans Kollhoff or Alexander Pols ([Kollhoff & Pols Architekten](#))

NOTE: Other review critics may be invited to the mid term and final reviews.

## 4. Course Content

- a. **Lectures:** Each week introduces a set of building science principles, key concepts of building performance, tectonic principles and the making of a building envelope.
- b. **Workshop Project:** This workshop is a practical experimentation on a semester long project as a hands-on focus to analyze the energy balance of a building and its architectural expression. Students will work in 2- or 3-person teams during the semester to advance the complex task of environmental design. The workshop is a step-by-step design process that will lead to a professionally drafted project.
- c. **Desk Crit:** Weekly desk crit review sessions will be organized with each team and related assignments will be reviewed. Teams will be required to develop their projects for desk crit and be ready to demonstrate work progress.
- d. **Deliverables.** The final project deliverable will be a project booklet of your workshop project – at 11x17 format, and should include drawings, renderings, images of models, calculations and analytical drawings. The lecture content will be tested with quizzes.

Week	Date	Lectures / Class Activity	Workshop / Assignments
1	Sep 13	<b>L01</b> _ Course Introduction & Performance Metric	<b>A01</b> _ City Walk - scenic sketches & research workshop project
2	Sep 20	<b>L02</b> _ Thermal Sensation & Comfort	<b>A02</b> _ Living Room - interior rendering & apartment plans (CBE Thermal Comfort Tool)
3	Sep 27	<b>L03</b> _ Thermal Flow & Mass	<b>A03</b> _ Bozzetto - clay models & Rhino model with urban context
4	Oct 4	<b>L04</b> _ Form & Thermal Performance	<b>A04</b> _ Heat Flow - computer model (DesignPH)
5	Oct 11	<b>L05</b> _ Solar Heat Gain & Shading	<b>A05</b> _ Mass & Void - solar analysis computer model (DesignPH) & Shading Mask (Rhino)
6	Oct 18	<b>L06</b> _ Airflow & Ventilation	<b>A06</b> _ Figure & Ground - façade elevation & computer model (DesignPH)
7	Oct 25	<b>L07</b> _ Passive House Principles, Energy Balance & Climate	<b>A07</b> _ Light Shadow Mass – charcoal perspective
	Nov 1	No Classes – Election Day Holidays	
8	Nov 8	<b>L08</b> _ Field Trip: Visit a Passive House ( <a href="#">The House at Cornell Tech</a> ), to be confirmed	<b>A08</b> _ Passive House Analysis
9	Nov 15	<b>L09</b> _ Tectonic & Façade	<b>A09</b> _ Tectonic - façade sketch & gypsum model
10	Nov 22	<b>L10</b> _ High Performance Details & Glazing	<b>A10</b> _ Façade - detail drawing
11	Nov 29	<b>L11</b> _ Path to Net Zero - Active Systems	<b>A11</b> _ Final perspective rendering (Rhino) & energy model (DesignPH)
12	Dec 6	Final Review	

NOTE: lectures, class activities, assignments, etc. subject to change as class progresses.

## 5. Grading

In this course, every effort is made to grade impartially regarding a team’s performance. Since project development is a team effort, grades are assigned to teams. On rare occasions,

individual grades may be awarded for exceptional or deficient performance within a group. Grading is based on the following criteria:

Criteria	Description	%
Workshop project	<ul style="list-style-type: none"> <li>Quality of concept, drawings, and models</li> <li>Weekly progress</li> <li>Presentations at reviews and desk crits (equal presentation by group members required)</li> </ul>	40%
Deliverables	<ul style="list-style-type: none"> <li>Quality and completeness of the final project booklet</li> <li>Course quizzes</li> </ul>	40%
Attendance and Participation	<ul style="list-style-type: none"> <li>Team collaboration</li> <li>Attendance</li> <li>Punctuality</li> <li>Preparedness for weekly mentorships</li> <li>Assignment completion</li> <li>Sketches, project organization</li> <li>Responsiveness to mentor feedback</li> </ul>	20%

NOTE: missing more than 2 classes is grounds for withdrawal.

Final grades are assessed based on the following %:

High Pass	>90%
Pass	60 – 90%
Low Pass	50 – 60%
Fail	<50%

## 6. Policies

- If you require an accommodation for a disability, please let me know as soon as possible. Some aspects of the course may be modified to facilitate your participation and progress.
- All students are held to the academic policies of the University.
- Plagiarism is knowingly presenting another person’s ideas, findings, images or written work as one’s own by copying or reproducing without acknowledgment of the sources. It is intellectual theft that violates basic academic standards. In order to uphold an equal evaluation for all work submitted cases of plagiarism will be reviewed by the individual faculty member and/or the Dean. Punitive measures will range from failure of an assignment to expulsion from the University.

- Students who miss deadlines due to valid extenuating circumstances may submit the required work at a later date, as agreed upon with the instructor. University regulations limit such circumstances to serious personal illness and death in the immediate family. Unexcused late projects will not be accepted, incomplete projects will be evaluated in relation to their degree of completion, and a student will be allowed to present such work only with instructor approval. Lectures and demonstrations cannot be repeated. There is no excuse for late submittals, late attendance at reviews or pin ups, due to printer or computer problems. You have to organize your output ahead of time or find other resources outside the college to complete your work on time. Late work will be accepted only at the discretion of the instructors and is subject to a grade.
- The final course evaluations are important to the quality of instruction. Please take the necessary time to critically and constructively evaluate the course as well as the instructor's quality of instruction and guidance in relation to your own participation in the course, engagement in the subject matter as well as your interaction with your peers and your instructor.

## 7. Reference Texts

The class does not have a textbook and will not require weekly readings. However, the following texts are recommended for review by students and as a starting point for creative stimulation:

- The Architecture of the Well-Tempered Environment, The University of Chicago Press, 1969, Reyner Banham – Chapter 2. Environmental management
- Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture, The MIT Press, 1995, Kenneth Frampton - 1 Introduction: Reflections on the Scope of the Tectonic
- The Mathematics of the Ideal Villa and Other Essays, published by MIT Press, 1956, Colin Rowe – Chapter: Chicago Frame
- The Autobiography of an Idea, Published by the American Institute of Architects, 1924, Louis H. Sullivan – Chapter XIII, The Garden City
- Passive House in Different Climates, The Path to Net Zero, Mary James

*“Architectural relations are based on the common laws of physics, but ultimately become truly meaningful only through reference and analogy to the individual's existence as a human being.”*

Karl Friedrich Schinkel, Das Architektonische Lehrbuch