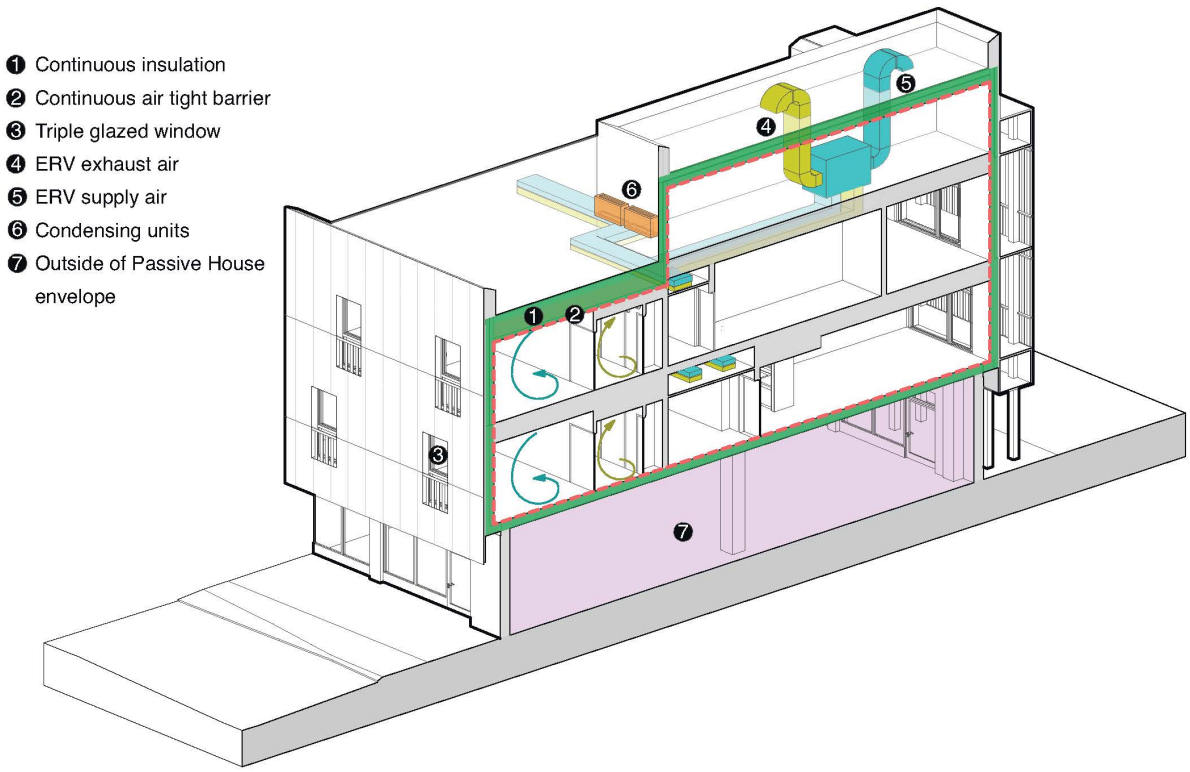
ARCH 483ST: PASSIVE HOUSE & BEYOND



The Passive House is a consequent further development of the low energy house. We reduced the unnecessary heat losses through walls, roofs and windows to the extent that a heating system became completely irrelevant.

- Dr. Wolfgang Feist

SPRING 2024
Monday / Wednesday | 8:30am - 9:50am | CULM Room 111
New Jersey Institute of Technology
Hillier College of Architecture + Design

Instructors: Hilary Padget RA, CPHD, LEED AP hp568@njit.edu
Anthony Harrington RA, CPHD, LEED AP harringt@njit.edu

Office Hours by Appointment

COURSE SYLLABUS

Prerequisite	See below
Type of Course	Elective
	Face-to-Face, Seminar Format
	3 credits, 3 contact hours per week, meets twice a week

COURSE DESCRIPTION

This course is a primer on the Passive House standard of construction as a way to reduce building energy use by 75-90% and meet carbon reduction climate goals. Students will review precedent projects, understand the principles of the standard, and put their knowledge into practice by modifying one of their past studio projects (orientation, apertures, detailing) to meet the standard.

PREREQUISITES

ARCH 224 Construction II
ARCH 304 Structures II
ARCH 314 Environmental Control Systems II

LEARNING OBJECTIVES

Students will be exposed to the Passive House standard as established by PHI (Passive House International). This international standard utilizes five core principles to increase energy efficiency of the built environment while elevating occupant comfort, improving building resiliency, improving indoor air quality, and lowering noise levels. Students will apply these principles to one of their previous design projects, and will come to understand what differentiates Passive House projects from conventional Code-built buildings.

COURSE LEARNING OUTCOMES

Students will have a working knowledge of the five basic International Passive House principles and how the standard can be applied in their design decision making processes for future projects.

This course will guide students to achieve the following competencies:

- Understand how the Passive House standard addresses climate change in the built environment.
- Demonstrate understanding of the Passive House concept and standard through research and discussion.
- Apply the International Passive House standard to a design project.

FORMAT

This course will meet twice a week and will consist of a lecture, assigned readings, group discussion of each week's topic focus, and culminating in applying the standard to a studio design project.

REQUIRED READING

The Passivhaus Designer's Manual: A technical guide to low and zero energy buildings, Christina Hopfe (ed.) and Robert McLeod (ed.), Routledge, ISBN 9781138471382

SUGGESTED READINGS

Passive House Details: Solutions for High Performance Design D. Comer, J.C. Fillinger & A.G. Kwok, Routledge

Passive house in different climates : the path to net zero Mary James, Bill James, New York : Routledge, Taylor & Francis Group

Passivhaus-Bauteilkatalog: Neubau : Ökologisch bewertete Konstruktionen = Details for passive houses: new buildings : a catalogue of ecologically rated constructions Tobias Waltjen, contributor.; IBO - Österreichisches Institut für Baubiologie und -ökologie, editor, Basel : Birkhäuser

Passive House in Different Climates: The Path to Net Zero Mary James, James Bill, Taylor and Francis

RESOURCES

https://www.passivehouse-international.org/
https://passipedia.org/start
https://naphnetwork.org/
https://passivehouseaccelerator.com/
https://www.nypassivehouse.org/
https://foursevenfive.com/smart-enclosure-downloads/
https://www.peelpassivehouse.ca/

SOFTWARE

Design PH 2.0 - SketchUp Plugin
PHPP Version 10 (Passive House Planning Package) - Excel Energy Modeling Software

CLASS POLICY

Class will meet twice a week: Monday 8:30am - 9:50am and Wednesday 8:30am - 9:50am
Attendance is required at all class meetings. Unexcused absences can result in the lowering of final grades or failure. Two or more unexcused absences will require a meeting with the instructor.

OFFICE HOURS

Instructors are available for individual questions outside of class time by e-mail and appointment via Zoom.

ASSIGNMENTS

Each assignment will constitute a percentage of the overall grade as follows:

Class attendance and participation	35%
Reading notes	30%
Final Project	35%

Final Project with Energy Model Requirements (the project will be based on one of the student's previous studio designs)

Annotated plans, sections and elevations
Typical details
Design PH model
Completed Passive House Planning Package (PHPP)
Project goals and findings report

SCHEDULE (subject to change)

Week 1

24.01.17	Introduction Lecture	What is Passive House? Syllabus Review

Week 2

24.01.22	Lecture	History of Passive House / Case Studies
24.01.24	Discussion	Present Potential Project Reading Assignment Due 01.24: The Passivhaus Designer's Manual, Chapter 1 Introduction: climate change and the built environment, pgs. 1-25

Week 3		
24.01.29	Lecture	Thermal Comfort
24.01.31	Discussion	Reading Assignment Due 01.31: The Passivhaus Designer's Manual, Chapter 2 Thermal and occupant comfort, pgs. 31-47
Week 4		
24.02.05	Lecture	Insulation / Airtightness / Windows and Doors / Thermal Bridges
24.02.07	Discussion	Reading Assignment Due 02.07: The Passivhaus Designer's Manual, Chapter 3 Introduction to building physics: implications for opaque and transparent building components, pgs. 49-83
Week 5		
24.02.12	Lecture	Daylighting
24.02.14	Discussion	Reading Assignment Due 02.14: The Passivhaus Designer's Manual, Chapter 4 Lighting and daylighting for visual comfort and energy efficiency, pgs. 89-103
Week 6		
24.02.19	Lecture	Heating and Cooling
24.02.21	Discussion	Reading Assignment Due 02.21: The Passivhaus Designer's Manual, Chapter 6 Heat and hot water generation for domestic buildings, pgs. 127-136, Chapter 7 Heating and cooling of nonresidential Passivhaus building using passive and environmental energy strategies, pgs. 137-158
Week 7		
24.02.26	Lecture	Ventilation
24.02.28	Discussion	Reading Assignment Due 02.28: The Passivhaus Designer's Manual, Chapter 8 Ventilation concepts: planning and implementation, pgs. 159-220
Week 8		
24.03.04	Lecture	Renewable Energy
24.03.06	Discussion	Reading Assignment Due 03.07: The Passivhaus Designer's Manual, Chapter 9 Renewable power technologies, pgs. 223-254

Spring Recess - No Class

Week 9

24.03.18	Lecture	Introduction to Design PH
24.03.20	Workshop	Project Work

Week 10

24.03.25	Workshop	Project Work
24.03.27	Workshop	Project Work

Week 11

24.04.01	Workshop	Project Work
24.04.03	Workshop	Project Work

Week 12

24.04.08	Workshop	Project Work
24.04.10	Workshop	Project Work

Week 13

24.04.15	Workshop	Project Work
24.04.17	Workshop	Project Work

Week 14

24.04.22	Final Presentations
24.04.24	Final Presentations

Week 15

24.04.29	Final Presentations

STUDENTS WITH DISABILITIES

It is the school's moral, ethical, and legal obligation to provide appropriate accommodations for all students with physical and/or learning disabilities. If students need an accommodation related to disabilities, all official documentation must be filed with the Dean of Students and the Disability Support Service Office. It is the responsibility of the student to notify the instructor at the beginning of the semester if accommodations are warranted.

Dean of Students: https://www.njit.edu/doss/
Office of Accessibility Resources and Services: https://www.njit.edu/studentsuccess/accessibility

ACADEMIC INTEGRITY

Academic integrity and honesty are of paramount importance. Cheating and plagiarism will not be tolerated. The NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students. All students are responsible for upholding the integrity of NJIT by reporting any violation of academic integrity to the Office of the Dean of Students. The identity of the student filing the report will remain anonymous. All students are expected to adhere to the University Code on Academic Integrity and to the Code of Student Conduct.

Dean of Students: www.njit.edu/doss
Code of Academic Integrity: https://www.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf Code of Student Conduct: https://www.njit.edu/doss/policies/conductcode/index.php

PLAGIARISM

It is extremely important that students and faculty familiarize themselves with a proper way to cite visual and intellectual sources. Plagiarism whether deliberate or inadvertent simply cannot be tolerated. Simply put, plagiarism is the use of visual or intellectual material created by others without proper attribution. Even the use of ones own material for more than one assignment can also be considered plagiarism. Students should not do so without the expressed consent of all instructors involved.

Our librarian Maya Gervits has assembled excellent resources on copyright, plagiarism citing, and avoiding plagiarism: http://researchguides.njit.edu/c.php?g=671665&p=4727920

EVALUATION AND GRADING CRITERIA

NJIT Undergraduate grading scale:

A	Superior
B+	Excellent
B	Very Good
C+	Good
C	Acceptable
D	Minimum
F	Inadequate
AUD	Audit
I	Incomplete
W	Withdrawal
S	Satisfactory
U	Unsatisfactory

Incompletes are only granted in the event of a documented medical or family emergency, and must be approved by the instructor and administration.
NJIT has a policy of issuing mid-term warnings for students who are not performing at a satisfactory level. Any student issued a warning will be required to have a conference with the instructor to evaluate satisfactory completion of the work for the remainder of the semester. At any point during the semester, students can arrange to meet one or both instructors to inquire how their performance of the assignments is progressing and how they may improve. Final grades may be discussed in person at the end of the semester by student or instructor request.
NJIT has a University Code of Academic Integrity that will be upheld, and any violations will be brought to the attention of the Dean of Students. For more information visit: www.njit.edu/doss/policies/conductcode/index.php

CANVAS

This course will use the learning management system CANVAS as the repository for all readings assignments and project assignments. All student work must be uploaded in the appropriate assignment folders. To access CANVAS, you must have a UCID account with NJIT.

KEPLER ARCHIVING

Students must upload copies of their assignments to the new KEPLER 5 system found under the KEPLER tab in CANVAS "Modules". CANVAS assignments folders are automatically ported to KEPLER, although students will need to initiate a separate KEPLER upload . The new KEPLER has an improved interface for easier batch uploading. Any file, regardless of file size, or type can be uploaded, although .pdfs and .jpegs are recommended to ensure viewability. KEPLER no longer has individual student folders. Rather, student work is now available for review in either "List View"

organized by student or "Gallery View" with thumbnails of all work in an assignment folder viewable at once.

LEARNING AND TEACHING CULTURE POLICY

In addition to the overarching values and ethics of the university, the New Jersey School of Architecture is dedicated to optimism, diversity and solidarity, professional conduct, constructive evaluation and instruction, collaborative community, health and wellbeing, time management and school-life-work balance, respectful stewardship and space management, and well-rounded enrichment. The pedagogy of architecture and design is as complex as it is rewarding, and as dynamically evolving as the people who learn and teach it. This understanding resides at the core of the NJSOA Learning and Teaching Culture Policy.

NAAB PROGRAM CRITERIA

The National Architectural Accrediting Board accredits NJIT's architecture program. The NAAB has Shared Values of the Discipline and the Profession that must be covered by any architectural curriculum to attain their approval. This course satisfies the following shared values.

Design: Architects design better, safer, more equitable, resilient, and sustainable built environments. Design thinking and integrated design solutions are hallmarks of architecture education, the discipline, and the profession.

Environmental Stewardship and Professional Responsibility: Architects are responsible for the impact of their work on the natural world and on public health, safety, and welfare. As professionals and designers of the built environment, we embrace these responsibilities and act ethically to accomplish them.

Knowledge and Innovation: Architects create and disseminate knowledge focused on design and the built environment in response to ever-changing conditions. New knowledge advances architecture as a cultural force, drives innovation, and prompts the continuous improvement of the discipline.