

48-315 and 48-635
ENVIRONMENTAL SYSTEMS 1: CLIMATE & ENERGY IN BUILDINGS

Fall 2023, Tuesday & Thursday Lecture & Lab TBA
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48-635 Instructor: Suzy Li

COURSE DESCRIPTION

Our commitment to designing net zero energy and indeed carbon positive buildings and communities is critical to environment equity and the UN Sustainable Development Goals. The U.S. uses more energy per capita than every other industrialized nation without even a guarantee of a shared quality of life. Energy bills can be as much as 25% of all disposable income for low-income households and seniors living solely on social security, and having the power, water or heating shut off is devastating.

This course introduces architectural design responses for energy conservation and natural conditioning, human comfort, and the site-specific dynamics of climate. Students will be expected to combine an understanding of the basic laws of comfort and heat flow with the variables of local climate to create energy design guidelines for their own work. The state of the art in building energy conservation and passive heating and cooling technologies will be presented in lectures and supported by readings and assignments.

To stress the significance of architectural design decision-making on energy consumption and comfort, full design specifications and calculations will be completed for a residential-scale building. Students will compile a professional energy consultant's report, designing the most viable energy conservation retrofit measures for their client from siting, massing, organization, enclosure detailing, opening control, to passive system integration and management. An overview of world energy consumption in buildings and energy design standards will be illustrated by lectures on building energy conservation successes, and emerging demands for a broader definition of sustainability. The course will end with a focus on the design integration of natural conditioning systems and the potentially dynamic interface of mechanical systems in small- and large-scale buildings.

Readings

Class references *are available on line through the library*: Kwok and Grondzik, [The Green Studio Handbook](#), 2nd or 3rd Edition, Elsevier 2018; C.Z. Brown, [Sun, Wind and Light](#), 2014 edition, Van Nostrand Reinhold NY, NY; and Grondzik, Kwok, Stein & Reynolds, [Mechanical and Electrical Equipment for Buildings](#). John Wiley and Sons, NY 12th or 13th edition 2019. For a drawing centric reference, students should review on Canvas [The Visual Handbook of Energy Conservation](#) by Charlie Wing, Taunton Press. Course powerpoints, recordings and additional reference material will be available on Canvas.