

## **48-798 HVAC and Power Supply for Low-Carbon Buildings**

What type of mechanical systems and power supply choices work effectively within a well-designed building envelope to create comfortable and healthful low-carbon buildings? HVAC and Power Supply for Low-Carbon Buildings is a graduate course that focuses on heating, cooling, ventilation, and power supply systems for new and future commercial buildings. The course is designed for architecture and engineering students. It provides an introduction to HVAC and power supply needs and to system choices likely to produce comfortable and healthful buildings that help us move toward a zero-carbon future. It is intended to engage students in consideration of sustainable choices for commercial buildings and how those choices may vary by building type and project location. The course should also strengthen students' understanding of these systems to prepare for 48-722, Building Performance Modeling.

The course begins with a review of (or introduction to) the language of building performance, using measurements of energy and water performance as essential indicators for US buildings, and as important indicators around the world. We then explore commercial building peak load calculations and characteristic load profiles for commercial buildings. This work supports sizing of heating and cooling equipment and our exploration of effective system design, equipment selection, and operation. We address building ventilation separately, considering outdoor air quality as well as code requirements, and study both conventional and higher-performance strategies.

Students will learn the fundamental components and operations of these systems, sufficient to understand how they impact building design and the environment. Current (2021) US commercial building codes, current ASHRAE standards, and climate zones will be referenced for system design, although we will also consider code requirements from EU countries, and from China and India, to provide additional perspective. Options for power supply and for electrical and thermal storage will be covered and will include applications for single or multiple buildings. Although building water systems will not be addressed, the water requirements for building energy systems will be considered since water can be a limiting resource in some locations.