

Building Science Education Learning Objectives

February 2022

Module 1: Buildings and Energy

- Discover how buildings account for 40% of total energy use in the United States and where this energy comes from.
- Gain insight on how electricity is delivered to buildings and how to read an electricity bill.
- Define the three main components of the power grid and how they work together to deliver electricity to buildings and other end users.

Module 2: Zero Energy Buildings

- Understand the critical balance between energy generation and consumption in a zero energy building.
- Distinguish between source energy and site energy, and understand the calculations for each.
- Identify various passive design elements and understand how they can be implemented to reduce building loads.

Module 3: Building Envelope


- Explain how heat travels from higher temperatures to lower temperatures using Fourier's Law.
- Understand and describe the methods of heat transfer (conduction, convection, and radiation), and how a well-designed building envelope optimizes each of these to create a comfortable indoor environment.
- Discuss the different types of insulation, windows, and wall construction materials and their impacts on the final R-value of a wall.

Module 4: Heating, Ventilation, and Air Conditioning

- Define the various efficiency metrics for heating, ventilating, and air conditioning (HVAC) systems.
- Interpret the science behind heating sources used in buildings and how heat is distributed.
- Discern the differences between types of hot water heating systems and explain why their design matters.

Module 5: Lighting

- Discuss the differences between incandescent, fluorescent, and LED (light-emitting diode) lighting technologies.
- Understand basic lighting principles such as efficacy, lighting power density, illuminance, and correlated color temperature.

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- Apply the lighting principles above when designing a lighting system for a specific space and selecting appropriate fixtures and lamps.

Module 6: Plug Loads

- Analyze plug loads and understand how they play such a large role in a building's energy consumption.
- Name and discuss various strategies for reducing plug loads in computers, electronics, appliances, and other plug load sub-end uses.

Module 8: Renewable Energy and Zero Energy Buildings

- Understand the basics of photovoltaics (PV) and leverage tools to estimate PV sizing and generation for a specific building and location.
- Discuss the basics of other renewable energy sources such as wind, geothermal, hydropower, and biomass.
- Learn the importance of aligning building loads with renewable energy profiles and identify strategies to accomplish this.