# HVAC - Equipment and Systems

An Online Continuing Education Course for Engineers

**Course Number: HV-8001**

**Credit: 8 Hours / 8 PDH / 8 CPD**

**Course: HVAC EQUIPMENT AND SYSTEMS**

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**Course Description**

HVAC system components may be grouped into three functional categories: source components, distribution components, and delivery components. Source components provide or remove heat or moisture. Distribution components convey a heating or cooling medium from a source location to portions of a building that require conditioning. Delivery components serve as an interface between the distribution system and occupied spaces. Compact systems that serve only one space or zone of a building (local systems) often incorporate all three functions in a single piece of equipment. Systems that are intended to condition multiple spaces in a building (central systems) usually have distinctly different equipment elements for each function.

This 8- hr course provides information on the various types of HVAC heating and cooling equipment along with associated system design aspects. The course describes how to select appropriate HVAC equipment for your application and how to integrate various components as a working system. This course is in continuation to the course titled “HVAC Concepts and Fundamentals”, which introduced the basic design aspects, comfort parameters, psychrometrics, heat transfer concepts, heat loss and heat gain calculations and methods to calculate the energy costs.

This course is intended for people who plan, design, install, and operate HVAC systems for buildings. Design engineers, architects, designers, contractors, energy auditors, facility managers and maintenance personal should benefit professionally. It is also relevant to anyone needing to know more about HVAC equipment production and use. Previous knowledge of the subject is not required.

The reader must take a multiple-choice quiz consisting of forty (40) questions at the end of this course to obtain PDH credits.

**Learning Objectives**

The course comprises 8 sections, to provide comprehensive information on the main equipment and uses of modern HVAC systems.

SECTION #1 Central Heating Sources - Provides an overview of various types of heating systems available for commercial and residential applications such as furnaces, boilers and heat pumps. Includes basic selection criteria for heating system and factors considered when designing commercial heating systems.

SECTION # 2 Central Cooling Sources- Provides an overview of various cooling equipment such as mechanical chillers, absorption chillers, DX units, evaporative cooling and cooling towers.

SECTION # 3 HVAC Delivery Equipment - Provides an overview of various heating and cooling delivery equipment such as convective and radiation baseboard units, air handling units, unitary units, fan coil units and their components.

SECTION # 4 Air Distribution Ductwork – Provides an overview of air movement, components of air distribution systems, duct classification on velocity, pressure, shape and materials.

SECTION # 5 Air Distribution Equipment & Accessories – Provides an overview of air delivery devices such as registers, grilles and diffusers. Covers other terminal devices such as dampers, louvers etc

SECTION # 6 System Design - Provides an overview of “all-air” and “all-water” systems. Describes constant air volume, variable air volume, single duct and multi-duct air conditioning systems.

SECTION # 7 Hydronic Distribution – Piping and Pumps – Provides an overview of the hydronic loops and the principles of centrifugal pumps.

SECTION # 8 Annual Energy Use Calculations – Describes the concept of balance point temperature and heating and cooling degree days in determining annual energy costs.

# HVAC EQUIPMENT AND SYSTEMS

The field of heating, ventilation, and air conditioning—HVAC—is a science and practice of controlling indoor climate, thereby providing health and comfortable interior conditions for occupants in a well-designed, energy-efficient, and low-emissions manner.

The term "H" in HVAC stands for heating that comprises of any number of heating systems from gas furnaces, electric furnaces, oil furnaces, oil and gas boilers, radiant heating systems, and heat pumps.

“V” in HVAC describes ventilation. This can be ventilating the facility using ductwork or ventilating a kitchen using ductwork and fans with a hood. It can also refer to combustion air or the air needed to have combustion for various heating systems.

"AC" in HVAC refers to air conditioning that comprises of 3 main methods – mechanical compression, vapor absorption and evaporative cooling. Air conditioners (direct expansion – DX systems) and chillers usually accomplish the job of air conditioning.

## Systems overview

HVAC systems have the following elements in common:

- Equipment to generate heating or cooling: The equipment is selected with a capacity to offset the peak load of the space or spaces to be served.
- A means of distributing heat, cooling, and/or filtered ventilation air where needed: air, water, or steam.
- Devices that deliver the heat, cooling, and/or fresh air into the building: registers and diffusers, hydronic radiators or convectors, and fan coil units.

**Heating and Cooling Equipment Performance Rating Terms**

A simple statement of efficiency is usually defined as “output divided by input at full load”. But since, the HVAC equipment operates more often at off-peak (less than maximum load) conditions, the term efficiency (at full load peak value) is deceptive. Seasonal efficiencies that consider a typical r… of operating conditions and loads are more repr… . There are a number of … ce.



…er efficiency …ut (electric …

1 ton is …er hour;

- … t of air … hour) …hour. …es to …

- **I** … cooling capacity in Btu p… energy input in watts at full-load conditions. The power input includes all inputs to compressors, fan motors, and controls. EER is always greater than one; typical values are 8 – 10. It typically applies to larger units over 65,000 Btuh capacity.