

## ME 4220 Air Conditioning Design

**2007 Catalog Data:** ME 4220. Air Conditioning Design. Lec. 3. Credit 3.  
Prerequisite: ME 4210. Design of heating, cooling and ventilating systems for buildings.  
Duct system design, pipe system layout and equipment selection. [Elective Course]

**Prerequisites by Topic:**

1. General knowledge of refrigeration and air conditioning systems
2. Understanding of building heating and cooling load calculations
3. Fluid mechanics and viscous flow in pipes and ducts
4. Psychrometrics and thermodynamics of heating and cooling water and moist air
5. Fluid mechanics of turbulent flow and pressure losses in pipes and ducts
6. Fundamentals of heat transfer

**Textbook and Resources:** Heating, Ventilating, and Air Conditioning, Parker, McQuiston & Spitler, John Wiley & Sons, Inc., 2000.  
ASHRAE Handbooks, Bell & Gossett Fluid Handling Course Materials

**Course Objectives:** This course is designed to teach seniors in Mechanical Engineering the fundamental concepts for the design of heating, ventilation and air conditioning systems. Included are the design of duct and piping systems as well as equipment selections.

**Course Topics:**

T1. Selection of pumps and design of piping systems	(16 %)
T2. Space air distribution systems and selection of diffusers and grilles	(13 %)
T3. Selection of fans and design of duct systems	(16 %)
T4. Design of primary/secondary piping systems	(16 %)
T5. Expansion tank sizing	( 9 %)
T6. Air control for hydronic systems	( 7 %)
T7. System control and valve sizing	(14 %)
T8. Equipment room piping practice	( 9 %)

**Class/Lab Schedule:** Minimum student contact time – 2200 minutes

**Course Outcomes:** Upon completion of this class, the student will be able to:

- C1. Design simple piping systems and select appropriate pumps. [a,c,e,k,l]
- C2. Describe fundamental space air distribution concepts. [e,k]
- C3. Design low pressure duct systems and select appropriate fans. [a,c,e,k,l]
- C4. Describe the basic principles of primary/secondary piping systems. [e,k,l]
- C5. Describe air control techniques for hydronic systems. [e,k,l]
- C6. Size control valves and expansion tanks for hydronic systems. [a,c,e,k,l]
- C7. Lay out piping for equipment rooms. [a,c,e,k,l]

And have gained experience with and/or exposure to:

- C8. The influence of Codes and Standard Practices on the engineering design process related to HVAC. [f,i]
- C9. The potential impact of ethical and societal concerns on the engineer and engineering design process. [f,i]
- C10. Working, as part of a team, on a project or other assignment, including the preparation and delivery of a technical oral presentation. [c,d,g,i]

**Professional Component:** This is an elective course for Mechanical Engineering students who follow an Area of Concentration (AOC) related to "thermal/energy systems." It involves the integration of foundational course material, within a practical design context.

### Contribution of Course to Meeting the Professional Component:

Math and Basic Science:

General Education:

Engineering: 3 credit hours. This course contains significant design.

Other:

**Relation to Program Objectives:** This course goes beyond the presentation of basic "analytical" skills, to incorporate experience in critical thinking (integration of analytical skills, quantitative and qualitative evaluation of alternatives, impact assessment) and communication (written/oral presentations, location and acquisition of information through direct contact with external sources/individuals). As a consequence, students who successfully complete this class should be more comfortable, confident and productive when engaged in career activities that involve: self-education, teamwork, and interaction with engineering and non-engineering communities and individuals.

**Course Coordinator:** Undergraduate Program Committee

**Prepared by:** Glenn T. Cunningham (J.A. Marquis)

**Date:** 1-15-08