

Department of Mechanical Engineering
ME 432 – Principles of Air Conditioning and Refrigeration
Elective

Catalog Description: ME 432 (3-0-3)

A course in the fundamentals of air conditioning and refrigeration. Topics covered are psychometrics, cooling and heat load calculations, air distribution systems, duct design, vapor compression and absorption systems, and the principles of cooling towers.

Prerequisites: ME 312 – Thermodynamics
ME 304 – Fluid Mechanics (Co-requisite)
ME 407 – Heat Transfer (Co-requisite)

Textbook(s) Materials Required:

McQuiston, Parker and Spitler, Heating Ventilation, and Air Conditioning: Analysis and Design, 6th Ed., John Wiley & Sons, Inc., 2005.

Reference(s) (Not Required):

1. McQuiston, Parker and Spitler, Heating Ventilation, and Air Conditioning: Analysis and Design, 4th Ed., John Wiley & Sons, Inc., 1994.
2. J. F. Kreider and A. Rabl, Heating and Cooling of Buildings: Design for Efficiency, McGraw-Hill, 1994.

Course Supervisor: Dr. C. Zhu

Pre-requisite by topic

1. Thermodynamics
2. Fluid Mechanics
3. Heat Transfer

Course Objectives¹:

1. Students will learn the basic concepts and principles of air conditioning and refrigeration. (A, B, C, D, E)
2. Students will learn the fundamental analysis methodology of air conditioning and refrigeration. (A, B, C, D, E)
3. Students will learn the basic process and systems of air conditioning and refrigeration. (A, B, C, D, E)
4. Students will apply the course knowledge to do a design project of HVAC system. (A, B, C, D, E)

Topics²:

1. General Air Conditioning Systems and Applications
2. Cooling and Refrigeration Cycles
3. Psychometrics and Air Conditioning Processes
4. Indoor Air Quality and Air Recirculation
5. Heat Transmission in Building Structure
6. Solar Radiation
7. Infiltration and Exfiltration
8. Cooling and Heat Load Calculation
9. Energy Calculation
10. Pump/Fan and Air Distribution Systems
11. Design Project of a HVAC System

Evaluation Method:

1. Classroom Attendance
2. Project Report and Presentation
3. Quizzes
4. Exam
5. Homework

Schedule: Lecture Recitation: 3 hours per week

Professional Component: Engineering Science

Program Objectives Addressed: A, B, C, D, E

Course Outcomes³ :**Objective 1**

1.1 Students will demonstrate an ability to analysis psychrometric processes and cycles of air conditioning systems. (2,3,4,5) (a, c, e, h, i, k)

1.2 Students will demonstrate an ability to estimate the energy requirements of cooling and heat equipment for simple air conditioning applications. (2,3,4,5) (a, c, e, h, i, k)

Objective 2

2.1 Students will demonstrate an ability to analysis and heat loads, particularly from solar radiation. (2,3,4,5) (a, c, d, e, i, k)

2.2 Students will demonstrate an ability to estimate energy requirements for simple air conditioning processes. (2,3,4,5) (a, c, e, i, k)

Objective 3

3. 1. Students will demonstrate an ability to apply principles of air conditioning to perform energy analysis of simple air conditioning applications. (2,3,4,5) (a, c, e, h, i, k)

Objective 4

4.1 Students will show an ability to apply the HVAC theory to design a HVAC system. (4) (a, b, c, d, e, f, g, h ,i, k)

4.2 Student will show an ability to prepare an effective engineering report. (4) (a, c, d, e, f, i, k)

4.3 Student will make an oral presentation of the HVAC design project. (4) (a, b, c, d, e, f, g, h ,i, k)

Prepared by: Chao Zhu

Date: September 28, 2006

¹ Capital Letters in parenthesis refer to the Program Objectives of the Mechanical Engineering

Department. Listed in Sec 2 d Tables B-2-9, B-2-12. Table B-2-8 links Program Objectives with the ABET a-k Criterion.

² Topic numbers in parenthesis refer to lecture hours. (three hours is equivalent to 1 week)

³ Outcome numbers in parenthesis refer to evaluation methods used to assess the student performance. Lower case letters in parenthesis refer to ABET a-k outcomes.