

King Fahd University of Petroleum & Minerals
College of Environmental Design
Architectural Engineering Department

ARE 345

Principles of HVAC

(3 Lectures- 0 Lab.-3 Credit-hours)

Spring Semester 2015 (142)

U.T.R. 10:00- 10:50 a.m.

Building - 19-413

INSTRUCTOR: *Dr. Mohammad S. Al-Homoud*
Building 21-801
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OFFICE HOURS: *M. W. 11:00- 12:00 or by appointment.*

GRADING POLICY:	Mid-term Examination	25%
	Final Examination	35%
	Homeworks/Assignments	25%
	Final Project/Presentation	10%
	Attendance & Class Participation	<u>5%</u>
		100%

OBJECTIVES:

This course is intended to provide *Architectural Engineering* students with the fundamental principles and engineering procedures for the design of heating, ventilating, and airconditioning (HVAC) systems. Building thermal load calculations, HVAC systems characteristics, system and equipment selection procedures. System analysis, design and layout techniques with computer applications.

OUTCOMES At the completion of this course, the student is expected to be able to:

1. Perform complete manual and computerized heating and cooling load analysis for a building project;
2. Design complete HVAC system for a small building project;
3. Select appropriate HVAC system and equipment for a given project.
4. Integrate HVAC system with other building systems.

TEXTBOOK:

Howell, Ronald, H. Sauer and W. Coad, (latest edition). *Principles of Heating, Ventilating and Air-Conditioning*. American Society of Heating, Ventilating and Air-Conditioning Engineers, Atlanta, GA. Latest Edition.

REFERENCES:

- McQuiston, F. C. and J. D. Parker, (latest edition). *Heating, Ventilating, and Air Conditioning Analysis and Design*. Latest edition, John Wiley & Sons, N. Y.
- American Society of Heating, Ventilating, and Air Conditioning Engineers. (latest edition). *ASHRAE Handbook of Fundamentals*. Atlanta, GA.
- American Society of Heating, Ventilating, and Air Conditioning Engineers. (latest edition). *ASHRAE Handbook: HVAC Applications*. Atlanta, GA.
- American Society of Heating, Ventilating, and Air Conditioning Engineers. (latest edition). *ASHRAE Handbook: HVAC Systems & Equipment*. Atlanta, GA.
- Instructor handouts which will be distributed in class when appropriate.

COURSE OUTLINE:

- **Introduction**
 - Course outline and requirements

- **Basic HVAC Systems Calculations**
 - Fundamental concepts
 - Comfort requirements
 - The psychrometric chart
 - HVAC system types and functions
 - HVAC processes and the psychrometric chart
 - The refrigeration cycle

- **Design Thermal Load Calculations**
 - Design conditions
 - Heat transfer coefficients
 - Comfort and ventilation requirements
 - Computerized design heat load calculations

- **Room Air Distribution & Duct Design**
 - Room air distribution
 - Diffuser selection
 - Duct sizing
 - Duct fittings loss coefficients

- **Fans**
 - Fan laws
 - Fan selection

- **HVAC Equipment**
 - Cooling and heating equipment
 - Equipment selection
 - Manufacturers catalogues

- **Air Handling Systems**
 - Cooling coils
 - Heating coils
 - Dehumidification/humidification
 - Air cleaners

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- **Pipe Sizing**
 - Pipe fittings and pressure losses
 - Pipe sizing
- **HVAC Systems and Energy Conservation**
- **Energy Estimating Methods**