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

ARE 342
Principles of HVAC

(2 Lectures- 0 Lab.- 2 Cridet-hours)
Spring Semester 2008-2009 (082)
S.M. 10:00- 10:50 a.m.
Building - 19-410

INSTRUCTOR: *Dr. Mohammad S. Al-Homoud*
Building 19-315 or Building 59-2049
Tel. (03) 860-3200/4705
E-mail: alhomoud@kfupm.edu.sa

OFFICE HOURS: *S.M. 9:00- 9:50 or by appointment*.

GRADING POLICY:

Mid-term Examination	25%
Final Examination *(Wed. June 24, 2009 @ 7:00 p.m.)*	30%
Quizzes	5%
Homeworks/Assignments	25%
Final Project/Presentation	10%
Attendance & Class Participation	5%
	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). *Princples of Heating, Ventilating and Air-Conditioning*. American Society of Heating, Ventilating and Air-Conditioning Engineers, Atlanta, GA.

REFERENCES:

- McQuiston, F. C. and J. D. Parker, (latest edition). *Heating, Ventilating, and Air Conditioning Analysis and Design*. 4th edition, John Wiley & Sons, N. Y.

- American Society of Heating, Ventilating, and Air Conditioning Engineers. 2005. *ASHRAE Handbook of Fundamentals*. Atlanta, GA.
- American Society of Heating, Ventilating, and Air Conditioning Engineers. 2007. *ASHRAE Handbook: HVAC Applications.* Atlanta, GA.
- American Society of Heating, Ventilating, and Air Conditioning Engineers. 2008. *ASHRAE Handbook: HVAC Systems & Equipment*. Atlanta, GA.
- Instructor handouts which will be distributed in class when appropriate.

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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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- **Central Refrigeration System**
  - Mechanical vapor compression
  - Absorption refrigeraation system
  - Cooling towers

- **Pipe Sizing**
  - Pipe fittings and pressure losses
  - Pipe sizing

- **HVAC Systems and Energy Conservation**

- **Energy Estimating Methods**

- **Heat Generation**
  - Fuels and combustion
  - Boilers
  - Terminal units
  - Electric heating