

MENG443- Heating, Ventilation and Air Conditioning

Department: Mechanical Engineering		
Program Name: Mechanical Engineering		Program Code: 23
Course Number: 238XX MENG443	Credits: 4 Credits	Year/Semester: 2013-2014

Required Course Elective Course (click on and check the appropriate box)

Prerequisite(s):
Prerequisite by topic: The students are expected to have a good background in thermodynamics, heat transfer, and fluid mechanics.

Catalog Description:
Psychrometrics and elementary psychrometric processes. Simultaneous heat and mass transfer in external flows. Direct contact transfer devices. Heating and cooling coils-compact heat exchangers. Thermal comfort. Hot water heating systems. Heating and Cooling load calculations. Vapor compression refrigeration cycles.

Course Web Page:
<http://me.emu.edu.tr/hacisevki/meng443.htm>

Textbook(s):
No textbook. However, some handouts will be distributed.

Reference Books

- Heating, Ventilating, and Air Conditioning: Analysis and Design, McQuiston F. C., Parker J.D. and Spitler J. D. Wiley, USA, 2005, 6th Ed.
- Thermodynamics: An Engineering Approach, Yunus A. Çengel, Mc Graw Hill, 6th Ed.
- Heat Transfer, A Practical Approach, Yunus A. Çengel, Mc Graw Hill, 2nd Ed.
- Fundamentals of Heat and Mass Transfer", F. P. Incropera, D. P. DeWitt.

Topics covered: (number of classes): Based on 4 classes (+ 1 hr tutorial) per week:

1. HVAC systems, thermal comfort (6)	2. Ventilation (4)
3. Warm Water Heating System Design (10)	4. Direct Contact Transfer Processes and/or Devices (10)
5 Heating, Cooling and Dehumidification of Atmospheric Air around/through Extended Surface Coils. (10)	6. Vapor Compression Refrigeration (10)
7. Controls (6)	

Class/tutorial/laboratory schedule, i.e., number of sessions each week and duration of each session: 14 week semesters, classes meet 2 days per week for (2 x 50) minute lectures and one day per week for 50 minute tutorial/lab.

Course Learning Outcomes:

The students will be asked to demonstrate their knowledge of the material covered in HVAC through their mastery of the following course objectives. The student will be able to:

Understand the scope of modern HVAC

1. Define the issues considered in HVAC design
2. Name major systems

3. To explain key concepts of air conditioning and refrigeration.
4. To design and select HVAC&R systems in buildings.
5. To describe major design considerations of air-side, water-side, ventilation and refrigeration systems.
6. To evaluate applications and design calculations of HVAC&R systems.
7. To understand ASHRAE standards
8. To understand the main concepts of the Turkish Standards-TS 2164 heating load (heat loss) calculations, and thermal Insulation in Buildings - TS 825.

Relationship of course to criteria 3 outcomes a-k (“N/A” {Not Applicable}, “minor” or Major” contributions):

Criteria 3 Outcomes a-k	Contribution	Discussion: Students must
a. Math, science, engineering	major	Apply principles of math, science and engineering in solving HVAC problems.
b. Design, conduct experiments	minor	Design, build, and conduct an experiment to cool and humidify air by evaporative cooling.
c. Design project	major	HVAC design and simulation of a typical house in Cyprus
d. Multi-disciplinary teams	major	demonstrate ability to function in design teams
e. Engineering problems	major	Solve HVAC problems.
f. Professional, ethics	minor	Identify ethical issues associated with engineering solutions to design related problems.
g. Communicate	minor	Demonstrate effective solution procedures to communicate solutions to engineering problems.
h. Impact of engineering	minor	Identify ways in which knowledge of HVAC aids in the design of a refrigeration system.
i. Life-long learning	major	Demonstrate effective use of the internet to find more information on applications of VAV.
j. Contemporary issues	minor	Write an essay (2 pages) on the applications of HVAC in every day life.
k. Skills, techniques, and modern tools	minor	apply software to the solution of HVAC problems

Background:

Air conditioning and refrigeration is closely related to the living standard of people and is the most important engineering system in many types of buildings. This course will describe the basic principles of air conditioning and refrigeration engineering, and discuss the design factors and practices.

Educational Objectives:

- To introduce students to the basic requirements for thermal comfort and good indoor air quality in the built environment.
- To enable students to understand the fundamental principles of air conditioning and refrigeration engineering.
- To study the characteristics and engineering design of heating, ventilating, air conditioning and refrigeration (HVAC&R) systems.
- To enable students to achieve effective and efficient design solutions.

Course Teaching and Learning Activities:

The teaching/learning will be supported by audio/visual aids, Web-based resources, technical visits and class discussions. The students have the opportunity to perform laboratory experiments or to undertake mini-projects to better understand the application of knowledge acquired. Satisfactory attendance rate and active class participation are expected and required (min 80%) .

Assesment

Midterm exam: 30 %

Laboratory: 0 %

Design and conduct a project: 20 %

Homework: 0%

Quizzes: 10%

Final examination: 40%

QUIZ Dates

Number of Quiz	Quiz Dates	Class
Quiz 1	1 / 11 / 2013	ME111
Quiz 2	8 / 11 / 2013	ME111
Quiz 3	6 / 12 / 2013	ME111
Quiz 4	20 / 12 / 2013	ME111

Prepared by: Assoc. Prof. Dr. Hasan Hacışevki

Date Prepared: 30th September 2013