METU, Department of Mechanical Engineering  
Me403 - Heating, Ventilating, Air Conditioning and Refrigeration

Instructor  
Dr. Rüknettin Oskay. Room: A-121, Tel: 210 2576, email: roskay@metu.edu.tr  
Mondays at 09:40 - 10:30 and Wednesdays at 10:40 - 12:30 in B101

Assistant  
Mehmet Yalılı. Room: G-116, Tel: 210 5244, email: myalili@metu.edu.tr

Web Page  
http://www.me.metu.edu.tr/courses/me403/

References
8. Deutsche Normen (English Translation) DIN 4701, 4704 and 4720.
9. TMMOB Makina Müh. Odası Yayın No. 84, Kalorifer Tesisi Proje Hazırlama Teknik Esasları.
12. TS 825 Thermal Insulation in Buildings.

Course Outline
1. Psychrometrics and Elementary Psychrometric Processes (2.5 Weeks)
   a. Atmospheric air as an ideal gas mixture of dry air and water vapor
   b. Properties of atmospheric air and definition of basic parameters
   c. Thermodynamics analysis of moist air system, i.e., conservation of mass and energy principles
   d. Adiabatic saturation process
   e. Psychrometric chart, Elementary psychometric processes
   f. Simultaneous heat and mass transfer in spray chambers
   g. Psychrometer and humidity measurements
2. Direct Contact Transfer Processes between Moist Air and water (3 weeks)
   a. Design of air washer
   b. Design of cooling tower
   c. Design of spray dehumidifier
3. Heating, Cooling, and Dehumidification of Moist Air around Extended Surface Coils (3 weeks)
   a. Design of Sensible heating or cooling coils (dry coils)
   b. Design of cooling and dehumidification coils (wet coils)
4. Physiological Reactions to Heating and Cooling (2 weeks)
   a. Properties of Moist air effecting, heating and thermal comfort
   b. Effective temperature, comfort charts
c. Heat loss from human body

d. Requirements for quantity and quality of moist air, ventilation standards (TSE, ASHRAE, IHVE)

5. Warm Water Heating System Design (3.5 weeks)
   a. Overall heat transfer coefficients of composite structural elements
   b. Insulation standards (TSE, DIN, ISO Standards)
   c. Heating load calculations according to Turkish and/or German Standards
   d. Types, selection and installation of heating appliances (heaters)
   e. Types and design of circulation (piping) systems
   f. Auxiliary parts and equipment in warm heating systems; boilers, pumps, expansion tank, valves, fitting etc.

Grading

<table>
<thead>
<tr>
<th>Grade</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Midterm Exams</td>
<td>50%</td>
</tr>
<tr>
<td>Homework</td>
<td>15%</td>
</tr>
<tr>
<td>Attendance (only if ≥70%)</td>
<td>Bonus (5%)</td>
</tr>
<tr>
<td>Final Exam</td>
<td>35%</td>
</tr>
</tbody>
</table>

Exams

There are two midterm examinations and one final examination. All examinations will be open notes and references. The dates will be announced by the department. You may not use your cell phones under any circumstance during the examinations; They must be turned off. All examinations will strictly reflect the material covered in class, and in homework assignments.

Make-up

You must have an official excuse to take a make-up examination. The make-up examinations will be given to eligible students within two weeks after the missed exam. You must contact your instructor within one week after the missed examination.

Attendance

Attendance to all lectures will be recorded. Students with attendance ≥ 70% will receive up to 5% attendance grade.

Final Exam Eligibility

In order to be eligible to take the final examination, you must be satisfy the following criteria:

1. Your attendance must be ≥70%
2. Your in term overall grade (including midterms, homework and attendance) must be at least 30 out of 70.

Homework

Homework will be assigned and collected, to be returned on time, with no exceptions. Homework problems will be designed to assist you in preparing for the exams and learn about the subject matter. It is essential that you work on the problems on your own. Homework assignments must be turned in on clean, white, A-4 size paper, with multiple pages stapled together. Neatness will be graded. Please do not use a plastic protector sheet.

Academic Honesty

1. Incidents of acts of dishonesty (cheating, copying, deceiving) on examinations or homework will results in a zero grade for that examination or homework assignment.
2. You may not deceive the academic staff in attendance sheets by signing in place of other students.
3. Repeated dishonesty will result in a grade of “FF” and report to the Department’s Ethics Committee.
4. Any unethical behavior will also cause bad reputation among all teaching staff of the department.