Fall 2014  SUS- 7600B: DESIGN OF MECHANICAL SYSTEMS FOR SUSTAINABLE BUILDINGS

[Cross-listed course: Mechanical Engineering 54700 - Environmental Control]

Details  3 credits 3 hrs/week. Fridays 5:00 - 7:40pm, in ST 207.


Prerequisite: Undergraduate course in heat transfer or transport phenomenon.


References:

1. ASHRAE Handbooks – Fundamentals & HVAC Applications, American Society of Heating Ventilating and Air Conditioning Engineers, Atlanta, Georgia.

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Objectives:  To provide the students with (1) the basic fundamentals required for the analysis and design of heating, ventilating and air conditioning systems for domestic, commercial, and industrial spaces, (2) To introduce the students to the utilization of computers for the analysis and design of heating, ventilating and air conditioning systems.

Prerequisites by Topic:
1. Thermodynamics
2. Introduction to Fluid Mechanics
3. Heat Transfer
4. Computer Programming
Topics:
1. Building sciences, energy consumption by buildings.
2. Review of heat transfer and basic air conditioning systems. Vapor compression, heat pumps, heat recovery systems.
3. Psychrometric processes & charts. Fundamental equations, psychrometric chart, space air conditioning design conditions.
6. Space heat & cooling loads. Design conditions, infiltration & ventilation, internal & external sources, the CLTD/SCL/CLF Method.
7. Fans, ducts & buildings air distributions.

Computer Usage:
Computers are employed in this course as an instructional tool. Students are required to integrate self generated programs with commercially available academic and industrial software packages for the purpose of analyzing and designing heating, ventilating, and air conditioning systems. The course will introduce students to the Software HCB by Peter S. Curtis (http://www.hcbcentral.com/hcb/hcb.htm) and the US Department of Energy Energy-Quest™. For customized codes, any programming language is acceptable, however, Matlab™ is preferred.

Laboratory/Design Projects:
1. Cooling and heating load estimation for a building consisting of a restaurant, lounge, and a kitchen to be located in several designated places around the world.
2. The second project will consist of providing correctly sized heating, ventilation and air condition loads and size the equipment for the commercial building of Project 1. Use of ASHRAE standards 55-2010, 62.1-2010, and 90.1-2010 should be demonstrated in the project.

Evaluation/Grade Reporting
1. 3-4 homework will be assigned based on assigned textbook and Professor’s problems. Two design projects will be assigned during the semester.
2. Two 90 minutes long mid-term exams with score of 100 points each will be given during the semester along with one final examination.
3. Three quizzes, 30-45 minutes, long, will be given during the Spring semester.
4. The final grade will be calculated using the following weight factors:
   - Mid Term Exams – 40%
   - Final Exam – 20%
   - Design Projects – 20%
   - Quizzes – 10%
   - Homework - 10%
5. Final Grade will be determined based on the following score
   - A - 90% and above
   - B – 78% - 89%
   - C – 62% - 77%
Attendance and Behavior:
- Attendance is mandatory. Students are expected to behave professionally with proper attire for a classroom.

Course Outline and Schedule:

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<td>HW#1</td>
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<td>Review of air conditioning equipment &amp; systems</td>
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<td>Week 2</td>
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<td>Cooling and Heating Load Estimation</td>
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<td><strong>Final Test (Tentative)</strong></td>
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