**University of Maryland, College Park**
**Mechanical Engineering Departments**
**ENME 423 – Modern Climate Control and Building Energy Design/Analysis**
**Fall Semester 2015**

Instructor: Dr. Michael Ohadi, (301) 405-5263, Ohadi@umd.edu
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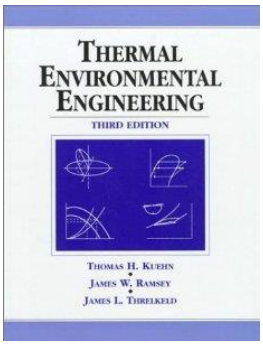
Teaching Assistant: Stefan Bangerth, sbangert@umd.edu
Office: Potomac Building, Room No 2121 EGR
Office Hours:

**Dr. Ohadi:** Mon. 1-2 pm; Wednesday 11:00 am -12:00 Noon
**Stefan Bangerth**: Monday, Tues., and Thursdays 10 am to 11 am.
Outside of the above hours by appointment only. Questions by e-mail welcome and will be responded within 24 hours when in town.

Text Book; T.H. Kuehn, J.W. Ramsey, and J.L. Threlkeld, Thermal Environmental Engineering, 3rd Ed., Prentice Hall, ISB **N 0-13-9172203. Supplementary Lect ure notes will be p**rovided through Blackboard as necessary.




References; 1. F.C. McQuiston & J.D. Parker, Heating, Ventilating & Air-Conditioning, 6th ed., John Wiley and Sons, ISBN 0-471-47015-5
2. ASHRAE Fundamentals Handbook, American Society of Heating, Refrigerating, and Air Conditioning Engineers, Atlanta, GA, 2009

**Course Description**:
*Prerequisite: ENME232 and ENME332.* Fundamentals and design calculations of heat and moisture transfer in buildings; evaluation of cooling, heating and power requirements of buildings; building energy consumption simulations, use of alternative energy and energy conservation measures in buildings; fundamentals of fans/pumps and air/water distribution in buildings; introduction to refrigeration and energy systems for data centers and other mission-critical facilities.

| TENTATIVE LECTURE SCHEDULE (Updates will be posted on the course web site if any changes take place) | Date | Week # |
|---|---|---|
| • Introductory Definitions & Concepts, Review of select Thermo, Fluids, and Heat Transfer of significance to HVAC & R systems; (Human thermal Comfort MO); **HW 1 assigned** | 9/3 | 1 |
| • Human thermal Comfort & Introduction to Psychometric Chart (Cont.); Introduction to Common HVAC Systems (MO); | 9/8 | 2 |
| • Problem solving session; also initial discussions on course project assignment (SB) | 9/10 | 2 |
| • Thermodynamics of Moist Air (MO) **HW 1 Due;** | 9/15 | 3 |
| • Mech. Vapor Compression Refrigeration (BV); **HW 2 assigned** | 9/17 | 3 |
| • Processing of Moist Air (Cont.); Problem solving session (MO) | 9/22 | 4 |

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|---|---|---|
| Cooling towers and Chiller systems/common HVAC systems Cont. (BV); **HW 2 Due; HW 3 assigned;** | 9/24 | 4 |
| • Solar energy fundamentals as applied to building energy design (MO); | 9/29 | 5 |
| • Building Energy Management Systems (BV); **HW 3 due** | 10/1 | 5 |
| • Tour of Project's Building facility on campus (MO/SB/the class); | 10/6 | 6 |
| • Introduction to Buildings Energy Modeling (BV/MO); **Also Quiz** | **10/8** | **6** |
| • Heat and Moisture Transfer in Buildings (MO); | 10/13 | 7 |
| • Applications of Building Energy Modeling and project discussions (SB), | 10/15 | 7 |
| • Design Heating and Cooling Loads components and their calculations (MO); **Project Part I due; HW 4 Assigned** | 10/20 | 8 |
| • Problem solving session/Project discussions (SB) ; | 10/22 | 8 |
| • Introduction to Design heating/cooling load components and their calculations, Cont. (MO); **HW 4 Due** | 10/27 | 9 |
| • Design cooling load components and their calculations (Cont.); (MO), **Project Part II due (In class 7-min presentations)** | 10/29 | 9 |
| • Project Discussions; **Also Hour Exam** (MO) | **11/03** | **10** |
| • LEED & Energy Star Rating Standards; Other important Building Standards (BV); | 11/05 | 10 |
| • Introduction to air and water distribution Systems (fans, pumps, duct/pipe design (MO) | 11/10 | 11 |
| • Air and water distribution systems, Cont. (MO) **Project Part III Draft version due; HW 5 assigned** | **11/12** | **11** |
| • Problem Solving session/Project Discussions (SB) | 11/17 | 12 |
| • Air and water pumping/distribution systems, Cont. (BV/MO); **Project Part III Final must be uploaded by 11/21/2014 by 11 PM.** | **11/19** | **12** |
| • **Project Presentations—Double Session** (MO/SB); | 11/24 | 13 |
| • No Class, In lieu of a double session on 11/24/14 | 11/26 | 13 |
| • Heating and Cooling by Extended Surfaces/Heat Exchangers (MO); **HW 5 Due; HW 6 assigned** | 12/01 | 14 |
| • Heating and Cooling by Extended Surfaces/Heat Exchangers (Cont.); also Problem Solving session/Discussions (MO/SB) | 12/03 | 14 |
| • Data Centers Cooling--Cooling/Refrigeration Systems for Mission Critical facilities (MO); **HW 6 Due;** | 12/08 | 15 |
| • Course Overview (MO) | 12/10 | 15 |
| • **Final Exam (MO/SB) (1:30-3:30pm)** | **12/17** | **16** |

**GRADING**

| | | |
|---|---|---|
| Quizzes | 15% | |
| Hour exam | 25% | |
| Course Project | 40% | |
| Final Exam | 20% | Per university designated final exam schedule |

**Tentative Exam Dates:**

| | |
|---|---|
| Quiz | 6th Week of the semester |
| Hour Exam | 9th Week of the semester |
| Final | Comprehensive and held during Final exams week |

**Tentative Grading Scale:**

*A+: 100-96 A: 95-92 A-: 91-90*
*B+: 89-87 B: 86-83 B-: 82-80*
*C+: 79-77 C: 76-73 C-: 72-70*
*D+: 69-67 D: 66-63 D-: 62-60*
*F: below 60*

**Note: The above grading scale is meant to serve as a guideline.**

**Homework grading policy:**

Homework sets will be assigned based on lecture coverage. Solutions will be made available on the Blackboard. We may grade selected homework sets and/or selected problems in a given set (due to the time involved). If a home work set is not to be collected it will be mentioned when the set is assigned. However, you are urged to do all of the home work problems, not only to score maximum possible grade for the home work, but also as a critical learning tool.

**Academic Honesty:**

All students are expected to uphold the highest ethical and professional of academic honesty (see the University of Maryland Code of Academic Integrity). A violation of the UMD Code of Academic Integrity includes (but is not limited to) intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise. Please be advised that a failure to accept and exhibit the fundamental value of academic honesty may result in a course grade of 'XF'

**Course Website**:

We will use ELMS (https://elms.umd.edu) (AKA Blackboard™ (https://bb.eng.umd.edu)) as the primary site to archive lecture notes and course related materials and share information. If you are unfamiliar with ELMS Learning System, it would be a good idea to familiarize yourself with its features now. In case of any technical difficulty, please send an email to elms@umd.edu & bb-help@umd.edu. Should you prefer assistance over the phone, you can call the OIT Help Desk at 301-405-1400. You are required to check the course website on a regular basis.

**Arrangements for Students with Disabilities**:

The University of Maryland is obligated to provide appropriate accommodations for any student with documented disabilities. University policy objective is to maintain consistent program requirements and academic standards for all students while allowing suitable flexibility in the assessment arrangements for students with disabilities. However, it is the responsibility of each student to bring his/her special needs to the attention of the instructor.

**Path to Success in ENME 423:**

The key factors for success in this course are to stay focused and fulfill your responsibilities. The course material is inherently cumulative such that the material learned in one session will be used in the following sessions. If you lose your focus for a session or two, it will be extremely hard for you to come back to the track. Please begin on your course project as soon as it is assigned.

**Topics & Lecture Dates:**

Tentative lecture and the exam dates are given in the course lecture schedule (above). If there is any change in the exam dates, students will be informed at least one week in advance.