MEC 506 Energy Management in Commercial Buildings

Instructor: Dr. Juldeh Sesay
Office: 226 Heavy Engineering
Contact: Telephone: (631)632-8493
Email: Juldeh.sessay@stonybrook.edu

Office Hours: Wednesdays 04-06 pm or by appointment
General Information's: check Brightspace

Course Description

Credit 3: Topics include basic heating, ventilating, and air-conditioning (HVAC) system design and selection for commercial buildings (includes both low-rise and high-rise buildings); selection of central plant components and equipment; calculation of space heating and cooling load; computer techniques for estimating annual energy consumption; design tools for reducing energy consumption; ASHRAE codes; building controls;

Course Prerequisites: Mass and Heat Transfer
Fluid Mechanics
Thermodynamics

Textbook

Heating, Ventilating, and Air Conditioning; Analysis and Design by Mcquiston, Parker and Spitler, Sixth Edition, Wiley

References

1. Principles of Heating, Ventilation, and Air Conditioning in Buildings, John W. Mitchell and James E. Braun, Wiley
2. Thermodynamics: An Engineering Approach by Yunus A. Cengel, 6rd Ed., McGraw-Hill
3. Fundamentals of Engineering Thermodynamics by Michael J. Moran and Howard N. Shapiro, 5th Edition, John Wiley
4. "Design of Fluid Thermal System", Fourth Ed., William S. Janna, PWS Publishing Company, 1998

Class schedule

Lectures: Wednesdays at 06:30 pm – 09:20 pm; LGT Engr. Lab. 152

Grader: None

Grading and Class Policies

Final grade is determined based on your performance on the following areas:
1. Homework: 10%
2. Quizzes: 10%
3. Attendance: 10%
4. Midterm 1: 35%
5. Midterm 2: 35%

Course Topics

Week 1: Lecture 1: Course Introduction
Common HVAC Units and Dimensions, Fundamental Physical Concepts

Week 2: Lecture 2: Air Properties Psychrometry
Moist Air and the standard Atmosphere, Fundamental Parameters, Adiabatic Saturation

Week 3: Lecture 3: Continuation Psychrometry
Wet Bulb Temperature and the Psychrometry Chart, Classic Moist Air Processes
Quiz 1

Week 4: Lecture 4: Comfort and Health
Indoor Environmental Quality, Comfort-Physiological Considerations, Environmental Comfort Indices, Comfort conditions, Common Contaminants Method of control Humidity, Methods of control Contaminants
Quiz 2

Week 5: Lecture 5: Refrigeration cycles and Heat pumps
The performance of refrigeration Systems, Theoretical Single-Stage Compression Cycle, Vapor Compression Heat Pump System, Refrigerants, Refrigeration Equipment Components, The Real Single Stage Cycle

Week 6: Lecture 6: Heat Exchangers
Types of Heat Exchangers, The Log Mean Temperature difference Method, The Number of Transfer Units Method, Heat Transfer- Single- Component Fluids, Transfort Coefficients inside Tubes, Transport Coefficients Outside Tubes and Compact Surfaces
Quiz 3

Week 7: Lecture 7: Heat Exchangers Continuation
The Number of Transfer Units Method, Heat Transfer- Single- Component Fluids, Transfort Coefficients inside Tubes, Transport Coefficients Outside Tubes and Compact Surfaces
Quiz 4

Week 8: Spring Break
Week 9: Midterm 1 (March 26, 2025)

Week10: Lecture 8: Flow Pumps and Piping Design
Fluid Flow Basics, centrifugal Pumps, Combined System and Pump Characteristics, Piping System Fundamentals

Week 11: Lecture 9: Spacing Heating Load
Outdoor Design Condition, Indoor Design Conditions, Transmission Heat Losses, Infiltration, Heat Losses from Air Ducts, .
Quiz 4

Week 12: Lecture 10: Heat Transmission
Basic Heat-Transfer Modes, Tabulated Overall Heat-Transfer Coefficients, Moisture Transmission
Quiz 5

Week 13: Lecture 11: Solar Radiation
The Earth's Atmosphere, Sun's Electromagnetic Spectrum, Thermal Radiation, The Earth's Motion about the Sun, Solar Calculations,
Quiz 6

Week 14: Lecture 12: Energy Calculations and Building Simulation

Week 15: Midterm 2 (May 7, 2025)

Course Policies:

1. Lecture notes will be posted on the brightspace prior to class**.**
2. Brightspace will be used for posting lectures, making course announcements, grading, and communicating with the class.
3. Lectures are held on Wednesdays from 6:30PM to 9:20PM
4. No late homework (HW) is accepted and zero grade will be assigned. Each homework will consist of four to six problems. Homework must be submitted in class immediately after lectures on the due dates. All procedures must be shown in homework's, projects, and tests.
4. The first homework page has to have heading; your name, identification number, course & HW number (MEC 526, HW-2, for example)
5. Submitted homework for grading has to be your own work. You have to **show all work or give related references**. No makeup tests will be given. If you do homework with someone else, you have to understand and stand behind the submitted work on your own. If it is determined that you are not familiar with the homework you may be responsible for plagiarism and cheating, and therefore loose all credits for that homework and all other homeworks to follow.
6. There are four to six Quizzes and each quiz will be based directly on homework and exams will be based directly on quizzes so the best way to excel in this class is to DO THE HOMEWORK!

Exams schedule:
The **tentative dates** for the two midterms are as follows:

1. Wednesday, March 26, 2025 (Online)
2. Wednesday, May 07, 2025 (Online)

Grading : Grades will be determined using :

Homework	10%
4/6 Quizzes	10%
Attendance	10%
Two exams	70% (35% each)

Instructor expectation:

- Be regular in class attendance
- Arrive on time
- Be attentive and participate in classroom discussions
- Come prepared to lectures/recitations
- Be up to date on previously cover material
- Allocate sufficient time every week to study for this course
- Be prepared to work hard and learn

Pet Peeves:

- Being distracted or distracting others in class
- Not willing to work hard or put an honest effort into learning
- Coming to me late in the semester for grade changes, extra credit, etc.
- Arguing over partial credit on homework/test grades
- Doing other tasks during lectures (including sleeping)
- Cellular phones ringing during lectures

Special Needs/Disabilities

If you have a physical, psychological, medical or learning disability that may impact on your ability to carry out assigned course work, I would urge that you contact the staff in the Disabled Student Services office (DSS), ECC (Educational Communications Center) Building, Room 128,(631)632- 6748. DSS will review your concerns and determine with you what accommodations are necessary and appropriate. All information and documentation of disability is confidential.

Statement on Academic Dishonesty

"Academic dishonesty is an extremely serious offense and will not be tolerated in any form. Academic dishonesty in general is the presentation of intellectual work is not originally yours. Examples include, *but are not limited to*, copying or plagiarizing class assignments including homework, reports, design, computer programs, and other submitted materials; copying or otherwise communicating answers on exams with other students; bringing unapproved aids, either in physical (written) or electronic form to an exam; obtaining copies of an exam prior to its administration, etc. Academic dishonesty violates both the ethical and moral standards of the Engineering profession and all infractions related to academic dishonesty will be prosecuted to the fullest via the CEAS CASA committee. For you, the honest student, academic dishonesty results in lower class curves, hence a depression in your GPA and class standing, while cheapening the degree you earn."

Calculator Policy

"Effective Spring, 2008 only the following calculators will be permitted to be used on all midterm and final exams in the department of Mechanical Engineering. There will be no exceptions! This list of calculators is identical to that allowed for the National Council for Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) Exam that many of you will take in your senior year, as well as the professional Engineering (PE) exam that you may take several years now. The sooner you become comfortable on one of these calculators, the better.

NCEES Allowed calculators as of spring, 2008:

► Casio: All **fx-115** models. Any Casio calculator must contain fx-115 in its model name

► Hewlett Packard: The **HP 33s** and **HP 35s** models, but no others.

► Texas Instruments: All **TI-30X** and **TI-36X** models. Any Texas Instruments calculator must contain either TI-30X or TI-36X in its model name.

The NCEES policy on calculators can be found here:
http://www.ncees.org/exams/calculators/."