

## **ME 440 – DESIGN OF HVAC AND BUILDING ENERGY SYSTEMS –FALL 2014**

### **CATALOG**

**DESCRIPTION:** Building energy design and simulation; HVAC systems, Heating and cooling load analysis; Air conditioning processes; Principles of human thermal comfort.

**PREREQUISITE:** ME 302, Graduate Standing or consent of the instructor.

**INSTRUCTOR:** Dr. Emmanuel C. Nsofor  
Office: E 20 Engineering Building  
Phone: 453-7021  
E-mail: nsofor@engr.siu.edu  
Office Hours: TR 11.00 a.m. to 12.00 noon and 3.30 p.m. to 5.30 p.m. (or by appointment).

**TEXTBOOK:** Heating, Ventilating and Air Conditioning – Analysis and Design by F. C. McQuiston, J. D. Parker and J. D. Spitler, 6<sup>th</sup> edition, John Wiley & Sons Publishing Company, 2005. Come to class with it because we shall refer constantly to materials in the text in class. ISBN 0-471-47015-5. Information on the price can be obtained online through SIUC webpage – Bookstore or by phone # 536-3321.

**REFERENCES:** ASHRAE Data and Handbooks (consisting of four volumes - (a) Fundamentals, (b) Refrigeration (c) HVAC Systems and Equipment and (d) HVAC Applications), as well as related textbooks on Heat Transfer, Thermodynamics and Fluid Mechanics.

**CLASSROOM:** Engineering A308                      **TIME:** TR 2.00 p.m. to 3.15 p.m.

**COURSE WEB ADDRESS:** From <https://online.siu.edu/>

**OBJECTIVES:** The objective of this course is to provide the students with adequate instruction, information and knowledge so that when they complete the course they:

1. Will be able to analyze a building for energy consumption, heating and cooling requirements in order to satisfy thermal comfort.
2. Calculate energy demand, heating and cooling loads for residences and commercial buildings, complying with Codes in HVAC design.
3. Calculate psychrometric properties and analyze psychrometric processes.
4. Determine sizes of ducts, pipes and fans for proper air distribution in building systems.

5. Will be able to use the HVAC heating and cooling load computer programs.
6. Will be able to apply a Department of Energy (DOE) computer program for building energy simulation.

In addition, the students will be able to

1. Do simple projects on building energy systems and HVAC open-ended problems.
2. Work together in project design teams or groups and
3. Produce comprehensive project reports after the design to communicate their technical work and procedure.

SEMESTER  
PROJECT:

Students will be required to demonstrate ability to deal with practical real-life problems by making design decisions and writing formal reports.

Apart from homework problems and term paper(s), the class will be divided into groups. Each group of student engineers will work on analyzing a building for heating/cooling requirements, calculate psychrometric processes, determining the required equipment and possibly costs. Possible buildings include residential, office or commercial buildings. The groups will each make presentations of their design to the class and submit a comprehensive formal report at the end of the semester.

It is planned for the class to have a tour of an HVAC/Building energy use facility. Details on this will be given later.

ADMINISTRATION  
OF THE COURSE:

Students are expected to attend all classes. Attendance will be taken for the classes. Homework and other assignments are to be turned in at the beginning of class on due dates. Slipping your homework under my door or the TA's door or dropping it in the mailbox is unacceptable.

For tests, homework and other assignments, you should take note of the following:

- (a) Put name, date, course number and page number on every sheet and staple all pages together.
- (b) Use one side of the paper only.
- (c) Neat diagrams should be drawn as needed.
- (d) Show how you solved problems by using text and descriptions throughout the steps in the solution.
- (e) Use appropriate units.
- (f) Highlight your final answer to problems with a box or underline and give the appropriate units.

Academic dishonesty will not be tolerated. Your work should be your own. For homework and assignments, you are encouraged to consult other students, the TA or the instructor if you run into problems. **Consulting is allowed but not copying.**

Your homework, tests, exams, reports etc are viewed as exercises in technical communication. Hence, correct procedure and effective presentations are important. As practicing engineers, your work will be checked by other engineers. It should be easy to do so.

The overall course grade will be based on scores obtained as shown below:

Homework	15%
Term Paper/Special Homework/Reports	15%
Tests	30%
Semester Project and Presentation	40%

There will be a 5% bonus for class attendance and participation. Any student who is absent from a class shall lose one bonus attendance point. The same will be the case if the professor decides that a student is late enough not to benefit adequately from a class. The maximum loss in this bonus *attendance points* is of course 5%. Note that loss of all the bonus points does not affect your maximum score of 100%.

<u>GRADES:</u>	A	90 – 100%
	B	80 – Less than 90%
	C	70 – Less than 80%
	D	60 – Less than 70%
	F	Less than 60%

#### OUTLINE OF THE TOPICS

1. Introduction and Fundamental Concepts
2. Air Conditioning Systems
3. Psychrometrics and Moist Air Properties
4. Review of Refrigeration and Thermodynamic Properties in Buildings
5. Piping/Duct Design and Building Air Distribution
6. Space Heating and Cooling Loads
7. Introduction to Building Simulation and EnergyPlus (DOE Computer Program for Building Energy Simulation)
8. Principles of Human Thermal Comfort and Indoor Air Quality
9. Semester Project
10. HVAC Plant Tour

#### SCHEDULE/DUE DATES

Test #1	Thursday, October 2 at 2.00 p.m.
Test #2	Thursday, November 25 at 2.00 p.m.
Term Paper/ Special Homework/Reports	Assignments will include the due dates.

Preliminary Presentation  
 HVAC Plant Tour  
 Final Presentation (1)  
 Final Presentation (2)  
 HVAC Plant Tour Report Due date  
 Semester Project Report Due date

Project assignment will include the date  
 Tuesday, November 20, at 2.00 p.m.  
 Tuesday, December 2 at 2.00 p.m.  
 Thursday, December 4 at 2.00 p.m.  
 Friday, December 6 at 3.00 p.m.  
 Monday, December 8 at 4.00 p.m.

Note: The professor reserves the right to make changes as necessary at any time.

## **SYLLABUS ATTACHMENT FALL 2014**

### **IMPORTANT DATES \***

Semester Class Begins .....**08/18/2014**  
 Last day to add a class (without instructor permission): .....**08/24/2014**  
 Last day to withdraw completely and receive a 100% refund: .....**08/31/2014**  
 Last day to drop a course using SalukiNet: .....**10/26/2014**  
 Last day to file diploma application (for name to appear in Commencement program): .....**10/31/2014**  
 Final examinations: .....**12/8–12/12/2014**  
*Note: For outreach, internet, and short course drop/add dates, visit Registrar's Academic webpage <http://registrar.siu.edu/>*

### **FALL SEMESTER HOLIDAYS**

Labor Day 09/01/2014  
 Fall Break 10/11—10/14/2014  
 Veterans Day 11/11/2014  
 Thanksgiving Vacation 11/26—11/30/2014

### **WITHDRAWAL POLICY ~**

#### ***Undergraduate only***

Students who officially register for a session may not withdraw merely by the stopping of attendance. An official withdrawal form needs to be initiated by the student and processed by the University. For the proper procedures to follow when dropping courses and when withdrawing from the University, please visit

<http://registrar.siu.edu/pdf/ugradcatalog1314.pdf>

### **INCOMPLETE POLICY~ *Undergraduate only***

An INC is assigned when, for reasons beyond their control, students engaged in passing work are unable to complete all class assignments. An INC must be changed to a completed grade within one semester following the term in which the course was taken, or *graduation*, whichever occurs first. Should the student fail to complete the course within the time period designated, that is, by no later than the end of the semester following the term in which the course was taken, or graduation, whichever occurs first, the incomplete will be converted to a grade of *F* and the grade will be computed in the student's grade point average. *For more information please visit:*

<http://registrar.siu.edu/grades/incomplete.html>

### **REPEAT POLICY**

An undergraduate student may, for the purpose of raising a grade, enroll in a course for credit no more than two times (two total enrollments) unless otherwise noted in the course description. For students receiving a letter grade of A,B,C,D, or F, the course repetition must occur at Southern Illinois University Carbondale. Only the most recent (last) grade will be calculated in the overall GPA and count toward hours earned. *See full*

policy at

<http://registrar.siu.edu/pdf/ugradcatalog1314.pdf>

## **GRADUATE POLICIES**

Graduate policies often vary from Undergraduate policies. To view the applicable policies for graduate students, please visit

<http://gradschool.siu.edu/about-us/grad-catalog/index.html>

## **DISABILITY POLICY**

Disability Support Services provides the required academic and programmatic support services to students with permanent and temporary disabilities. DSS provides centralized coordination and referral services. To utilize DSS services, students must come to the DSS to open cases. The process involves interviews, reviews of student-supplied documentation, and completion of Disability Accommodation Agreements.

<http://disabilityservices.siu.edu/>

## **PLAGIARISM CODE**

[http://pvcaa.siu.edu/\\_common/documents/Plagiarism/Guide%20to%20Preventing%20Plagiarism.pdf](http://pvcaa.siu.edu/_common/documents/Plagiarism/Guide%20to%20Preventing%20Plagiarism.pdf)

## **SALUKI CARES**

The purpose of Saluki Cares is to develop, facilitate and coordinate a university-wide program of care and support for students in any type of distress—physical, emotional, financial, or personal. By working closely with faculty, staff, students and their families, SIU will continue to display a culture of care and demonstrate to our students and their families that they are an important part of the community. For Information on Saluki Cares: (618) 453-5714, or [siucares@siu.edu](mailto:siucares@siu.edu), <http://salukicare.siu.edu/index.html>

## **EMERGENCY PROCEDURES**

Southern Illinois University Carbondale is committed to providing a safe and healthy

environment for study and work. We ask that you become familiar with the **SIU Emergency Response Plan** and **Building Emergency Response Team (BERT)**

programs. Emergency response information is available on posters in buildings on campus, available on BERT's website at [www.bert.siu.edu](http://www.bert.siu.edu), Department of Safety's website at [www.dps.siu.edu](http://www.dps.siu.edu) (disaster drop down) and the Emergency Response Guideline pamphlet. Instructors will provide guidance and direction to students in the classroom in the event of an emergency affecting your location. ***It is important that you follow these instructions and stay with your instructor during an evacuation or sheltering emergency.***

## **INCLUSIVE EXCELLENCE**

SIU contains people from all walks of life, from many different cultures and sub-cultures, and representing all strata of society, nationalities, ethnicities, lifestyles, and affiliations. Learning from and working with people who differ is an important part of education as well an essential preparation for any career. *For more information please visit:* <http://www.inclusiveexcellence.siu.edu/>

## **MORRIS LIBRARY HOURS**

<http://www.lib.siu.edu/about>

## **LEARNING AND SUPPORT SERVICES**

Help is within reach. Learning support services offers free tutoring on campus and math labs. To find more information please visit the Center for Learning and Support Services website:

**Tutoring** : <http://tutoring.siu.edu/>

**Math Labs**

[http://tutoring.siu.edu/math\\_tutoring/index.html](http://tutoring.siu.edu/math_tutoring/index.html)

## **WRITING CENTER**

The Writing Center offers free tutoring services to all SIU students and faculty. To

find a Center or Schedule an appointment  
please visit <http://write.siu.edu/>

### **AFFIRMATIVE ACTION & EQUAL OPPORTUNITY**

Our office's main focus is to ensure that the university complies with federal and state equity policies and handles reporting and investigating of discrimination cases. *For more information visit:*

<http://diversity.siu.edu/#>

***Additional Resources Available:***

### **SALUKINET:**

<https://salukinet.siu.edu/cp/home/displaylogin>

**ADVISEMENT:** <http://advisement.siu.edu/>

***“We emphasize student achievement and success because achievement and success are essential if we are to shape future leaders and transform lives.”<sup>1</sup>***

<http://pvcaa.siu.edu/>