HVAC Design, ARE 346P / CE 389H Spring 2013

The University of Texas at Austin
Department of Civil, Architectural and Environmental Engineering

Course Unique Number: 15100 (ARE 346P) / 15725 (CE 389H) (3 hrs.)

Classroom and Time: ECJ 7.208, Tuesday and Thursday 12:30 p.m. – 2:00 p.m.

Course Website: http://www.ce.utexas.edu/prof/Novoselac/classes/ARE389H

Prerequisites: For undergraduate students ARE 346N or consent of instructor

Instructor: Dr. Atila Novoselac
Office: ECJ 5.422
Phone: 512-475-8175
e-mail: atila@mail.utexas.edu
http://www.ce.utexas.edu/prof/Novoselac

Office Hours: Tuesday and Thursday, 11:00 AM - 12:00 PM or by appointment. I have an open door policy – if my office door is open, I will see students without an appointment. If I am busy, we will schedule a convenient time for both of us.

Course Catalog Description Fundamentals of design of heating, ventilation, and air conditioning systems

Academic/Learning Goals & Course Objectives:
By taking this class you will be able to:

1) Apply fundamental physical principles to HVAC design
2) Describe and size each component in an HVAC system
3) Design HVAC systems based on manufacturer's datasheets
4) Contrast residential systems with commercial systems and use appropriate design techniques for each type of system
5) Solve HVAC design problems with high-quality references

Textbook (required):
Kuehn, T.H.; Ramsey, J.W.; Threlkeld, J.L. 1998. *Thermal Environmental Engineering (3rd Edition)* Prentice Hall ISBN: 0139172203. **Reprinted with Corrections, June 2001**

Other References: (optional – on 2 hour reserve at Engineering Library)
2005 ASHRAE Handbook: Fundamentals. IP or SI edition, hard copy or CD (in Reference section of Engineering Library, 2001 editions on 2 hour reserve at Engineering Library).

Spittler, McQuiston, and Parker, (2000), *Heating, Ventilating, and Air Conditioning : Analysis and Design*, 5th Edition, Wiley.

Kreider, Curtiss and Rabl, (2002), *Heating and Cooling of Buildings: Design for Efficiency*, 2nd Edition, McGraw Hill.

Incropera, DeWitt, (2006), *Fundamentals of heat and Mass Transfer*, John Wiley & Sons.

Topics:

1.	Background, Introduction and Review	2 wks
2.	Heating and Cooling Loads	1 wk
3.	Psychrometrics and mass transfer	1 wk
4.	Air conditioning and refrigerant cycles	2 wks
5.	Chillers and Boilers	1 wk
6.	Coils and heat exchangers	2 wks
7.	Ducts, air, and water systems	2 wks
8.	Large HVAC Systems	2 wk
9.	HVAC Control	2 wk
10.	Final Project, field trip	1 wk
		15 wks

Grading:

Exam	25%
Project	30%
Homework Assignments	40%
Participation	5%
	100%

Course Letter Grades: (Numerical Grade)

90-93,	>93		A-, A
80-83,	>83-86,	>86-90	B-, B, B+
70-73,	>73-76,	>76-80	C-, C, C+
60-63,	>63-66,	>66-70	D-, D, D+
< 60			F

Attendance Policy:

Regular attendance and participation are essential and expected. Random attendance will be taken throughout the semester by various means and it can affect your grade up to 5% (participation grade). "A student who is absent from a class or examination for the observance of a religious holy day may complete the work issued within a reasonable time after the absence, if proper notice has been given". The deadline for notification of such an absence is 14 days prior to the class absence.

Class Participation:

It is important that you are familiar with the course material as the course evolves. Your ability to answer questions and discuss the material will be part of the overall participation evaluation. Therefore, you should review class material ahead of time.

Assignments:

Homework assignments are a central part of this course. Homework will be assigned approximately five times over the course of the semester. All assignments are due at the beginning of the class for the assigned day. Homework assignments should be completed individually.

Final Project Description:

There will be one final project assigned at the beginning of April, and it will relate to a design of HVAC system for a commercial building. It will be a group project and student will have a choice to select specific building and HVAC system. Each group will prepare a two page proposal to define the project objectives, scope, methodology, and deliverables. Students are welcome to propose problems from their current research or future career. Based on these proposals the course instructor will refine the final project scope and deliverables for each group, so that each student will have the same final project work load. Each group member will have the same project grade.

Midterm Exam:
This course will have one exam at beginning of April. The exam will cover principles of HVAC systems and components learned in the first 2/3 of the course.

Final Exam:
This course will not have a final exam. The final project and the final project presentation will replace the final exam.

Due Dates Policy:
All assignments are due at the beginning of class**;** those turned in late will count 10%off per day.

Personal Problems:
If you have illness or personal problems that will affect your performance during the course of the semester, please let me know as soon as possible. "After the fact" provides little protection unless there are extreme circumstances. I have an answering machine and an e-mail address if you need to get in touch with me after hours. Do not hesitate to use them.

Honor Code:
The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, thrust, fairness, and respect towards peers and community.

Policy of Scholastic Dishonesty:
Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Since such dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. For further information, visit the Student Judicial Services web site http://deanofstudents.utexas.edu/sjs/.

Privacy – Web Based Class Sites:
Web-based, password-protected class sites may be associated with all academic courses taught at the University. Syllabi, handouts, assignments and other resources are types of information that may be available within these sites. Site activities could include exchanging email, engaging in class discussions and chats, and exchanging files. In addition, electronic class rosters will be a component of the sites. Students who do not want their names included in these electronic class rosters must restrict their directory information in the Office of the Registrar, Main Building, Room 1. For information on restricting directory information, see:
http://www.utexas.edu/student/registrar/catalogs/gi00-01/app/appc09.html.

Accommodations:
The University of Texas at Austin provides, upon request, appropriate academic accommodations for qualified students with disabilities. For more information, contact Services for Students with Disabilities at 471-6259 (voice) or 232-2937 (video phone).

Dropping the Course: From the 1st through the 12th class day, an undergraduate student can drop a course via the web and receive a refund, if eligible. From the 13th through the university's academic drop deadline, a student may Q drop a course with approval from the Dean, and departmental advisor. After the academic drop deadline has passed, a student may drop a course only with Dean's approval, and only for urgent, substantiated, non-academic reasons.

Course Evaluations:

Each student will be given the opportunity to evaluate the course and the instructor using the standard course/instructor evaluation form at the end of semester.

Important Dates:

Exam: April 9 (will be confirmed)
Preliminary results for the final project due: April 23
Final project due: May 3

TENTATIVE COURSE SCHEDULE

Date	Topics	Reading	Due
01/15	Course introduction and terminology		
01/17	Review: Thermodynamics	Chapter 2	
01/22	Review: Heat transfer	Chapter 2	
01/24	Review: Building Load and HVAC Systems	Handouts	
01/29	No class (ASHRAE meeting) make up will be a Field trip		
01/31	Psychrometric chart	Chapters 7&8	HW1
02/05	AHU & Psychometrics	Chapters 7&8	
02/07	Psychrometric processes	Chapters 7&8	
02/12	HVAC Systems	Chapters 7&8	
02/14	Cooling towers	Hadouts&Ch.10	
02/19	Refrigeration Cycles	Chapter 4	HW2
02/21	Refrigeration Systems	Chapter 4	
02/26	Refrigerants	Chapter 4	
02/28	Refrigeration System Components	Chapter 11	
03/05	Heat Exchangers I	Chapter 11	
03/07	Heat Exchangers II	Chapter 11	HW3
03/19	Heat Exchangers III, Example	Chapter 11	
03/21	Air distribution components	Chapter 18	
03/26	Duct design	Chapter 18	
03/28	Fans	Chapter 18&19	HW4
04/02	Pumps and plumbing sizing	Chapter 18&19	
04/04	Review		
04/9	Course projects and Exam *(Exam - out of class time)*		*Exam*
04/11	Principle of HVAC Control	Handouts	
04/16	Variable air volume systems	Handouts	
04/18	Final Project and Load Calculation	Chapters 15&16	
04/23	Automatic Control for HVAC systems	Handouts	*Project*
04/25	Residential vs. Commercial HVAC Systems		
04/30	Review *(Field trip – out of class time)*		
05/02	Project discussion		Project