

# **Building Environmental Systems, ARE 346N    Fall 2010**

The University of Texas at Austin

Department of Civil, Architectural, and Environmental Engineering

**Course Unique Number:** 14960 (3 hrs)

**Classroom and Time:** ECJ 5.410, Tuesday and Thursday 9:30 AM-11:00 AM

**Course Website:** <http://www.ce.utexas.edu/prof/Novoselac/classes/ARE346N>

**Prerequisites:** Physics 303L and 103N (ME 320 recommended)

**Professor:** Dr. Atila Novoselac

Office: ECJ 5.422

Phone: 512 475 8175

e-mail: [atila@mail.utexas.edu](mailto:atila@mail.utexas.edu)

<http://www.ce.utexas.edu/prof/Novoselac>

**Office Hours:** Tuesday and Thursday 11:00 AM-12:00 PM

**Course Catalog Description** Planning and design of heating, ventilation, and air conditioning systems; noise and vibration control systems; power distribution and lighting systems; introduction to plumbing systems.

**Course Objectives:** By taking this class you will be able to:

- 1) Describe the role of building environmental systems in building planning and design,
- 2) Research and critically analyze claims about building environmental systems made by salespeople, subcontractors, and building designers,
- 3) Calculate building heating, ventilating, and air conditioning loads and specify HVAC equipment for residential and light commercial construction,
- 4) Acquire design requirements for building electrical systems and design basic systems,
- 5) List characteristics of different lamps, describe building lighting designs and their consequences and demonstrate knowledge of lighting design principles.

**Textbooks (required):**

Tao and Janis, (2004 or 2009), *Mechanical and Electrical Systems in Buildings*, 3<sup>rd</sup> or 4<sup>th</sup> Edition, Prentice Hall.

**References:** (optional – on 2 hour reserve at Engineering Library)

Trost, J., (1999), *Efficient Building Design Series Volume 1: Electrical and Lighting*, Prentice Hall.

*2001 ASHRAE Handbook: Fundamentals*. IP or SI edition, hard copy or CD (in Reference section of Engineering Library, 1997 editions on 2 hour reserve at Engineering Library). Note that it is much cheaper to become a member of ASHRAE to get this text.

Spittler, McQuiston, and Parker, (2005), *Heating, Ventilating, and Air Conditioning: Analysis and Design*, 6<sup>th</sup> Edition, Wiley.

Stein and Reynolds, (1999), *Mechanical and Electrical Equipment for Buildings*, 9<sup>th</sup> Edition, Wiley.

## Topics:

1. Background and Introduction	1 wk
2. HVAC Systems – Motivation and Basics	1 wk
3. Heating and Cooling Load Calculations	1 wk
4. Heating and Cooling Equipment	2 wks
5. Air Systems and Delivery Equipment	2 wks
6. Electrical Systems	3 wks
7. Lighting Introduction and Equipment	2 wks
8. Lighting Design	1 wk
9. Plumbing/Acoustics	1 wk
10. Field trips	<u>1 wk</u>
	15 wks

<b><u>Grading:</u></b>	Quizzes	10%
	Midterms	25%
	Projects	15%
	Homework Assignments	20%
	Participation	5%
	Final Exam	<u>25%</u> (see below)
		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

## **Exams, Quizzes, and Assignments:**

All exams and quizzes are closed book, closed notes. The instructor reserves the right to adjust letter grades, upward only, based on individual attendance and class participation if the numerical grade warrants such consideration. Exams and quizzes will include material covered in reading assignments and class discussions. Exam make-up's will be given only in the event of a verified emergency or doctor-verified sickness. The student is responsible for all reading assignments and class handouts whether or not covered in class or listed on the syllabus.

The **final exam** for this class will be **optional** for those students who **achieve a C grade or better on both of the first two exams**. Students who meet this criterion and elect for this option are responsible for providing me with written confirmation by 5 pm on December 8<sup>th</sup>. Any student who is qualified, meets the above notification criterion, and chooses not to take the final exam will have their **midterm exam grade** represent **50% of their course grade**.

Short quizzes will be given at the **beginning** (5-10 minutes) of each Thursday class (a total of 11 scheduled). The average of these quizzes will constitute 10% of the final grade. Each student will be allowed to drop one of the quiz grades. *No make-up quizzes will be given.*

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. **Your attendance will be**

**used to evaluate your participation grade.** I consider a student missing more than one week (three classes) of class lectures without excuse to be a serious participation problem. In some cases,

**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, a fax machine and an e-mail address if you need to get in touch with me after hours. Do not hesitate to use them.**

**Academic Honesty**

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://www.utexas.edu/depts/dos/sjs/>.

**Students with Disabilities:**

The University of Texas at Austin provides, upon request, appropriate academic adjustments for qualified students with disabilities. Any student with a documented disability (physical or cognitive) who requires academic accommodations should contact the Services for Students with Disabilities area of the Office of the Dean of Students at 471-6259 as soon as possible to request an official letter outlining authorized accommodations. For more information, contact that Office, or TTY at 471-4641, or the College of Engineering Director of Students with Disabilities at 471-4321.

**Privacy:**

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 the Course Schedule, Undergraduate Catalog or go to: <http://www.utexas.edu/student/registrar/catalogs/gi00-01/app/appc09.html>.

**Course Evaluations:**

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

**Computer Usage:**

With the exception of using word processing and spreadsheet software in the development of assignments, this course does not directly involve computer usage.

**Project:**

There will be two group projects assigned on March 2<sup>nd</sup> that will be due on March 23<sup>rd</sup> (Project 1) and April 22<sup>nd</sup> that will be due on May 6<sup>th</sup> (Project II). The projects will count for 15% of your final grade.

**Important Dates:**

Midterm 1: March 9

Midterm 2: April 29

Project 1 Due: March 23

Project 2 Due: May 6

**Final Exam:** Thursday, May 13, 9:00–12:00 noon

No classes on October 23 - ASHRAE conference (make up: second field trip)

**TENTATIVE COURSE SCHEDULE**

ARE 346N - dates in bold are quiz days

<b>Date</b>	<b>Topics</b>	<b>Assigned Reading</b>	<b>Deadlines</b>
01/19	Introduction to the course	Tao Ch.1	
01/21	HVAC, Fundamentals	Tao Ch.2	HW1
01/26	No class	Tao Ch.2	
<b>01/28</b>	HVAC, Heat gains and loses	Tao Ch.2	
02/02	HVAC, Load calculation	Tao Ch.2 and Handouts	
<b>02/04</b>	HVAC, Cooling load	Tao Ch.2 and Handouts	HW2
02/09	HVAC, Heating systems	Tao Ch. 5	
<b>02/11</b>	HVAC, Cooling cycles	Tao Ch. 4	
02/16	HVAC, Cooling systems	Tao Ch. 4	
<b>02/18</b>	HVAC, Delivery systems	Tao Ch. 3	HW3
02/23	HVAC, Air Handling Units	Tao Ch. 3	
<b>02/25</b>	HVAC, Distribution system	Tao Ch. 7	
03/02	Example problems and project I assignment		
03/04	Midterm review		HW4
03/09	Midterm 1		
03/11	Field trip 1		
03/23	Electric, Introduction and fundamentals	Tao Ch.10	Project 1
<b>03/25</b>	Electric, Electric elements	Tao Ch.11	
03/30	Electric, Electric systems	Tao Ch.11	HW5
<b>04/01</b>	Electric, System design	Tao Ch.13 and Handout	
04/06	Electric, Example problems		
<b>04/08</b>	Lighting, Introduction and fundamentals	Tao Ch.14	
04/13	Lighting, Type of lamps	Tao Ch.16 and 17	
<b>04/15</b>	Lighting, Design parameters	Tao Ch.16 and 17	HW6
04/20	Lighting, System design	Tao Ch.11 and 13	
<b>04/22</b>	Example problems and project II assignment		
04/27	Midterm review (Field trip 2)		HW7
04/29	Midterm 2		
05/04	Acoustics	Tao Ch. 18	
<b>05/06</b>	Review		Project 2