

Building Environmental Systems, ARE 346N Spring 2019

The University of Texas at Austin

Department of Civil, Architectural, and Environmental Engineering

Course Unique Number: 15010 (3 hrs)

Classroom and Time: ECJ 3.402, Tuesday and Thursday 11:00 AM-12:30 PM

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

Prerequisites: Physics 303L and 103N (ME 326 or ME 320 co-requisite)

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Office Hours: Tuesday and Thursday 12:30 PM-1:30 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*, 3rd or 4th 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*, 6th Edition, Wiley.

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

Topics:

1. Background and Introduction	0.5 wk
2. HVAC Systems – Motivation and Basics	2.5 wks
3. Heating and Cooling Load Calculations	2 wks
4. Heating and Cooling Equipment	1 wk
5. Air Systems and Delivery Equipment	1 wk
6. Electricity Theory	2 wks
6. Electrical Systems	3 wks
7. Lighting Introduction and Equipment	1 wk
8. Lighting Calculation and Design	1 wk

Grading:

Quizzes	10%
Midterm 1	15%
Midterm 2	15%
Projects	15%
Homework Assignments	20%
Participation	5%
Final Exam	<u>20%</u> (see below in the exam section)
	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 and Quizzes:

All exams and quizzes are closed book, closed notes. Exams and quizzes will include material covered in reading assignments and class discussions. Exam make-ups will be given only in the event of a verified emergency or doctor-verified sickness.

The **final exam** for this class will be **optional** for those students who **achieve a C grade or better ($\geq 73/100$) on both of the first two exams**. Any student who meets the above 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 occasionally at the beginning of class. The average of these quizzes will constitute 10% of the final grade. **No make-up quizzes will be given.**

Homework:

You may discuss homework problems with other members of the class, but **your write-up must be done individually**. Copying of homework solutions from others is not allowed. **You may turn in up to two homework assignments late** (no more than one week after the actual deadline). **Other than that, no late homework will be accepted.** The late exception does not apply to the class project reports.

Behavior:

Please do not talk to your classmates during the lecture as this disrupts the learning environment. (Class activities organized by instructor are excluded). **Please always bring your Calculator.** Please keep your cell phone silent.

Attendance:

Although it is in your own best interest to attend class, I do not intend to check attendance. If for some reason you do not come to class, **it is your responsibility** to make sure that you are aware of any announcements that have been made and that you are familiar with the material covered in class. Please notice that **No make-up quizzes will be given.**

Office Hours:

I encourage all students to come and see me outside of class. This gives me an opportunity to explain concepts that may be unclear, to get feedback on how the class is going, and to get to know you. I have open door policy, but I encourage to use scheduled office hours.

Problems:

If you experience difficulty with the course material or encounter unexpected academic or personal problems during the semester that might impact upon your performance in the class, please let me know as soon as possible. I am always willing to help those who are honest and who accept responsibility for their own actions.

Special Needs:

The University of Texas at Austin provides, upon request, appropriate academic accommodations for qualified students with disabilities. For more information, contact the Division of Diversity and Community Engagement, Services for Students with Disabilities, 512-471-6259 or <http://diversity.utexas.edu/disability/>

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, please visit the Student Judicial Services web site <http://catalog.utexas.edu/general-information/appendices/appendix-c/student-discipline-and-conduct/>

Dropping the Class:

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 class day through the university's academic drop deadline, a student may Q drop a course with approval from the Dean, and departmental advisor.

Course/Instructor Evaluation:

An evaluation of the course and instructor will be conducted at the end of the semester using the approved UT Course/Instructor evaluation forms.

TENTATIVE COURSE SCHEDULE

Date	Topics	Assigned Reading
01/22	Introduction to the course	Tao Ch.1
01/24	Thermal Comfort and Psychrometry	Tao Ch.2
01/29	Thermal Comfort and Psychrometry	Tao Ch.2
01/31	Thermal Comfort and Psychrometry	Tao Ch.2
02/05	Thermal Comfort and Psychrometry	Tao Ch.2
02/07	Heat/Cooling Load	Tao Ch.2
02/12	Heat/Cooling Load	Tao Ch.2
02/14	Heat/Cooling Load	Tao Ch.2
02/19	Heat/Cooling Load	Tao Ch.2
02/21	Heating/Cooling Equipment and Systems	Tao Ch.4, 5
02/26	Heating/Cooling Equipment and Systems	Tao Ch.4, 5
02/28	HVAC Delivery Systems	Tao Ch.3
03/05	Air Handling Units and Distribution Systems	Tao Ch.6
03/07	Air Handling Units and Distribution Systems	Tao Ch.6
03/12	Electricity Theory	Tao Ch.10
03/14	Exam I	
03/26	Electricity Circuit	Tao Ch.10 & handouts
03/28	Electricity Circuit	Tao Ch.10 & handouts
04/02	Electricity Circuit	Tao Ch.10 & handouts
04/04	Electricity Circuit	Tao Ch.10 & handouts
04/09	Building Electrical Equipment and System	Tao Ch.11, 13
04/11	Building Electrical Equipment and System	Tao Ch.11, 13
04/16	Building Electrical Equipment and System	Tao Ch.11, 13
04/18	Building Electrical Equipment and System	Tao Ch.11, 13
04/23	Building Electrical Equipment and System	Tao Ch.11, 13
04/25	Lighting Fundamentals	
04/30	Exam II	
05/02	Lighting Equipment and Systems	Tao Ch.15
05/07	Lighting Calculations and Design	Tao Ch.16, 17
05/09	Lighting Calculations and Design	Tao Ch.16, 17

Important Dates:

Midterm 1: March 14

Midterm 2: April 30

Field trips will be scheduled around week 6 and 13