ARE 346N - Unique Number 15080
Building Environmental Systems

11:00 am – 12:30 pm; T TH; ECJ 3.402
Fall Semester 2018

Instructor:	Dr. Ying Xu Location: ECJ 5.436 Email: xuying@mail.utexas.edu	Office Hours: T TH 1:00 pm – 2:00 pm Other times by appointment

Prerequisites: Physics 303L and 103N (ME 326 or ME 320 corequisite)

Course Website: Class notes, class problems, assignments and homework solutions will all be posted on the Canvas website. Please check the site regularly and have the class notes, class problems, and assignments available in class.

Course Description: Analysis and design of building air conditioning systems; heating and cooling load calculations; air side systems analysis; air distribution; building electrical requirements; electrical and lighting systems.

Academic/Learning Goals and Course Objectives:

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

Textbook: Tao and Janis, *Mechanical and Electrical Systems in Buildings*, 4th Edition (2009) or 5th Edition (2014), Prentice Hall.

References:

- *ASHRAE Handbook: Fundamentals*.
- Grondzik et al., (2009), *Mechanical and Electrical Equipment for Buildings*, 11th Edition, Wiley.
- Spittler, McQuiston, and Parker, (2005), *Heating, Ventilating, and Air Conditioning: Analysis and Design*, 6th Edition, Wiley. Hambley, (2013), *Electrical Engineering: Principles and Applications*, 6th Edition, Prentice Hall.

Topics:	1. Background/Introduction	0.5 wks
	2. HVAC Systems – Fundamentals	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
	7. Electrical Systems	3 wks
	8. Lighting Introduction and Equipment	1 wks
	9. Lighting Calculation and Design	1 wk
Grading:	Quizzes	10%
	Mid-Term Exam I	15%
	Mid-Term Exam II	15%
	Homework Assignments	20%
	Class Mini-Projects	20%
	Final Examination	20% (see below)

Letter Grade: (A) 94-100; (A-) 90-93
(B+) 87-89; (B) 84-86; (B-) 80-83
(C+) 77-79; (C) 74-76; (C-) 70-73
(D+) 67-69; (D) 64-66; (D-) 60-63
(F) <60

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 (≥74/100) 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. As far as possible, however, I ask that you restrict this activity to the 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://www.utexas.edu/diversity/ddce/ssd.
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://deanofstudents.utexas.edu/sjs/.
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.

ARE 346N – Course Outline

Week	Lecture Dates	Approximate weekly topics	Textbook
1	8/30	Introduction	Ch. 1
2	9/4	Thermal Comfort and Psychrometry	Ch. 2
	9/6	Thermal Comfort and Psychrometry	Ch. 2
3	9/11	Thermal Comfort and Psychrometry	Ch. 2
	9/13	Thermal Comfort and Psychrometry	Ch. 2
4	9/18	Heat/Cooling Load	Ch. 2
	9/20	Heat/Cooling Load	Ch. 2
5	9/25	Heat/Cooling Load	Ch. 2
	9/27	Heat/Cooling Load	Ch. 2
6	10/2	Heating/Cooling Equipment and Systems	Ch. 4, 5
	10/4	Heating/Cooling Equipment and Systems	Ch. 4, 5
7	10/9	HVAC Delivery Systems	Ch. 3
	10/11	Air Handling Units and Distribution Systems	Ch. 6
8	10/16	Air Handling Units and Distribution Systems	Ch. 6
	10/18	Electricity Circuit	
9	10/23	Electricity Circuit	By Prof. McCann
	10/25	**Midterm I Exam**	Ch. 1, 2, 3, 5 of
10	10/30	Electricity Circuit	*Hambley (2013)*
	11/1	Electricity Circuit	
11	11/6	Building Electrical Equipment and System	Ch. 10
	11/8	Building Electrical Equipment and System	Ch. 11, 13
12	11/13	Building Electrical Equipment and System	Ch. 11, 13
	11/15	Building Electrical Equipment and System	Ch. 11, 13
13	11/20	**Midterm II Exam**	
	11/22	**No Class –** Thanksgiving holidays	
14	11/27	Lighting Fundamentals and Equipment	Ch. 11, 13
	11/29	Lighting Fundamentals and Equipment	Ch. 14, 15
15	12/4	Lighting Calculations and Design	Ch. 16, 17
	12/6	Lighting Calculations and Design	Ch. 16, 17

Important dates:

October 25: Mid-Term Exam I
October 18: Hand in Mini-Project I Report
November 15: Upload Mini-Project II Data
November 20: Mid-Term Exam II
December 6: Hand in Mini-Project II Report
December 15: Final Exam 7:00-9:00 pm
Field trips are scheduled on 10/2 and 11/29, respectively.