

**UNIVERSITY OF NORTH TEXAS**  
**Department of Mechanical and Energy Engineering**

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**MEEN 4810.009 Principles of HVAC**

**MEEN 5200.001 Principles of HVAC**

**MEEN 5200.601 Principles of HVAC**

(Web assisted online on Black Board at <https://learn.unt.edu/>)

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**Spring 2020**

**A. LOGISTICS**

**INSTRUCTOR :** Dr. Shaojie Wang, Adjunct Professor

Office: F101T, email: [shaojie.wang@unt.edu](mailto:shaojie.wang@unt.edu)

**OFFICE HOURS:** Appointment

**CLASS SCHEDULE:** Tu 18:30-21:20, Room: F175

**TEXTBOOK:** McQuiston, F.C., Parker, J.D. and Spitler, J.D. 2005. Heating, Ventilation, and Air Conditioning - Analysis and Design, sixth Edition.

**B. CATALOG COURSE DESCRIPTION**

**MEEN 4810. Principles of HVAC. 3 hours.** HVAC systems analysis; Fundamentals of moist air properties (Psychrometrics), basic air conditioning processes, heat transfer in building structures, heating and cooling load calculations, space air diffusion, fans and air distribution systems. HVAC system design, equipment sizing and selections. Lectures, homework assignments, quizzes, 1 exam, and 1 team project.

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**C. COURSE OBJECTIVES**

1. Develop fundamental understanding of the objectives and principles of heating, ventilating, and air-conditioning with emphases on the application of theories of thermodynamics, fluid mechanics, and heat and mass transfer.
2. Introduction to HVAC system types and their components.
3. Develop the ability to design and analyze HVAC systems.
4. Introduction to integrated building design process, and energy modeling for green building system design.

## **D. RELATIONSHIP OF COURSE TO ACHEIVING MECHANICAL AND ENERGY ENGINEERING STUDENT OUTCOMES (MEEN 4810.001)**

- (a) Ability to apply knowledge of mathematics, science, and engineering
- (d) Ability to function on multi-disciplinary teams
- (e) Ability to identify, formulate, and solve engineering problems
- (f) Understanding of professional and ethical responsibility
- (g) Ability to communicate effectively
- (h) Broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) Recognition of the need for, and an ability to engage in, lifelong learning
- (j) Knowledge of contemporary issues
- (k) Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

## **E. PREREQUISITE KNOWLEDGE:**

1. Techniques and applications of derivatives and integrals.
2. Mass conservation in fluid flow.
3. Momentum conservation in fluid flow.
4. Energy conservation in control volume.
5. Viscous flow characteristics.
6. Thermal conduction, convection and radiation (Prerequisite: MEEN 3110 and MEEN 3210)
7. Computational skills using a mathematically functional spreadsheet such as Excel.
8. Understanding programming flow chart.
9. Conduct research using the literature database and web.

## **F. COURSE REQUIREMENTS:**

### ***General Plan***

The class will focus on both understanding of concepts and problem solving. It will emphasize your figuring out things using your own mind, not simply memorizing what is in a textbook. On a typical day you will be given lecture on main concepts and typical problem solving methods. You will then be engaged in questioning and discussion in class for the problem solving practice. You are encouraged to assess and monitor your own progress using criteria and standards discussed in class. If at any time in the semester you feel unsure about your "grade", you should request an assessment from the professor.

The knowledge acquired through your learning experience in this course will be reinforced by a combination of written assignment, either from the textbook or from the professor, and class projects. Those assignments should follow the recommended format and reflect a logical reasoning of your thinking. At different stages of the course, an assessment will be given in a form of a written quiz. At the mid semester, a test will be given in place of a quiz.

You are encouraged to improve your performance, increase your strengths and diminishing your weaknesses.

### ***Requirements***

All students must complete all of the following:

1. Homework assignments. Due on Tuesday of the following week unless announced in class.
2. Close-book quizzes, all in a closed book format.
3. Progressive Test, all in a closed book format.
4. Consistent classroom attendance and active participation (extra credit).

### ***Grade Evaluation***

The class will be graded based on a percentage and point system. Following weigh factors are applied to calculation of the final grade:

ASSIGNMENTS	20%
QUIZZES	30%
TEST ONE	20%
CLASS PROJECT	30%
ACTIVE CLASS PARTICIPATION (for extra credit. A class roll will be circulated.)	5%
TOTAL	100% +5%

### ***Class Policies***

Each homework assignment gains a point (total points for the homework equal to the total number of assignments). The late submission after the due date but before the next class day gets a half point. No-submission within those days gets zero point. The final grade for the assignments is calculated as (No. of points/Total points) x 100% x0.20.

Excusable absence from the quizzes is accepted only if the student informs the professor before the event such as illness and non-reschedulable prior appointment, or after the event, such as medical or other emergencies, within a reasonable time frame. In all the cases, academic honesty is expected.

Quizzes will be evaluated on a median average basis.

### ***Grade Significance:***

<u>GRADE</u>	<u>SCORE RANGE</u>	<u>GRADE</u>	<u>SCORE RANGE</u>
A	100 - 90 %	C	69.9 - 55 %
B	89.9 - 70 %	D	54.9 - 40 %
		F	< 40 %

### ***Dishonesty***

Any form of dishonesty during the semester will result in a final grade of F for the course and a recommendation for expulsions to the Provost. No exceptions. Please avoid cheating or any other form of misconduct. If you are having personal problems, come and talk to the instructor.

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### **G. CONTENTS:**

1. Overview and Introduction	<1>
2. HVAC Systems and Major Components	<2>
3. Moist Air Properties and Conditioning Processes	<3-4>
4. Comfort and Health-Indoor Environmental Quality (design goals)	<5>
5. Heat Transmission in Building structures	<6>
6. Solar Radiation	<7>
7. Space Heating Load	<8>
8. The Cooling Load	<9>
9. Energy Calculations	<10>
10. Flow, Pumps, and Piping Design	<11>
11. Space Air Distribution	<12>
12. Fans and Building Air Distribution	<13>
13. Team project presentation and reviews	<14-15>

## H. TENTATIVE SCHEDULE OF READING ASSIGNMENT

WEEK	OF DATE	READING ASSIGNMENT*	QUIZ**
1	1/14	Overview and Introduction	
2	1/21	HVAC Systems and Major Components	
3	1/28	Moist Air Properties and Conditioning Processes	
4	2/4	Thermal Comfort and IAQ	Quiz 1
5	2/11	Heat Transmission in Building Structures (Envelope System)	
6	2/18	Space Heating Load	Quiz 2
7	2/25	Solar Radiation	
8	3/4	Cooling Load Calculation	Test 1
9	3/11	<b>Spring break (no classes)</b>	
10	3/18	Space Air Diffusion	Quiz 3
11	3/25	Energy Calculations and Building Simulation	
12	4/1	Schematic Design/Design Development Wizard	Quiz 4
13	4/8	Detailed interface	
14	4/15	Graphical Report	
15	4/22	Detailed Report	
16	4/29	<b>Final report due</b>	
17	5/6	<b>Final project presentations</b>	

\* The reading assignments are approximate. It is possible that in-class adjustments are made.

\*\* All the quizzes and tests will be administrated on Tuesday of the week.

### ***Disclaimer***

The course schedule, content, and assignments are subject to modification when circumstances dictate and as the course progresses. If changes are made, you will be given due notice.