ME 485/685 HVAC Syllabus

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Lecture: Tuesday-Thursday 2:00 PM, Dolve Hall Room 10.

Office Hours: TuTh: 9-11 AM

Referenced Text: "Heating, Ventilating and Air Conditioning, Analysis and Design" by McQuiston, Parker and Spitler, 6th Ed.

Prerequisites: ME 352 and admission to the professional program

Catalog Description: Application of the basic fundamentals of thermodynamics, heat transfer, and fluid flow to heating, ventilating, and air conditioning.

Topics Covered and Tentative Schedule

The content of the course and the approximate class time is outlined below:

Topic	Reading	Class Periods
Air Conditioning systems	Chapter 1&2	1-2
Moist Air Systems and Processes, applications of psychometrics to the HVAC process	Chapter 3	4
Indoor air quality, and design comfort conditions	Chapter 4	3
Quiz 1	**Thursday, February 8th**	
Heat transmission in buildings, conduction heat transfer through the building envelope, estimating heat loss or gain	Chapter 5	3
Space heat loads, estimating heating requirements for a space or building, internal heat gain.	Chapter 6	3
Quiz 2	**Thursday, February 28th**	
Method for estimating the space heat gains and the cooling loads	Chapter 8	3
Energy calculations, degree day concepts estimating seasonal energy costs	Chapter 9	3
Quiz 3	**Thursday March 30th**	
Pump and liquid system design, hot and steam heating systems	Chapter 10	3
Space air diffusion, selection and location of air vents to space for optimal air movement	Chapter 11	3
Fans and building air distributions systems, basics of sizing and selecting air handling equipment	Chapter 12	3
Quiz 4	**Thursday April 26th**	
Refrigeration equipment. Operation and control of vapor compression refrigeration systems.	Chapter 15	2
Final Exam	**Thursday , May 9th 2:00 pm**	

Grading Procedures:

	Undergraduate	Graduate
Quizzes	40%	30%
Project	40%	40%
Final	20%	20%
Special Topic Presentation		10%

Quizzes:

Quizzes will consist of two parts: an in-class portion on concepts and a take home portion for practical application. Lecture will be given prior to the quiz for approximately 60 mins at the discretion of the instructor. The remainder of the class will be utilized for the completion of the quiz.

Individual makeup quizzes will be given for missed quizzes at the discretion of the instructor and only for an excused absence.

Project:

The project will consist of the designing of a full HVAC system for a conceptual building. Projects will be a team effort of groups of 2 to 3 people. The project will be submitted in two intervals the first due the week after spring break **Friday March 23rd.** Review and grading will be returned with comments for correction no later than **March 30th. Points that are docked for the first submission can be reclaimed up to 18% of the total 20%.** The final submission will be due the **Friday(May 3rd)** of dead-week.

First Submission project scope(tentative):

- Building Heating and Cooling load estimates
- IAQ
- Psychometric processes

Special Tropic Presentation:

Graduate students will be required to present details on a special topic of their choosing related to HVAC, presentations will be done via power-point with a duration of 20 mins. Topics should be outside the prevue of the topics listed in the course content. Submission of project ideas will be due at the same time as the first project submission.

Intended Course Outcomes:

A student achieving a passing grade in this course will be able to estimate heating loads, space heat gains and space cooling loads using accepted engineering methods. The student will be able to apply the psychometrics to determine the coil loads for cooling and heating systems. The student will be able to select equipment and design systems to provide comfort conditionings within the building.

No.	Course Outcome	Affected ABET Outcomes
1.	Identify needs and design constraints (technical, safety, economic, environmental, etc.) associated with an engineering problem.	1,2
2.	Identify relevant properties of gases, liquids and solids	1,2
3.	Understand and apply gaseous mixture theories to engineering processes	1,2
4.	Identify and evaluate moist air processes	1,2
5.	Size and select primary movers such as pumps and fans, by means of curves and corresponding online tools	1, 2
6.	Size ductwork and piping for efficient distribution of cooling and heating based on cost, noise reduction, and easy of use.	1,2
7.	Demonstrate effective visual communication skills through the development of project documentation	3,5
7.	Demonstrate effective written communication skills in writing technical reports, at a level consistent with the background of the audience.	3,5
8.	Demonstrate effective oral presentation skills in the development and delivery of oral presentations (including responses to questions), at a level consistent with the background of the audience.	3,5
9.	Consider the code of ethics and professional responsibilities in design decision making.	4
10.	Demonstrate effective visual communication skills through the development of project documentation	3,5
11.	Participate in and contribute to group discussions and decisions.	3,5
13.	Work collaboratively in setting goals, developing a project schedule, and completing assignments to meet the objectives.	3,5
15.	Utilize external resources to supplement existing knowledge in the solution of engineering problems.	7

General Course Expectations:

No late homework or reports accepted without special permission from the instructor.

Attendance Statement:

According to **NDSU Policy 333 (www.ndsu.edu/fileadmin/policy/333.pdf)**, attendance in classes is expected. Veterans and student service members with special circumstances or who are activated are encouraged to notify the instructor as soon as possible and are encouraged to provide Activation Orders.

Please do not come to class if:

- you are feeling ill, particularly if you are experiencing COVID-19 symptoms, or
- you are infected during your five-day isolation period.

You will still need to complete the assignments, exams, reading, etc. necessary to meet class learning objectives. You can complete missed work by contacting the instructor and making arrangements.

Americans with Disabilities Act for Students with Special Needs Statement:
Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor and contact the **Disability Services Office (www.ndsu.edu/disabilityservices)** as soon as possible.

Approved Academic Honesty Statement:
The academic community is operated on the basis of honesty, integrity, and fair play. **NDSU Policy 335: Code of Academic Responsibility and Conduct** applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the **Office of Registration and Records**. Informational resources about academic honesty for students and instructional staff members can be found at **www.ndsu.edu/academichonesty**.