

SYLLABUS
MENG 2203-301: Thermodynamics
(Required Course)
Summer 2022

Instructor: Dr. Salim Azzouz.

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Office Hours: See schedule on instructor front door.

Course Schedule: MTWR 8:00 AM - 10:00 AM, Location: MY 136.

CATALOG DESCRIPTION

The fundamental laws of thermodynamics; properties of systems, solids, liquids, and gases; and thermodynamics tables.

COURSE PREREQUISITES

MATH 2534 Calculus III.

OTHER PREREQUISITES

Basic computer skills, MS Excel, hand calculator.

TEXTBOOK

Fundamentals of Engineering THERMODYNAMICS, 9th. Edition, Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey.

REFERENCES

Additional material will be distributed in the form of handouts.

TOPICS COVERED

Topics	Topics
Defining volume, pressure, and temperature	Vapor Power Systems
Energy and the First Law of Thermodynamics	Gas Power Systems
Evaluating Properties	Refrigeration and Heat Pump Systems
Control Volume, Analysis Using Energy	Thermodynamics Relations
The Second Law of Thermodynamics	Psychrometric Applications
Using Entropy	Combustion*
Exergy Analysis	Vapor Power Systems*

* If time permit.

COURSE LEARNING OBJECTIVES AND RELATIONSHIP TO STUDENT OUTCOMES

Outcome-Related Course Learning	1	2	3	4	5	6	7
Name the three major mechanisms of heat transfer	X						X
Apply SI and English engineering units, including units for specific volume, pressure, and temperature	X	X					X
Demonstrate understanding of key concepts related to the first law of thermodynamics including internal, kinetic, and potential energy, work, heat transfer, and power cycles	X	X					X
Sketch T-v, p-v, and phase diagrams, and locate states on these diagrams	X						X
Apply mass and energy balances to control volumes	X	X					X
Describe the Carnot cycle	X						X
Evaluate entropy change between two states, and analyze isentropic processes	X	X					X
Demonstrate understanding of key concepts related to exergy analysis	X						X
Sketching schematic cycles and accompanying T-s diagrams	X	X					X
Define gas power cycles	X	X					X
Develop understanding of basic vapor-compression refrigeration and heat pump	X	X					X
Calculate p-v-T data using equations of state	X						X
Demonstrate basic understanding of humidity ratio, relative humidity, and Dew point temperature	X	X					X

3a: an ability to apply knowledge of mathematics, science, and engineering

3b: an ability to design and conduct experiments, as well as to analyze and interpret data

3c: an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

3d: an ability to function on multidisciplinary teams

3e: an ability to identify, formulate, and solve engineering problems

3f: an understanding of professional and ethical responsibility

3g: an ability to communicate effectively 3h: the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

3i: a recognition of the need for, and an ability to engage in life-long learning

3j: a knowledge of contemporary issues

3k: an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

CONTRIBUTION OF COURSE TO PROFESSIONAL COMPONENT

This course contributes to the engineering science component of the mechanical engineering program.

COURSE ORGANIZATION AND STUDENT PERFORMANCES ASSESSMENT

- Lecture Format

This course consists of a two 50-minutes sessions per day (MTWR). The two hours class will be spent mostly explaining and discussing concepts, and solving relevant case problems. Lectures will not be used to communicate the entire textbook course content and thus, you will have to study a set of course paragraphs specified by the instructor on your own to further your understanding. Student participation in class discussions is highly encouraged and rewarded.

- Exams

There will be two regular exams plus a final one at the end of the semester. Each exam is based on two testing parts. A Theoretical part based on chapters reading is designed to test the students' ability to acquire a self-reading knowledge of the taught materials. A practical part is designed to test the students' ability to analyze and solve a set of problems. Each exam is based on the course materials developed between two consecutive exams. Only your hand written notes, the textbook, and the handouts posted on D2L by the instructor are allowed. A mandatory hand written one page sheet summarizing the exam materials should be handed with the submitted exam. Any other document is considered illegal. You are expected to take the exam on the scheduled date and time it is given. No make-up exam will be given. **It is strictly forbidden to use cell phones or other electronic devices with the exception of a simple calculator during the exam.** Cell phones will be collected at the beginning of the exam and restituted at the end of it.

- Homework & Quizzes

Homework will be assigned from a set of chosen chapters by the instructor. Organized, neat with appropriate content, homework have to be turned in on the due date at the beginning of class. After the deadline, homework will still be accepted till the end of the semester, maximum 60% of the normal 100% grade. There will be a take home quiz given for each homework to encourage the students to study the course materials and do the homework by themselves. Quizzes will consist of questions related to current homework problems. You are expected to hand these quizzes with the homework. Each student is responsible for submitting his own individual personal homework and quiz copy, written in his own words. No dual or group homework copy is accepted unless specified by the instructor.

- Course Grade

The final grade for the course will be based on the scores earned in the two regular exams, the final exam, the average score earned in the homework, and a score for the student work neatness, attitude, and attendance. The first exam contributes 10%, the second exam contributes 25%, the third exam contributes 35%, homework average contributes 20%, and participation, neatness, attitude, and class attendance contribute 10%, for a total of 100%. The overall average score (X) for the course is determined as follows:

$$X = 0.10 \times (\text{exam1 score}) + 0.25 \times (\text{exam 2 score}) + 0.35 \times (\text{third exam score}) + 0.20 \times (\text{homework average score}) + 0.10 \times (\text{participation/neatness/attitude/attendance})$$

scores).The final letter grade for the course is based on the value of X and is determined from the following grade levels:

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Value Range of X (in %)	Letter Grade
$89.5 \leq X \leq 100$	A
$79.5 \leq X < 89.5$	B
$69.5 \leq X < 79.5$	C
$59.5 \leq X < 69.5$	D
< 59.5	F

STUDENT RESOURCES

https://msutexas.edu/academics/scienceandmath/student_resources.php

CONFLICT RESOLUTION

If a misunderstanding or a conflict arises between the student and the instructor. Please follow this conflict resolution procedure:

- 1) The student should contact the instructor face to face or via e-mail if there is an issue with the course or the instructor. The faculty and the student will discuss this face to face or via email. Hopefully a resolution is reached on the issue.
- 2) The student should notify the faculty via email again if the issue still did not get resolved after the first encounter or communication.
- 3) The student can then contact the Chair of the McCoy School of Engineering, Dr. Desai, face to face or via email, (raj.desai@msutexas.edu), and discuss this issue. Dr. Desai will discuss the issue at hand with the faculty member. Dr. Desai will discuss the result of this discussion with the student. Hopefully a resolution is reached on the issue after this.
- 4) The student should notify the Chair via email if the issue still did not get resolved.
- 5) The Chair will contact the Dean and try to resolve the conflict. In case the conflict deals with the student grade, she will forward the case to the Grade Appeals Committee if necessary.

COVID-19

- Face coverings recommended, not required.
- Vaccination recommended, available.
- Reporting required for unvaccinated individuals in contact with positive or testing positive https://msutexas.edu/coronavirus/report_covid_19.php.
- Quarantine/isolation still in effect after reporting.

GENERAL GUIDELINES

- Plan to spend at least 6 hours outside of class to study the material and to work on homework assignments, and lab experiments. Do not wait until the last day to start working on your report, or prepare for the exam.
- Read the course material before coming to class.
- Utilize the instructor office hours throughout the semester to seek explanations from the instructor.

- Use engineering or blank paper for all homework assignments and exams. Use a systematic approach to solve problems. If a problem involves drawing a graph, use Excel, or any other graphic software tool to draw the graph. In engineering, neatness is a must, not a luxury. Be advised that you will be penalized for a lack of neatness.
- You are strongly encouraged to study in-group and seek tutoring.

MIDTERM PROGRESS REPORT

In order to help students keep track of their progress toward course objectives, the instructor for this class will provide a Midterm Progress Report through each student's WebWorld account. At-risk students will be reported and will receive a midterm overall grade. Midterm grades will not be reported on the students' transcript; nor will they be calculated in the cumulative GPA. They simply give students an idea of where they stand at the midpoint of the semester. Students earning below a C at the midway point should have a meeting with the professor and seek out tutoring.

CAMPUS CARRY STATEMENT

Senate Bill 11 passed by the 84th Texas Legislature allows licensed handgun holders to carry concealed handguns on campus, effective August 1, 2016. Areas excluded from concealed carry are appropriately marked, in accordance with state law. For more information regarding campus carry, please refer to the University's webpage at <https://msutexas.edu/campus-carry/rules-policies>.

GENERAL EDUCATION STATEMENT

Students in this course must demonstrate their competency in oral and written communication through written homework assignments, lab reports, quizzes, and exams. They must also demonstrate their ability to use the English language.

ACADEMIC INTEGRITY POLICY AND ETHICS

Scholastic dishonesty will not be tolerated and will be prosecuted to the fullest extent. You are expected to have read and understood the current issue of the student handbook regarding student responsibilities & rights, and the intellectual property policy information about procedures and what constitutes acceptable on-campus behavior. Any form of plagiarism will not be accepted, and will be heavily reprimanded.

DISABILITY SUPPORT SERVICES

Students registered with Disability Support Services should have a letter verifying their disability and the appropriate accommodations.

DISCLAIMER STATEMENT

Information contained in this syllabus, other than grading, and late assignments, may be subject to change with advance notice, as deemed appropriate by the instructor.

Prepared by: Dr. Salim Azzouz, Date: 05/30/2022