



Technical Thermodynamics

The University of Toledo

College of Engineering

MET 2210:901 / Summer 2020

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Office Hours:	T&R: 1:00pm to 3:30pm or by appointment	Class Day/Time:	DL Online
Office Location:	DL Online	Credit Hours:	4.0

COURSE/CATALOG DESCRIPTION

Analysis of thermodynamic concepts as they apply to heating and power production; conservation of energy, work and heat, engines and refrigeration.

COURSE OVERVIEW

The class is the first course in Thermodynamics. It provides an overview of basic concepts used in thermodynamics, energy and energy transfer including the First Law of Thermodynamics, properties of pure substances, energy analysis of closed systems, energy analysis of control volumes, Second Law of Thermodynamics, and entropy. There is no laboratory component for this course.

STUDENT LEARNING OUTCOMES

Upon completion of this course, the students will be able to:

- o To identify the unique vocabulary associated with Thermodynamics (LO1)*
- o To understand the forms of energy and energy transfer as well as be able to apply an energy balance (LO2)*
- o To understand the concept of pure substance and ideal – gas, and to be able to apply the Ideal – Gas Equation of State (LO3)*
- o To examine the moving boundary work and to be able to develop the general energy balance applied to closed systems (LO4)*
- o To be able to apply the mass conservation principle to various systems and to be able to solve energy balance problems (LO5).*
- o To understand the second law of thermodynamics and to be able to apply the Carnot principle to heat engines, refrigerators, and heat pumps (LO6)*



- *To apply the second law of thermodynamics to processes and to calculate the entropy changes that take place during processes for pure substances (LO7)*

TEACHING STRATEGIES

This course is designed to stimulate learning through engagement and participation. I will assign homework each week and I will give special assignments and short quizzes. I expect that you will be actively engaged in class discussions through the Discussion Board.

Recommendations for success:

- *Read the pages from the textbook on the material to be presented – it will help you focus on the lecture and to better understand the concepts;*
- *Read the posted notes and solved problems;*
- *Redo on your own the practice problems posted & discussed during the lectures;*
- *Try to do the weekly assignment alone; If you do not know how to do it, ask for guidance (email or Discussion Board);*
- *Actively participate to discussions posted on the Discussion Board;*
- *If you do not understand something, there is a good chance that others have the same problem. Never be embarrassed to ask for help if you find something confusing;*
- *A professional attitude is expected at all time.*

PREREQUISITES AND COREQUISITES

The required prerequisites to be successful in this class are:

- Undergraduate level PHYS 2010 Minimum Grade of D- or Undergraduate level PHYS 2070 Minimum Grade of D- or Undergraduate level PHYS 2130 Minimum Grade of D-
- Undergraduate level MET 1050 Minimum Grade of D-
- Undergraduate level MATH 1850 Minimum Grade of D- or Undergraduate level MATH 2450 Minimum Grade of D-)

REQUIRED TEXTS AND ANCILLARY MATERIALS

Thermodynamics, by Cengel. – required; 8th Edition, ISBN: 9780073398174

TECHNOLOGY REQUIREMENTS

Web assist - Blackboard <https://blackboard.utdl.edu/>

The technical skills required to be successful in this course are: proficient in Blackboard and proficient in Excel.



To succeed in this course, it will be important for learners to possess the following technical skills:

1. Rename, delete, organize, and save files.
2. Create, edit, and format word processing and presentation documents.
3. Copy, paste, and use a URL or web address.
4. Download and install programs and plug-ins.
5. Locate and access information using a web search engine.
6. Use a learning management system.

Browser Check Page - *Students need to have access to a properly functioning computer throughout the semester. [The Browser Check Page](#) will enable you to perform a systems check on your browser, and to ensure that your browser settings are compatible with Blackboard, the learning management system that hosts this course.*

Internet Service - *High-speed Internet access is recommended; This course may contain streaming audio and video content.*

Use of Public Computers - *If using a public library or other public access computer, please check to ensure that you will have access for the length of time required to complete tasks and tests. A list and schedule for on-campus computer labs is available on the [Open Lab for Students](#) webpage.*

UT Virtual Labs - *Traditionally, on-campus labs have offered students the use of computer hardware and software they might not otherwise have access to. With UT's Virtual Lab, students can now access virtual machines loaded with all of the software they need to be successful using nothing more than a broadband Internet connection and a web browser.*

The virtual lab is open 24/7 and 365 days a year at [VLAB: The University of Toledo's Virtual Labs](#).

Accessibility Policies

Blackboard - <https://www.blackboard.com/accessibility/index.html>

Microsoft - <https://www.microsoft.com/en-us/accessibility>



UNIVERSITY POLICIES

The University is an equal opportunity educational institution. Please read [The University's Policy Statement on Nondiscrimination on the Basis of Disability Americans with Disability Act Compliance](#).

Academic Accommodations

The University of Toledo is committed to providing equal opportunity and access to the educational experience through the provision of reasonable accommodations. For students who have an accommodations memo from Student Disability Services, it is essential that you correspond with me as soon as possible to discuss your disability-related accommodation needs for this course. For students not registered with Student Disability Services who would like information regarding eligibility for academic accommodations due to barriers associated with a potential disability, please contact the [Student Disability Services Office](#).

Policy Statement on Academic Dishonesty

As a reminder, "MISCONDUCT: Students may work together on homework problems or assigned papers, but must submit their own work. Students are not allowed to work together on exams". Any occurrence of academic misconduct will result in a grade of F in the course. Students that receive a reduced course grade as a result of academic misconduct will not be allowed to withdraw from the course and may not petition for a GPA recalculation after retaking the course. Please refer to the [Academic Dishonesty](#) and [Academic Grievance](#) policies for more details

Academic dishonesty will not be tolerated. Please read [The University's Policy Statement on Academic Dishonesty](#).

Copyright Notice

The materials in the course website are only for the use of students enrolled in this course for purposes associated with this course, and may not be retained or further disseminated.

COURSE EXPECTATIONS

Lectures: On Monday morning of each week I will post the class notes, a series of solved problems, and the assignment for that week. Please read all the posted files under each module in the order they are presented. Start with Module Objective, and end with the Assignment Submission.



Assignments (assignment or quiz): I will assign an assignment each week to help you better understand the material discussed during the lecture. I expect to be a total of 11 weekly assignments. As a general rule, each assignment is valued at 50 points each. Please check the Grading Criteria rubric for details regarding the project grading. Each assignment will have a due date set as **Sunday end of day**, and in general will consist in problems similar with those discussed during the weekly module. Please submit your work before the due date. Late submissions will not be accepted. I will grade your submission in less than 48 hours and I will provide you with feedback.

Note: There will be opportunity for **extra credit** during the semester.

COMMUNICATION GUIDELINES

Email: Please check your UT email account frequently for important course information. If you have any issues with the material discussed or the assignment, please let me know and I will do my best to respond to your email within 24 hours.

Discussion: In this fully online course, participation is vital to your success, and your active engagement during weekly discussion is crucial to learning. On Monday morning of each week, I will post the class notes, a series of solved problems, and the assignment for that week. The assignment is due by the end of that week. Try to engage in the discussion board. I will participate also in these spaces, and I will respond to discussion questions within 24 to 48 hours.

Real-Time Communication: A link to a real-time communication or chat tool has been added to the Course Menu. We will not be using this tool as part of our course assignments; however, the tool is available for you to use if and when you need it. To that end, I would be happy to arrange a time to meet with you in a chat room if you feel that you have questions that would best be answered in real-time. Conversely, you could also use the tool to meet with fellow students online in order to enhance your understanding of course concepts.

Netiquette:

It is important to be courteous and civil when communicating with others. Students taking online courses are subject to the communication regulations outlined in the Student Handbook. To ensure your success when communicating online, take time to familiarize yourself with the "dos" and "don'ts" of [Internet etiquette](#).

GRADING Criteria

Strategy to Evaluate the Assignment Problems	Points
All formulas correctly applied, values from tables correct selected, and no calculation errors;	50
All formulas correctly applied, at least one value from tables incorrect selected, and no calculation errors;	45
One or two formulas incorrectly applied, values from tables correct selected, and no calculation errors;	35
One or two formulas incorrectly applied, at least one value from tables incorrect selected, and no calculation errors;	30
One or two formulas incorrectly applied, at least one value from tables incorrect selected, and at least 1 calculation errors	25
Otherwise	0

Strategy to Evaluate the online Quiz: In general, there will 10 questions per quiz, each valued at 5 points, unless otherwise specified in quiz.

*The following parts will be considered when calculating the **final grade**:*

- *Assignments: 11 total (1/week) -> 11 x 50 points = 550 points -> 100% of the final grade*

Midterm Grading - *The midterm grading will be based on the assignment score after the first 5 weeks of lectures.*

Final Grading

The final grade will be determined using a straight scale as follows:

Numerical Average	Grade
≥ 93.00	A
89.33 – 92.99	A–
85.67 – 89.32	B+
82.00 – 85.66	B
78.33 – 81.99	B–
74.67 – 78.32	C+
71.00 – 74.66	C
67.33 – 70.99	C–
63.67 – 67.32	D+
60.00 – 63.66	D
≤ 60.00	F

ACADEMIC SUPPORT SERVICES

Besides using my office for institutional support, the university offers additional support, like free tutoring or support, through:

- Engineering Technology Department - NE 1604 & NE 1606
- University of Toledo – Learning Enhancement Center - <http://www.utoledo.edu/success/lec/> or <http://www.utoledo.edu/studentaffairs/support.html>
- Disability Services Office <https://www.utoledo.edu/offices/student-disability-services/>
- Counseling Center <https://www.utoledo.edu/studentaffairs/counseling/>

SAFETY AND HEALTH SERVICES FOR UT STUDENTS

A comprehensive list of safety and health services available to you as a UT student, can be found at <http://www.utoledo.edu/offices/provost/utc/docs/CampusHealthSafetyContacts.pdf>

COURSE SCHEDULE - Tentative

Week(s)	Learning Module #	Lecture	Chapter	Learning Objective
1, 2	1	Introduction and Basic Concepts	1	LO1
3, 4	2	Energy, Energy Transfer, and General Energy Analysis	2	LO2
5, 6	3	Properties of Pure Substances	3	LO3
7	4	Energy Analysis of Closed Systems	4	LO4
8	5	Mass and Energy Analysis of Control Volumes	5	LO5
9, 10	6	Second Law of Thermodynamics	6	LO6
11	7	Entropy	7	LO7