Technical Thermodynamics

The University of Toledo
Mechanical Engineering Technology program, College of Engineering
MET-2210-001, CRN: 48488

Name:	William Mugge	**Class Location**:	PH 2450
Email:	William.Mugge@utoledo.edu		
Office Hours:	(Insert Availability)	**Class Day/Time**:	2:30 pm – 4:20 pm MW
Office Location:	NE 1639	**Lab Location**:	Not Applicable
Instructor Phone:	419-530-3277		
Offered:	Fall 2018	**Lab Day/Time**:	Not Applicable
		Credit Hours:	4.0

CATALOG/COURSE DESCRIPTION

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

COURSE STATEMENT

Upon completion of this course, the students will be able to:
1. To understand the relationship between pressure, volume / specific volume, and temperature for a gas.
2. To use gas tables to determine the properties of gases and gas-liquid combinations.
3. To use graphs and charts to find the properties of gases and apply them to machine cycles.
4. To understand the design and function of air compressors.
6. To apply thermodynamics to manufacturing processes.
5. To perform an energy analysis of closed systems
6. To calculate the thermodynamics efficiency of Carnot cycles

STUDENT LEARNING OUTCOMES

Outcome a. An ability to apply the knowledge and techniques to understand the relationship between pressure, temperature, and specific volume in a thermodynamics process and the work or heat that is necessary to accomplish it, as evidenced by the ability to perform a complete thermodynamics analysis.

Outcome b. An ability to select and apply knowledge of engineering tools to design and specify the thermodynamics aspects of hydronic heating systems, air compressors, and thermodynamics manufacturing processes.

Outcome f. An ability to identify, analyze and solve technical problems associated with the steady flow engineering problems, Carnot cycle, etc.

PHILOSOPHY OF TEACHING (TEACHING METHODOLOGY)

This is an active learning course that will require students to be fully engaged. Face-to-face instructions in lectures will provide maximum help to students. Homework, chapter tests, and comprehensive tests will be given. The purpose of this course is to help students understand the fundamental thermodynamics theories and use those theories to solve the relevant problems. Students are welcome to ask questions and discuss problems. The course will be instructed based on the philosophy of cycling education:

- *through the theory to understand the formula*
- *through the usage of formulae to the understand examples*
- *through the examples to solve similar exercise problems*
- *through face-to-face instruction to improve learning efficiency*
- *through exams to emphasize importance and clarify confusion*
- *though taking this course to have the capability to self-study for future work or research*

Recommendations for success:

- *Come to lectures and take notes*
- *Read the relevant contents in the textbook*
- *Solve examples in the textbook and do homework*
- *Review the relevant contents and homework before each test or exam*

Never hesitate to ask for help from the instructor

PREREQUISITES AND COREQUISITES

PHYS 2010 Technical Physics I, MET 1050 Computers for Engineering Technology, and MATH 2450 Calculus for Engineering Technology with minimum Grade of D-

REQUIRED INSTRUCTIONAL MATERIALS (TEXTS AND ANCILLARY MATERIALS)

Yunus A. Cengel, and Michael A. Boles, Thermodynamics: An Engineering Approach, McGraw Hill Education, Ninth Edition, 2015, ISBN: 978-1-259-82267-4*. (required)*

TECHNOLOGY EXPECTATIONS

Web assist - Blackboard http://blackboard.utdl.edu/

UNIVERSITY POLICIES

Academic Accommodations

(Insert the following: 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.)

ACADEMIC POLICIES

Students in this course should be familiar with policies that govern the institution's academic process. Please find a total list of undergraduate Academic Polices: http://www.utoledo.edu/policies/academic/undergraduate/

***Missed Class Policy**: Students are expected to attend each class session. Should there be an unexpected absence on your part, you must notify me **by e-mail**. Please read the Missed Class Policy: http://www.utoledo.edu/policies/academic/undergraduate/*

***Academic Dishonesty Policy**: MISCONDUCT: Students may work together on homework problems, but must submit their own work. Students are not allowed to work together on exams. Any occurrence of academic misconduct will follow the policy for Academic Dishonesty. 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. If you are caught in the act of plagiarism or cheating, you will be reported to the Dean and you will be placing your entire academic career at risk. There are no reasonable excuses or exceptions for cheating and plagiarism. Examples include, but are not limited to as followings. Please read the http://www.utoledo.edu/policies/academic/undergraduate/*

1. *Plagiarizing or representing the words, ideas or in formation of another person as one's own and not offering proper documentation;*
2. *Giving or receiving, prior to an examination, any unauthorized information concerning the content of that examination;*
3. *Referring to or displaying any unauthorized materials inside or outside of the examination room during the course of an examination;*
4. *Communicating during an examination in any manner with any unauthorized person concerning the examination or any part of it;*
5. *Giving or receiving substantive aid during the course of an examination;*
6. *Commencing an examination before the stipulated time or continuing to work on an examination after the announced conclusion of the examination period;*
7. *Taking, converting, concealing, defacing, damaging or destroying any property related to the preparation or completion of assignments, research or examination;*
8. *Submitting the same written work to fulfill the requirements for more than one course.*

***Exams Policy:** There will be no makeup tests given. It is the student's responsibility to contact the instructor prior to the scheduled exam if an absence cannot be avoided in order to make alternate arrangements.*

***Attendance Policy:** Attendance will not be taken, but students are fully responsible for being present at all examinations, and for all materials, announcements, or changes in the schedule in class. In case of excused absence, **any missed work must be done** and written documentation of the circumstance (such as a doctor's signed note) must be provided to be kept on file.*

Syllabus Revisions: *The instructor reserves the right to amend this syllabus at any time during the semester.*

Disturbance to Other Students: *any behavior that negatively impacts the learning of other students, such as conversation that can be heard from three rows away, or cell phone ringing. Cell phones and other similar devices must be in silent mode during lectures.*

Electronic Devices: *No personal laptop / tablet / phone is allowed during examination. If you are found using any such device, you will automatically get zero on that quiz/test, and possibly considered for academic dishonesty regulations.*

COURSE EXPECTATIONS

Homework: *Homework will be assigned for the corresponding lecture. Homework is normally due at beginning of the class on the day a week from the assigning day. Homework will usually not be graded. Please show all necessary steps to solve the problem. Credits will* ***not*** *be given for purely final answer displayed without the procedure. Homework turned in after the solution is posted online or given in class will* ***not*** *be accepted*

OVERVEW OF COURSE GRADE ASSIGNMENT

Both the midterm and final grading use the same formula, scale, and weights.

Midterm Grading

Midterm grades will be presented per university requirements and based on the current updated cumulative scores obtained by the students usually the first 5 or 6 weeks.

Final Grading

Chapter tests: 33% (7)	A: 93.00-100	C+: 74.67-78.32
Mid-term test:33%	A-: 89.33-92.99	C: 71.00-74.66
Final Exam: 34%	B+: 85.67-89.32	C-: 67.33-70.99
	B: 82.00-85.66	D+: 63.67-67.32
	B-: 78.33-81.99	D: 60.00-63.66
Total: 100%		F: < 60.00

COURSE GUIDELINES

Please use your UT student email address (XX@Rockets.Utoledo.edu) for all your communications. All others type of email address will go directly to Junk E-mail folder.

ACADEMIC SUPPORT SERVICES

(Insert information on how the institution's academic support services such as the Center for Success Coaching, Starfish, Learning Enhancement Center, the Counseling Center, Disability Services Office, etc. can assist in their academic success. Be sure to include information on how to contact these offices. – For specific verbiage and links to Academic Support Services please refer to the ***Syllabus Guidelines Document****.)*

SAFETY AND HEALTH SERVICES FOR UT STUDENTS

***Escort Service**: If any student desires an escort to their vehicle after class, they should call the escort service at 419-530-4292.*

To see a comprehensive list of these services, please use the following link: (http://www.utoledo.edu/offices/provost/utc/docs/CampusHealthSafetyContacts.pdf)

*Should the need arise, the **Student Food Pantry** is available:*

http://www.utoledo.edu/studentaffairs/food-pantry/).

COURSE SCHEDULE

No Class Dates:

Mondays
Wednesdays

Final Exam Date:

Per university schedule

COURSE SCOPE

In order to more adequately cover the material required for this course, a formal schedule will not be strictly adhered to. However, the following topics will be used as a guideline to the progress of the class:

- *First Law of Thermodynamics*
- *Phases of a pure substance; P-v diagram,*
- *Ideal Gas Law*
- *Energy analysis of closed systems: moving boundary work: Constant Volume Processes, Constant Pressure Processes, Constant Temperature Processes, Polytropic Processes*
- *Conservation of mass*
- *Steady flow engineering devices: nozzles and diffusers, turbines and compressors, mixing chambers, heat exchangers, pipe and duct flow*
- *Second law of thermodynamics: heat engines, refrigerators and heat pumps*
- *Carnot cycle: principle, Carnot heat engine, Carnot refrigeration and heat pump*

Course Schedule (Subject to Change depending on the course progress)

Week No.	*Course Content*	
1	*Ch1 Introduction and Basic Concept*	
2	*Ch1, and Ch2 Energy, Energy Transfer, and General Energy Analysis*	
3	*Ch2 Energy, Energy Transfer, and General Energy Analysis* *Ch3 Properties of Pure Substances*	
4	*Ch3 Properties of Pure Substances*	
5	*Chapter 1 - 3*	*Exam 1*
6	*Ch4 Energy Analysis of Closed System*	
7	*Ch4 Energy Analysis of Closed System*	
8	*Ch5 Mass and Energy Analysis of Control Volumes*	
9	*Ch5 Mass and Energy Analysis of Control Volumes*	
10	*Ch6 The Second Law of Thermodynamics*	
11	*Ch6 The Second Law of Thermodynamics*	
12	*Ch7 Entropy*	
13	*Ch7 Entropy*	
14	*Review 2*	
15		*Final Exam*