

## ME 398, Thermodynamics I, Fall, 2016

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<b>Office Hours:</b>	M/W 2:00 – 3:30 pm or by appointment
<b>Classroom; Days/Time:</b>	JH 127; M/W 3:30 – 4:45 pm
<b>Prerequisites:</b>	MATH 243, and PHYS 313
<b>Teaching Assistant:</b>	TBA
<b>TA Contact Info:</b>	TBA

### How to Use This Syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves.

### Academic Honesty

Students are responsible for knowing and following the Student Code of Conduct [http://webs.wichita.edu/inaudit/ch8\\_05.htm](http://webs.wichita.edu/inaudit/ch8_05.htm) and the Student Academic Honesty policy [http://webs.wichita.edu/inaudit/ch2\\_17.htm](http://webs.wichita.edu/inaudit/ch2_17.htm). **No credit** will be given to the student's assignment and/or exam, associated with cheating activity and/or attempt.

### Course Description

This course is an introduction to the study and analysis of thermodynamics, energy, and entropy, and their interactions relevant to engineering, centered on the first and the second laws of thermodynamics.

### Definition of a Credit Hour

Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

### Measurable Student Learning Outcomes

- Recognize and use the terminology, symbols, and units specific to thermodynamics.
- Identify and interpret the interaction of a system and its surroundings, and apply the First Law of thermodynamics.
- Evaluate, calculate, and approximate the properties of engineering substances.
- Classify and interpret processes and cycles, and analyze the energy balance for both closed systems and open systems (control volumes).
- Identify and interpret the concept of entropy, and apply the Second Law of thermodynamics.
- Evaluate and calculate the entropy of engineering substances, and analyze the entropy balance for both closed systems and open systems (control volumes).

### Required Texts/Readings Textbook

Fundamentals of Engineering Thermodynamics, 7<sup>th</sup> Ed., Wiley, by Moran et al.

## Other Readings

The animations of the textbook are strongly encouraged to view:

<http://bcs.wiley.com/hee->

[bcs/Books?action=mininav&bcsId=6124&itemId=0470495901&assetId=236674&resourceId=23141&newwindow=true](http://bcs.wiley.com/hee-bcs/Books?action=mininav&bcsId=6124&itemId=0470495901&assetId=236674&resourceId=23141&newwindow=true)

## Class Protocol

- Attendance is strongly recommended.
- The use of laptops is allowed only for class-related activities.
- Discussions related to the grade will take place ONLY in in-person meetings scheduled by appointment via e-mail or during office hours.
- Students are expected to behave courteously and professionally, and disciplinary infractions will be reported to the university authorities.

## Grading Policy

The final letter grade will be given based on the student performance on assignments and exams. The details are given as follows

Assignments and Exams	Contribution to Final Grade
Homework (10-12 assignments)	10%
In-class Quiz (4-6 sets)	10%
Midterm Exam I	25%
Midterm Exam II	25%
Final Exam (Comprehensive)	30%

The student performance will be scaled to 100% based on the grading policy (see the table above) and the letter grade will be given the percentage as shown below.

Student Performance (100%)	Letter Grade	Interpretation
100-93	A	<i>The A range denotes excellent performance.</i>
85-92	A-	
75-84	B+	
70-74	B	<i>The B range denotes good performance.</i>
65-69	B-	
60-64	C+	
55-59	C	<i>The C range denotes satisfactory performance.</i>
53-54	C-	
50-52	D+	
45-49	D	<i>The D range denotes unsatisfactory performance.</i>
40-45	D-	
< 40	F	<i>F denotes failing performance.</i>

## Homework/Reading Assignments

- 10-12 homework sets will be given (weekly basis).
- In general, a number (typically 5-8) of homework problems will be given on Wednesday on Blackboard. Homework will be collected on the following Wednesday (before class time, 3:30 pm), giving one week of time to finish the homework.
- Students are strongly encouraged to form study groups with the peer to discuss about the understandings of homework problem statement and problem-solving approach, however, **the significant overlap of the homework solution among the study group members is considered as a cheating activity, i.e., the homework solution MUST be individual and unique to get a credit.**
- Students are strongly encouraged to read course content before the class.

### Quizzes/Exams

- 4-6 in-class quizzes will be given based on the homework problems.
- Two midterm exams and one (comprehensive) final exam will be given.
- All the quizzes/exams are **CLOSE BOOK/NOTE** tests, and formula sheet will be given by the instructor.
- Calculator is required, and **only standard function calculator (NO scientific calculator having matrix calculation, nonlinear equation solver, and/or advanced functions) is allowed for exams.**
- **The use of all other electronic devices, such as mobile phone, laptop, and tablet, is strictly prohibited.**

### Appeal to Grade on Hw/Quizzes/Exams

- Appeal to grade **MUST** be made within **7 days** after the hw/Quizzes/Exams are returned to the students.

### Extra Credit

- NO extra credit work, i.e., late quiz/exam, will be assigned/accepted.

### Late Assignments

- Late hw assignments will be accepted, but 10% of the maximum grade of non-late homework will be deducted every 24 hour after the hw due. **No late quiz/exam will be accepted.**

### Missed Assignments and Exams

- Make-up hw/quiz/exam will be administered **only upon the submission of the relevant documents,** explaining the reasons for the missing ones. The student **MUST** contact to instructor about this **24 hr prior to the assignment due date** to schedule the make-up assignment.
- One minimum hw and one minimum quiz can be dropped.

### Important Academic Dates

For fall semester of 2016, classes begin **08/22**, and end **12/07**. The last date to drop a class and receive a W (withdrawn) instead of F (failed) is **11/01**. There are no classes on **09/05 (Labor day holiday)**, **10/17 (Fall break)** and **11/23 (Thanksgiving holiday)**. The final exam is on **12/14**.

### Disabilities

If you have a physical, psychiatric/emotional, or learning disability that may impact on your ability to carry out assigned course work, I encourage you to contact the Office of Disability Services (DS). The office is located in Grace Wilkie Annex, room 230, (316) 978-3309 (voice/tty) (316-854-3032 videophone). DS will review your concerns and determine, with you, what academic accommodations are necessary and appropriate for you. All information and documentation of your disability is confidential and will not be released by DS without your written permission.

### Counseling & Testing

The WSU Counseling & Testing Center provides professional counseling services to students, faculty and staff; administers tests and offers test preparation workshops; and presents programs on topics promoting personal and professional growth. Services are low cost and confidential. They are located in room 320 of Grace Wilkie Hall, and their phone number is (316) 978-3440. The Counseling & Testing Center is open on all days that the University is officially open. If you have a mental health emergency during the times that the Counseling & Testing Center is not open, please call COMCARE Crisis Services at (316) 660-7500.

### Diversity and Inclusive

Wichita State University is committed to being an inclusive campus that reflects the evolving diversity of society. To further this goal, WSU does not discriminate in its programs and activities on the basis of race, religion, color, national origin, gender, age, sexual orientation, gender identity, gender expression, marital status, political affiliation, status as a veteran, genetic information or disability. The following person has been designated to handle inquiries regarding nondiscrimination policies: Executive Director, Office of Equal Employment Opportunity, Wichita State University, 1845 Fairmount, Wichita KS 67260-0138; telephone (316) 978-3186.

### **Intellectual Property**

Wichita State University students are subject to Board of Regents and University policies (see [http://webs.wichita.edu/inaudit/ch9\\_10.htm](http://webs.wichita.edu/inaudit/ch9_10.htm)) regarding intellectual property rights. Any questions regarding these rights and any disputes that arise under these policies will be resolved by the President of the University, or the President's designee, and such decision will constitute the final decision.

### **Shocker Alert System**

Get the emergency information you need instantly and effortlessly! With the Shocker Alert System, we will contact you by email the moment there is an emergency or weather alert that affects the campus. Sign up at [www.wichita.edu/alert](http://www.wichita.edu/alert).

### **Student Health Services**

WSU's Student Health clinic is located in 209 Ahlberg Hall. Hours are 8:00am to 7:00pm (8:00 am to 5:00 pm on Fridays), though the clinic may be closed occasionally on Wednesdays from noon to 1:30pm. The telephone number is (316) 978-3620. In addition to outpatient and preventive care (including immunizations, a prescription service, and testing/counseling for sexually transmitted infections), Student Health can handle minor injuries. All services are confidential. For more information see [www.wichita.edu/studenthealth](http://www.wichita.edu/studenthealth).

### **Student Advocate**

The Student Advocate is available to serve students, faculty, and staff in an accessible and confidential manner. The Student Advocate's office is located in the Student Government Association suite, RSC 219, and can be contacted by phone at (316) 978-3026 or by email at [student.advocate@wichita.edu](mailto:student.advocate@wichita.edu). For more information, visit [www.wichita.edu/studentadvocate](http://www.wichita.edu/studentadvocate).

### **The Heskett Center and Campus Recreation**

Whether you are wanting to be active on campus, relieve the stress from classes or take care of your body, Wichita State Campus Recreation is the place for you. Campus Recreation, located inside the Heskett Center, contributes to the health, education, and development of Wichita State University students, faculty, staff, alumni, and community members by offering quality programs and services. With many programs and facilities which are free to all students and members, Campus Recreation offers its members limitless opportunities. For more information about our services see [www.wichita.edu/heskett](http://www.wichita.edu/heskett).

### **Video and Audio Recording**

Video and audio recording of lectures and review sessions without the consent of the instructor is prohibited. Unless explicit permission is obtained from the instructor, recordings of lectures may not be modified and must not be transferred or transmitted to any other person, whether or not that individual is enrolled in the course.

### Tentative Schedule (subject to changes)

Week	Date	Subject	Reading
1	8/22	Introductions: overview and backgrounds	1.1-1.3
	8/24	Unit and measuring properties	1.4-1.9
2	8/29	Energy and work	2.1-2.3
	8/31	Energy transfer by heat and first law of thermodynamics	2.4-2.5
3	9/5	No class (Labor day holiday)	-
	9/7	Energy analysis of cycles and energy storage	2.6-2.7
4	9/12	State properties: pressure, specific volume, and temperature	3.1-3.3
	9/14	Evaluating properties	3.4-3.8
5	9/19	Review: Chap. 1.1-3.8	1.1-3.8
	9/21	<b>In-class Midterm Exam I: Chap 1.1-3.5</b>	1.1-3.8
6	9/26	Thermodynamics properties: specific heats	3.9
	9/28	Liquid and solid, generalized compressibility and ideal gas model	3.10-3.11
7	10/3	Ideal gas model and polytropic process relation	3.12-3.15
	10/5	Conservation of mass for a control volume	4.1
8	10/10	Mass rate balance and conservation of energy	4.2-4.5
	10/12	Nozzles, diffusers, and turbines	4.6-4.7
9	10/17	Compressors and pumps	4.8
	10/19	Heat exchangers	4.9
10	10/24	Review: Chap. 3.9-4.12	3.9-4.9
	10/26	<b>In-class Midterm Exam II: Chap. 3.9-4.9</b>	3.9-4.9
11	10/31	Throttling devices and system integration	4.10-4.11
	11/2	Transient analysis	4.12
12	11/7	Entropy in Closed Systems	5.1-5.4
	11/9	Applying the second law to thermodynamic cycles	5.5-5.7
13	11/14	Maximum performance measures	5.8-5.9
	11/16	Carnot cycle, Clausius inequality, and Entropy	5.10-6.4
14	11/21	Entropy change of an ideal gas and closed system	6.5-6.7
	11/23	No class (Thanksgiving holiday)	-
15	11/28	Entropy change of closed system	6.8
	11/30	Entropy rate balance for control volume and isentropic process	6.9-6.11
16	12/5	Isentropic efficiencies and heat transfer	6.12-6.13
	12/7	Final review: Chap. 1.1-6.13	1.1-6.13
	12/14	<b>Final Exam: 3:00-4:50 pm, JB 127 (Chap 1.1-6.13)</b>	1.1-6.13