

## ENME 3770 – Thermodynamics (Required Course)

### 2003/05 Catalog Data

**Cr. 3**

Prerequisites: Credit or registration in Mathematics 2109 or 2112 and Physics 1062. Basic laws of thermodynamics; equilibrium; entropy; availability; flow and non-flow processes.

**Class Hours:** 6:00pm – 8:45pm T & Th (EN – 318)

**Instructor:** Jobaidur Rahman Khan (CERM 136, 280-2389, jrkh@uno.edu)  
(Building II in campus map, a map is attached here with indication to the building)

**Office Hours:** 3:00am – 5:00pm T & Th (or Email for prior appointment)

**Grade Policy:**

Home Work:	30%
Two Tests:	40%
Final:	30%

Final grade assignments will be curved based on the total cumulative points earned during the semester.

### Textbook

Michale J. Moran and Howard N. Shapiro, Fundamentals of Engineering Thermodynamics, 7th ed., John Wiley & Sons.

### References

Yunnus A. Cengel and Michael A. Boles, Thermodynamics – an Engineering Approach, McGraw-Hill.  
R. E. Sonntag, C. Borgnakke and G. J. Van Wylen, Fundamentals of Thermodynamics, 6th ed., John Wiley & Sons.

### Prerequisites by Topics

1. Calculus
2. Basic ideas concerning heat, work and energy from physics

### Course Content by Topics

1. Introduction to Thermodynamics: systems, thermodynamic properties, and equilibrium.
2. First law for closed systems: heat and work, internal energy, closed systems, 1st law applications.
3. First Law of Thermodynamics for open systems: conservation of mass in open systems, conservation of energy in open systems, enthalpy, applications to steady flow open systems.
4. Thermodynamic properties: properties of water (liquid and vapor phases), independent thermodynamic properties, thermodynamic properties of other common substances, ideal gases.
5. The Second Law of Thermodynamics: reversible processes, reversible cycles, Carnot cycle, thermodynamic temperature scale, Clausius' inequality entropy, entropy and irreversibility, numerical evaluation of entropy, applications of the Second Law.
6. Thermodynamic processes: constant volume, constant pressure, constant enthalpy, constant temperature, adiabatic and isentropic processes, polytropic processes.
7. Thermodynamic Cycles: Ericsson cycle, Rankine cycle etc.

### Course Objectives

After completion of this course, students will be able to:

1. Apply the basic laws of thermodynamics to various engineering problems.
2. To solve various engineering problems that relate to the transfer of energy in terms of work or heat.
3. Analyze and predict the thermodynamic state of various open and closed systems using the basic laws of thermodynamics.

### Course Policy

1. The prerequisites to this course are Mathematics 2109 and Physics 1062. The co-requisite of this course is Mechanical Engineering 2750.
2. This course is a prerequisite to ENME 3773 and 3776, 4720, 4721, 4722 and 4772.
3. If the instructor does not show up for class in fifteen minutes, call (504) 339-6686. If the instructor cannot be reached and no advanced arrangements have been made, you are authorized to leave.
4. **Home works must be submitted as a hard copy.** Soft copy of homework will not be accepted for any situation whatsoever. **ABSOLUTELY NO EXCEPTION.** Failed to submit homework on time, will be penalized 10% per each calendar (**not business**) day after the due date of submission. Home works older than 10 days will not be accepted at all, without any **LEGITIMATE** reason.
5. **Home works must be submitted as final submission.** Partial submission will not be accepted. In case of part by part submission, the first submission will be counted and latter's will be rejected.
6. You are welcome to consult with the instructor for help with any difficulties. However, make certain that you have made a worthy attempt to solve your problems before asking for help.
7. Those who miss the class without **LEGITIMATE** reasons are responsible for the consequences themselves. A student who incurs **five** inexcusable absences will be given the grade **F. Anybody with less than 75% attendance will not be considered for curving at the end of the semester.**
8. You are encouraged to discuss homework with your peers but are prohibited from copying other people's work. If discovered, both the copied and the original work will be assigned a grade of zero.
9. Using mobile phone is not allowed in class. Please put them in at least vibration mode. Mobile phone on the test date is not allowed at all, you have to turn them off, unless somebody from your family is in ICU or in a situation like that. **Any turned on phone will be considered as cheating on the exam and you will have to leave the exam immediately, if you do so.**
10. It is **highly recommended that students avoid make-up exams**, which are much harder than the regular ones. It is suggested that students try their best to appear on the regular exam date in case of illness.
11. Email is the only way of communication. Once an email is sent to the students, the instructor will assume students got the message.
12. The approximate date (except the final, which is already fixed) for each test is listed below. The exact date will be announced a week earlier before each test.

Test # 1:	Thursday, June 23, 2010
Test # 2:	Tuesday, July 12, 2010
Final:	7:00pm – 9:00pm, Tuesday, July 26, 2010, Same class room.

### Frequently Asked Questions

1. How can I get an A?  
A. You get 90%, you will get an A. There are millions of combinations to get 90%. You figure it out. **Don't ask me.**
2. I did not do good in exam(s), is there any way to get an extra credit by doing some other works?  
A. **Absolutely no.** This is unfair to the other students.
3. I did not do good in exam(s), would you drop the worst test from grade?  
A. **Absolutely no.** This is unfair to the top students.
4. Since I have done good in my first two test, can I avoid the final?  
A. **Absolutely no.** This is not practiced here.
5. Can you put the class notes on blackboard?  
A. **No.** These are the properties of the university and not subjected to post publicly.
6. Can I bring calculator in the exam hall?  
A. **Yes.** But it cannot have **Alfa-numeric** memory.
7. Can I get a recommendation letter for my scholarship/job application?  
A. **Definitely.**
8. Will you curve the test grade?  
A. Not the individual ones, but the overall grade may be curved at the end of the semester.

# Schedule

Date	Session	Subject
06/02/10 (Thursday)	First	Thermodynamic property, terminology, units, pressure and temperature.
	Second	Energy and first law of thermodynamics, reversible polytropic process for ideal gas Some example problems for first law of thermodynamics
06/07/10 (Tuesday)	First	Properties of a pure, simple compressible substance (P-v-T curves), introduction to enthalpy, $C_p$ , $C_v$ , $R$ .
	Second	Ideal gas and real gas, polytropic process of ideal gas.
06/09/10 (Thursday)	First	Phase problems
	Second	Steam cycle problems
06/14/10 (Tuesday)	First	Control volume system, nozzle, diffuser, compressor, turbine, heat exchanger, throttling process.
	Second	Problems of control volume.
06/16/10 (Thursday)	First	Second law of thermodynamics, different statements for second law, reversible and irreversible processes.
	Second	Efficiency, performance, Carnot Cycle, carnot efficiency
06/21/10 (Tuesday)	First	Problems of carnot cycle
	Second	Problems of carnot cycle Review for test # 1
06/23/10 (Thursday)	First	<b>Test # 1</b>
	Second	Entropy, entropy a property, entropy for ideal gas
06/28/10 (Tuesday)	First	Carnot cycle on T-s diagram, entropy production
	Second	Increase of entropy principle Problems of irreversibility
06/30/10 (Thursday)	First	Entropy balance for open system, reversible polytropic process for ideal gas, relative pressure and volume, isentropic efficiencies.
	Second	Use of entropy in energy conversion, open system and closed system Problem related reversibility
07/05/10 (Tuesday)	First	Problem of reversibility
	Second	Problem of isentropic efficiency
07/07/10 (Thursday)	First	Availability
	Second	Second law efficiency, exergy. Review for test # 2

Date	Session	Subject
07/12/10 (Tuesday)	First	<b>Test # 2</b>
	Second	Problems of exergy
07/14/10 (Thursday)	First	Problems of exergy
	Second	Problems of exergy and second law efficiency.
07/19/10 (Tuesday)	First	Rankin cycle and its components
	Second	Different improvements in Rankin cycle
07/21/10 (Thursday)	First	Problems of Rankin cycle.
	Second	Review for final test
<b>07/26/10</b>	<b>Tuesday</b>	<b>Final Test (7:00 – 9:00)</b>

