

Spring 2015

## ME 5321

# Advanced Classical Thermodynamics

(Tentative syllabus subject to change)

<b>Instructor</b>	<b>Hyejin Moon, Ph.D.</b> Associate Professor of Mechanical Engineering E-mail <a href="mailto:hyejin.moon@uta.edu">hyejin.moon@uta.edu</a> Phone 817-272-2017 / Office WH 306B
<b>Schedule</b>	MWF 10:00 – 10:50 am, NH 109
<b>Website</b>	<a href="http://www.uta.edu/blackboard">http://www.uta.edu/blackboard</a> Login with your NetID and password
<b>Office Hours</b>	MW 3:00 – 5:00 pm or by Appointment via e-mail (preferred)
<b>Prerequisites</b>	Undergraduate Thermodynamics (MAE 3309) or equivalent
<b>Course Description</b>	Review of the general thermodynamic relations pertaining to simple compressible systems; Equations of state of single component gas systems; Fundamentals of multi-component systems (gas mixtures, liquid solutions); Multi-component phase equilibrium
<b>Subjects</b>	<b>Part I. Fundamental of thermodynamics</b> <ul style="list-style-type: none"><li>• Energy, Heat and Work, System</li><li>• State, Equation of state</li><li>• Conservation of mass, energy, momentum</li><li>• Entropy</li></ul> <b>Part II. Thermodynamic relations</b> <ul style="list-style-type: none"><li>• Thermodynamic properties of real substances</li><li>• Free energy and Chemical thermodynamics</li><li>• Equilibrium and stability in single-component system</li></ul> <b>Part III. Thermodynamics of multicomponent mixtures</b> <ul style="list-style-type: none"><li>• Ideal gas mixture</li><li>• Solutions</li><li>• Reacting mixtures and combustions</li></ul> <b>Part IV. Phase Equilibrium in mixtures</b> <ul style="list-style-type: none"><li>• Vapor-liquid equilibrium</li><li>• Solubility of gas in a liquid</li><li>• Solubility of liquid in liquid</li><li>• Freezing</li><li>• Osmotic equilibrium</li></ul> <b>Part V. Chemical Reactions</b> <ul style="list-style-type: none"><li>• Chemically reacting systems</li><li>• Chemical Equilibrium</li></ul>
<b>Assignments and Tests</b>	<ul style="list-style-type: none"><li>• There will be several homework assignments that are normally due one week after given. <u>Late homework will not be accepted.</u></li><li>• On the homework due date, there will be quiz regarding the</li></ul>

homework. Therefore, there will be no credit for homework submission and quiz credit will be counted for your final letter grading.

- Two tests (one midterm and one final exam) will be given. The exact dates and times will be specified and announced later.

**Grading**

Quiz 20%, Midterm Exam 40%, and Final Exam 40%.

**Textbook**

No textbook is required. The most of contents are covered in the later chapters of undergraduate Thermodynamics textbooks. Some relevant references on each subject will be specified and/or necessary additional material will be distributed.

**From the College of Engineering**

**Americans with Disabilities Act**

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112 – The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, here is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide “reasonable accommodation” to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels.

**Academic Dishonesty**

It is the philosophy of the University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts. (Regents’ Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.2.2).

## Class Schedule

(Tentative schedule subject to change)

Week	Date	Topics	Notes
0	1/21	Introduction, Review of Thermodynamics	
	1/23	Review of Thermodynamics	
1	1/26	First Law of Thermodynamics	
	1/28	First Law of Thermodynamics	
	1/30	First Law of Thermodynamics	
2	2/2	First Law of Thermodynamics	
	2/4	Second Law of Thermodynamics & Entropy	
	2/6	Second Law of Thermodynamics & Entropy	
3	2/9	Second Law of Thermodynamics & Entropy	
	2/11	Second Law of Thermodynamics & Entropy	
	2/13	Second Law of Thermodynamics & Entropy	
4	2/16	Availability	
	2/18	Availability	
	2/20	Availability	
5	2/23	State Relationships of Gas and Liquids	
	2/25	State Relationships of Gas and Liquids	
	2/27	State Relationships of Gas and Liquids	
6	3/2	Thermodynamic Properties of Pure Fluids	
	3/3	<b>Midterm Test – 1<sup>st</sup> half</b>	
	3/5	<b>Midterm Test – 2<sup>nd</sup> half</b>	
7	3/9	<b>Spring Break</b>	
	3/11	<b>Spring Break</b>	
	3/13	<b>Spring Break</b>	
8	3/16	Thermodynamic Properties of Pure Fluids	
	3/18	Thermodynamic Properties of Pure Fluids	
	3/20	Thermodynamic Properties of Pure Fluids	
9	3/23	Thermodynamic Properties of Pure Fluids	
	3/25	Thermodynamic Properties of Pure Fluids	
	3/27	Thermodynamic Properties of Pure Fluids	
10	3/30	Thermodynamic Properties of Mixtures	
	4/1	Thermodynamic Properties of Mixtures	
	4/3	Thermodynamic Properties of Mixtures	
11	4/6	Thermodynamic Properties of Mixtures	
	4/8	Thermodynamic Properties of Mixtures	
	4/10	Phase Equilibrium for a Mixture	
12	4/13	Phase Equilibrium for a Mixture	
	4/15	Phase Equilibrium for a Mixture	
	4/17	Phase Equilibrium for a Mixture	
13	4/20	Gas-Vapor Mixtures	
	4/22	Gas-Vapor Mixtures	
	4/24	Gas-Vapor Mixtures	
14	4/27	Chemically Reacting Systems	
	4/29	Chemically Reacting Systems	
	5/1	Chemically Reacting Systems	
15	5/4	Chemically Reacting Systems	
	5/6	<b>Final Test – 1<sup>st</sup> half</b>	
	5/8	<b>Final Test – 2<sup>nd</sup> half</b>	