

CHEN 3330- 08B THERMODYNAMICS II- Fall 2017

PROFESSOR

Dr. Sidney Lin (Cherry 3103, 409-880-2314, sidney.lin@lamar.edu)

COURSE SCHEDULE

9:35 – 10:55 am, Tuesday and Thursday, Lucas 109

TEXTBOOK

Smith, J. M., H. C. Van Ness, and M. M. Abbott, "Introduction to Chemical Engineering Thermodynamics," 7th edition (2005), ISBN 0-07-310445-0.

REF. BOOKS

"Perry's Chemical Engineer's Handbook", 7th ed., McGraw-Hill (1997).

"Physical Chemistry", Robert J. Silbey, Robert A. Alberty and Moungi G. Bawend, 4th edition (2004), ISBN 978-047-121-5042.

OFFICE HOURS

Office Hours: TW 2:00-3:00 PM or by appointment.

COURSE DESCRIPTION

Application of the First and Second Laws to chemical Processes. Thermodynamic properties of pure fluids and mixtures. Physical equilibrium.

PREREQUISITES

1. Thermodynamics I (CHEN 2374),
2. Process Analysis (CHEN 3340)
3. Organic Chemistry I (CHEM 3311 and CHEM 3111)

OBJECTIVES AND MEASURED OUTCOMES:

Numbers in brackets indicate assessment method. Letters in parentheses are ABET attributes.

1. Perform calculations for volumetric properties of fluids including PVT relationships for gases and equations of state for liquids. Emphasize use of volume in "real world" applications such as design of storage vessels, reactors, and other process equipment. [1,2] (a,e,j,k,l)
2. Perform calculations for heat effects including heating gas, heating liquid, heating solid, heat of vaporization, heat of reaction, and other heat transfer operations.
3. Perform calculations for thermodynamic properties of fluids including corrections for high pressure and involving enthalpy of real gas, entropy of real gas, residual enthalpy, and residual entropy. [1,2] (a,e,j,k,l)
4. Perform calculations for vapor-liquid equilibrium (VLE) including fugacity, Raoult's law, K-values, bubble point, dew point, and flash operations. Emphasize importance of such calculations in distillation and other mass transfer operations. [1,2] (a,e,j,k,l)
5. Perform calculations for solution thermodynamics including activity coefficient models, bubble point temperature, and bubble point pressure. [1,2] (a,e,j,k,l)
6. Perform calculations for topics in phase equilibrium including data analysis, activity coefficient at infinite dilution, and thermodynamic consistency. [1,2] (a,e,j,k,l)
7. Perform calculations for chemical reaction equilibria including change of Gibbs energy for reaction, thermodynamic favorability for reaction, and equilibrium yields for reactions. [1,2] (a,e,j,k,l)
8. Perform calculations for adsorption including adsorption capacity of activated carbon, usage in air-clean-up, and usage in water purification. Emphasize use of adsorption in environmental applications having very, very low concentrations. [1,2] (a,e,j,k,l)

TOPICS

1. Volumetric properties of fluids
2. Heat effects
3. Thermodynamic properties of fluids
4. Vapor-liquid equilibrium, fugacity
5. Solution thermodynamics
6. Topics in phase equilibrium
7. Chemical-reaction equilibria
8. Adsorption

GRADING POLICY

- | | |
|---------------------|-----|
| 1. Quizzes | 25% |
| 2. Tests | 40% |
| 3. Final Exam | 25% |
| 4. Class Attendance | 10% |

GRADING SCALE

<u>Points</u>	<u>Letter Grade</u>
100 - 90	A
89 - 80	B
79 - 70	C
69 - 60	D
59 - below	F

CLASS ATTENDANCE

You should come to the class on time. A signature page may be given at the beginning of the class. If you do not sign the page because you come to the class late, you will not receive the point for the attendance of that day.

ASSIGNMENTS

Representative problems in each chapter will be assigned for you to practice. It is not required to turn in the homework. You are encouraged to form groups to work on homework problems. Although you do not have to turn in the homework it is necessary for you to understand how to solve those problems.

QUIZZES

Quizzes may be unannounced and can occur at any time. A quiz is usually given at the beginning or the end of the class. If you come to the class late or leave the class early, you may miss a quiz and your grade for that quiz is zero. The total points of each quiz may vary. Take-home quiz needs to be handed in at the beginning of next class. **You must work on the take-home quiz by yourself. It is NOT allowed to discuss the take-home quiz with any others, including students, friends, spouse, and parents.** A blue or black pen must be used in the quiz. Pencils or red pens are not allowed. You can only use your own calculator in the quiz. No calculator sharing with another student. You can **NOT** use your cell phone as your calculator in the quiz. **Make-up quiz will be given only by prior arrangement and only for valid reasons.** If you miss any quiz, your grade for that quiz will be 0 unless you have a valid excuse. You are **NOT** allowed to remove the staple from the test or use your own paper. **Any form of academic dishonesty (see the special note below) will not be tolerated and will result in a zero (0) grade of the quiz. If you provide evidence of dishonesty conducted by another student(s) in the Thermodynamics II classes (both sessions), you will receive up to 5 (five) points to your final semester grade.**

TESTS/FINAL EXAM

There will be two midterm tests and one final exam. A blue or black pen must be used in the exams. Pencils or red pens are **not** allowed. If an open book/note exam is given, you can bring your textbook and class note to the exam. Neither solution manual nor your homework can be used in the exams. You can only use your own calculator in the test. No calculator sharing with

another student. You can **NOT** use your cell phone as your calculator in the test. **Make-up quiz will be given only by prior arrangement and only for valid reasons.** If you miss any exam, your grade for that exam will be 0 unless you have a valid excuse. You are **NOT** allowed to remove the staple from the test or use your own paper. **Any form of academic dishonesty (see the special note below) will not be tolerated and will result in a zero (0) grade of the exam. If you provide evidence of dishonesty conducted by another student(s) in the Thermodynamics II classes (both sessions), you will receive up to 5 (five) points to your final semester grade.**

**TENTATIVE FINAL EXAM TIME: 8:00 - 10:30 Thursday, December 7, 2017 AND
9:35 - 1:55 Tuesday, December 12 2017**

PROFESSIONAL PROGRAM

The ABET category content as estimated by the faculty member who prepared this course material: Engineering Topics – 3 credits

SPECIAL NOTE:

Academic Honesty Policy

Lamar University expects all students to engage in academic pursuits in a manner that is above reproach. Students are expected to maintain complete honesty and integrity in their academic experiences both in and out of the classroom. Any student found guilty of dishonesty in any phase of academic work will be subject to disciplinary action.

This may include failure of the assignment, class or removal from the program.

Forms of Academic Dishonesty

The University and its official representatives may initiate disciplinary proceedings against a student accused of any form of academic dishonesty including, but not limited to, cheating on an examination or other academic work which is to be submitted, plagiarism, collusion, and the abuse of resource materials. Cheating includes:

- a) copying, without authorization from the instructor, another student's test paper, laboratory report, other report, or computer files, data listings, and/or programs;
- b) using, during a test, materials not authorized by the person giving the test;
- c) collaborating, without authorization, with another person during an examination or in preparing academic work;
- d) knowingly, and without authorization, using, buying, selling, stealing, transporting, soliciting, copying, or possessing, in whole or in part, the contents of test or assignment that has not been administered or assigned;
- e) substituting for another student, permitting any other person, or otherwise assisting any other person to substitute for oneself or for another student in the taking of an examination or test or the preparation of academic work to be submitted for academic credit;
- f) bribing another person to obtain a test not yet administered or information about such; and
- g) purchasing, or otherwise acquiring and submitting as one's own work any research paper or other written assignment prepared by an individual or firm. (This section does not apply to the typing of the rough and/or final versions of an assignment by a professional typist).

Plagiarism shall mean the appropriation of another's work or idea and the unacknowledged incorporation of that work or idea into one's own work offered for credit. Collusion shall mean the unauthorized collaboration with another person in preparing work offered for credit. Abuse of resource materials shall mean the mutilation, destruction, concealment, theft, or alteration of materials provided to assist students in the mastery of course materials. Academic work shall mean the preparation of an essay, dissertation, thesis, report, problem, assignment, creative work or other project that the student submits as a course requirement or for a grade.

Students with Disability Policy

Lamar University is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is located in the Communications building room

105. Office staff collaborate with students who have disabilities to provide and/or arrange reasonable accommodations.

For students:

- If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact the DRC at 409-880-8347 or drc@lamar.edu to arrange a confidential appointment with the Director of the DRC to explore possible options regarding equitable access and reasonable accommodations.
- If you are registered with DRC and have a current letter requesting reasonable accommodations, we encourage you to contact your instructor early in the semester to review how the accommodations will be applied in the course.

Emergency Procedures

Many types of emergencies can occur on campus; instructions for severe weather or violence/active shooter, fire, or chemical release can be found at <http://www.lamar.edu/about-lu/administration/risk-management/index.html>.

Severe Weather

- Follow the directions of the instructor or emergency personnel.
- Seek shelter in an interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside.
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building.
- Stay in the center of the room, away from exterior walls, windows, and doors.

Violence/Active Shooter (CADD)

- **CALL**- 8-3-1-1 from a campus phone (880-8311 from a cell phone). Note: Calling 9-1-1 from either a campus phone or cell phone will contact Beaumont City Police Dispatch rather than University Police.
- **AVOID**- If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- **DENY**- Barricade the door with desks, chairs, bookcases or any other items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it is safe.
- **DEFEND**- Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.

Academic Continuity Statement:

In the event of an announced campus closure in excess of four days due to a hurricane or other disaster, students are expected to login to Lamar University's website's homepage (www.Lamar.edu) for instructions about continuing courses remotely. The instructor will also share this information via email and blackboard.

Prepared by Sidney Lin, Associate Professor, Dan F. Smith Department of Chemical Engineering