Department of Chemistry
The University of Texas at El Paso
Physical Chemistry I: Thermodynamics

CHEM 3351 (CRN 11301**)** Fall Term, 2020

Instructor: Prof. Lela Vuković
Held online
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Lectures will be posted on Monday, Wednesday and Fridays at 9:30 AM. Office hours will be held on Mondays from noon – 1pm (tentative) or by appointment; in case of changes, the class will be informed in time.

Course Description
The objective of this course is to describe the fundamentals of thermodynamics in chemical systems. We will provide a description of matter at the macroscopic level utilizing bulk properties such as density, pressure, volume, temperature, and the introduction of other more complex concepts. Basic concepts such as Heat, Work, Internal Energy, and Enthalpy and their relationship to the first law of thermodynamics will be discussed. The second law of thermodynamics and the concept of entropy, and the second and third laws of thermodynamics. We will discuss chemical equilibrium as it relates to Free energies (Gibbs and Helmholtz). We will revisit ideal gases and discuss concepts related to real gases. We will also cover phase diagrams and the relative stability of solids, liquids, and gases, and if time permits, we will discuss the basics for electrochemistry. We will try to cover chapters 1 to 11 from the textbook. This is a mathematics intensive course, and understanding of integral, differential and multivariable calculus is required. We will follow the textbook.

Textbook:
Physical Chemistry; Thomas Engel, Philip Reid, 3rd. Edition; *Pearson*. If needed, additional handouts will be uploaded on the web and the information will be provided.

Additional reading:
Principles of Physical Chemistry; Lionel M. Raff, Prentice Hall.

Grading:
The grade will be determined by tests held throughout the course (90% total) and problem sets (10%).

Problem sets and tests will be assigned throughout the course. This is a difficult course. Most of the material will be learned by you outside of class. *Just attending the lecture will probably not be enough to pass this course*. It is in your best interest to fully understand the assigned homework. The homework will be graded based on it being turned in. The tests will be graded with a heavy **emphasis on the effort and understanding the concepts**. Students can work alone or collaboratively on the problem sets. The tests should be your individual work. Answers of identical solutions by two or more students will **not** be tolerated. It is in your best interest to do the problems in the back of each chapter.

Each test will build upon the previous one, and all the material covered will be considered for each test. (i.e. you should be aware that test 2 may include content covered before test 1, etc.).

Quizzes may be given occasionally during the semester and the percentages will be applied to the homework contribution.

Syllabus (tentative)
1. Fundamental concepts in thermodynamics (Ch 1)
2. Ideal gas, Real gas (from Ch1+Ch 7), math concepts (test 1)
3. Heat, Work, First law of thermodynamics (Ch2); (test 2)
4. State functions: enthalpy and internal energy (Ch 3) (test 3)
5. Thermochemistry: Hess law (Ch 4) (test 4)

6. Second law of thermodynamics (Ch 5)
7. Third law of thermodynamics (Ch 5) (test 5)
8. Chemical equilibrium (Ch 6) (test 6)
9. Phase diagrams (Solid, liquids, gases) (Ch 8) (test 7)
10. Solutions (Ch 9) (test 8)
11. Electrochemistry (Chapters 10,11) (test 9)

Course Drop Policy: Drop date deadline is of October 30th, 2020.
All grades of Incomplete must be accompanied by an Incomplete Contract that has been signed by the instructor of record, student, departmental chair, and the dean. Although UTEP will allow a maximum of one year to complete this contract, the College of Science requests it be limited to month based upon completion data. A grade of Incomplete is only used in extraordinary circumstances confined to a limited event such as a missed exam, project, or lab.

Other considerations: **Some aspects of the course may be changed, depending on the progress during the online teaching.**

Disability If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at (915) 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at https://www.utep.edu/student-affairs/cass/