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

CHEM 3351 (CRN 10515**)** Fall Term, 2024
Instructor: Prof. Lela Vuković
Chemistry Computer Sci Bldg 1.0202, Mon, Wed from 10:30 am to 11:50 am
Delivery Method: In-person
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Office hours will be held in person in CCSB 2.0308 on Mondays from 9:30 – 10:20 am (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.

Grading:
The grade will be determined by tests held throughout the course (60% total), the final exam (30% total) and problem sets (10%). Random quizzes, if given, will contribute to extra-credit. Randomly taken attendance will contribute to extra-credit.

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 obtained points will count as extra-credit. Attendance may be taken randomly and will be counted as extra-credit (if you cannot attend, you should send an email notice about it).

Syllabus (tentative, may be changed during the semester, depending on student needs)
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)
9. Phase diagrams (Solid, liquids, gases) (Ch 8) (test 6)
10. Solutions (Ch 9)
11. Electrochemistry (Chapters 10,11)

Final exam: in regular class on Wednesday, 12/04/2024

Course Drop Policy: Drop date deadline is November 1st, 2024.

Other considerations: **Some aspects of the course may be changed, depending on the progress and conditions during the semester.**

EXCUSED ABSENCES AND/OR COURSE DROP POLICY

I will not drop you from the course. However, if you feel that you are unable to complete the course successfully, please let me know and then contact the Registrar's Office to initiate the drop process. If you do not, you are at risk of receiving an "F" for the course.

DEADLINES AND LATE WORK

- Homework assignments will be due on the assigned days at 10:00 PM via Blackboard. No late work will be accepted if the reason is not considered excusable.

MAKE-UP WORK

Make-up work will be given *only* in the case of a *documented* emergency. Note that make-up work may be in a different format than the original work, may require more intensive preparation, and may be graded with penalty points. If you miss an assignment and the reason is not considered excusable, you will receive a zero. It is therefore important to reach out to me—in advance if possible—and explain with proper documentation why you missed a given course requirement. Once a deadline has been established for make-up work, no further extensions or exceptions will be granted.

ALTERNATIVE MEANS OF SUBMITTING WORK IN CASE OF TECHNICAL ISSUES

I strongly suggest that you submit your homework with plenty of time to spare in the event that you have a technical issue with the course website, network, and/or your computer. If you are experiencing difficulties submitting your work through Blackboard, please contact the UTEP Help Desk. You can email me your backup document as a last resort.

INCOMPLETE GRADE POLICY

Incomplete grades may be requested only in exceptional circumstances after you have completed at least half of the course requirements. Talk to me immediately if you believe an incomplete is warranted. If granted, we will establish a contract of work to be completed with deadlines.

*ACCOMMODATIONS POLICY

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act

Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services (CASS). Contact the Center for Accommodations and Support Services at 915-747-5148, email them at cass@utep.edu, or apply for accommodations online via the CASS portal.

SCHOLASTIC INTEGRITY

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. To learn more, please visit HOOP: Student Conduct and Discipline.

COVID-19 PRECAUTIONS

Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu. For more information on COVID-19 testing at UTEP, please visit: https://www.utep.edu/ehs/covid/.