

CHM 4411 – Physical Chemistry, Thermodynamics and Kinetics (Spring 2017)

Instructor: Coray Colina

Office Hours: 312 Leigh Hall (LEI), colina@chem.ufl.edu, 352-294-3488

T 10:30 – 11:30 a.m., W 11:00 a.m.– noon, or by appointment.

Lecture: T R Periods 2 – 3 (8:30 AM – 10:25 AM), FLI 50

TAs: Grit Kupgan, Shalini Jayaraman. Emails: gt2199@ufl.edu, shalinijr1993@chem.ufl.edu

Office Hours: M 5:30 – 6:30 PM, W 5:00 – 7:00 PM, 328 LEI

Course Objective: To provide students with a solid understanding of the concepts of physical chemistry and their application to chemical systems.

Course Website: This course has a Canvas page for notes and announcements.

Textbook: Recommended: “Physical Chemistry, 10th Ed.” By: Atkins and de Paula. There are a number of Physical Chemistry books on the market. This book is a suggestion, but any book should be sufficient. Please let me know if you have any questions about possible textbooks.

Midterm Exams: There will be 3 midterm in-class exams. The tentative dates for the midterms are February 2nd, March 2nd and April 13th. Doing well on midterm exams requires mastery of qualitative, conceptual material.

The exams will cover homework problems and emphasize understanding of the lecture materials and problem solving. All exams will be closed book.

Final Exam: The final exam is scheduled for Wednesday April 26th from 5:30 – 7:30PM (ECO 2023.) The final exam is cumulative.

Only for the final exam: you can bring one hand-written letter-size sheet with your own notes with formula etc. that aid understanding of the course.

Grading:

Exam Grade: Your exam grade will be a combination of the three highest scores from the midterm and final exams. Examples:

Midterm 1	Midterm 2	Midterm 3	Final	Average
80	90	85	75	85
80	90	85	95	90
80	90	85	0	85

Homework: There will be 6 homework assignments throughout the semester. Homework assignments will be worth 10 points each. The assignments should be presented in a **professional** manner, with the work, any assumptions and explanations presented **clearly**. Several of the homework assignments involve interpretation of computational and experimental data. When preparing graphs, you **must** use Excel or a comparable graphing program. If you are doing a curve-fit, you must justify the choice of fitting function. While you might work in groups, **you must turn in your own work to receive any credit!** You must also reference the other members of your study group. Failure to adhere to these requirements will result in zero credit for the assignment.

Assignments should be hand-written or printed and turned in before class on the due date.

Late submission won't be accepted.

Please write your name and UFID clearly on each page.

Quizzes: There will be 3 quizzes assignments throughout the semester. Quizzes will be worth 20 points each. The quizzes should be presented in a **professional** manner, with the work, any assumptions and explanations presented **clearly**.

Grading: Your final grade will be determined from the following

Homeworks = 20% ; Quizzes= 20% ; Exams = 60%

Approximate Grade Ranges:			
> 90	A	69 - 72.99	C+
86 - 89.9	A-	64 - 68.9	C
82 - 85.9	B+	60 - 63.9	C-
77 - 81.9	B	56 - 59.9	D+
73 - 76.9	B-	50 - 55.9	D
		< 50	E

Makeups: There will be no makeup exams unless prior arrangements are made. If an exam is missed for an excused reason, the final exam score will be used in the exam calculation. Homework assignments that are turned in late will not be accepted unless prior arrangements have been made.

Re-grades: Any requests for re-grading an exam, quiz or homework assignment must be made within one week of the assignment/quiz/exam grade being posted on Canvas and handed back during TA office hours.

Philosophy: Physical chemistry is concerned with the **quantitative** description of natural phenomena. The homework and quizzes are designed to have you interpret experimental and computational data – if you were going to go into the laboratory, what would you measure and how would you treat the data? The midterm exams are intended to gauge mastery of basic concepts and elementary calculations or derivations. It is not a good idea to leave studying until the night before the exam. It takes time to grasp some of the concepts of physical chemistry and to work through the problems. ‘Cramming’ is not the way to be successful in this course. Working in groups is encouraged, but copying another student’s work will not be tolerated.

Attendance: Lecture attendance is essential for your success in this class. However, we will not take roll. Repeated absence in class will make it very difficult to earn full participation points.

Disabilities: Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter, which must be presented to the instructor when requesting accommodations. Students with disabilities should follow this procedure as early as possible in the semester.

Counseling: The University of Florida provides counseling services for students, staff, and faculty. See <http://www.counsel.ufl.edu/> or call (352) 392-1575 during regular service hours (8am – 5pm). For other hours or on weekends call the Alachua County Crisis Center (352) 264-6789. Students may also call the clinician on-call at Student Mental Health for phone callback and consultation at (352) 392-1171.

Cell Phones: Please put all cell phones and other digital devices on “silent mode” during all class periods. During exams, your cell phone must be placed on the table in front of you, face down, for the entire test period.

Honor Code: This class will operate under the policies of the student honor code, which can be

found at:

<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>

<http://www.registrar.ufl.edu/catalog0809/policies/students.html>

The students, instructor, and TAs are honor-bound to comply with the Honors Pledge: ***We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity by abiding by the Honor Code.***

Objectives:

By the end of this course you should be able to:

- Analyze, graph, fit and interpret experimental and computational data.
- Perform elementary derivations and manipulations on equations of state.
- Understand the relationships between different thermodynamic functions.
- Understand the criteria for equilibrium or spontaneity for chemical processes under different sets of conditions.
- Calculate thermodynamic and equilibrium quantities for a variety of chemical processes and reactions.
- Analyze and interpret phase diagrams for 2 and 3 component mixtures.
- Derive rate laws for complex reaction mechanisms.
- Understand how microscopic properties of matter translate to $\square$ macroscopic thermodynamic properties

Tentative Lecture Schedule:

See next page

	January		Textbook	
Th	5	Introduction		
T	10	Ideal and real gases	Chapter 1	
Th	12	Kinetic gas theory, Maxwell distribution I	Chapter 20	HW1
T	17	First Law of Thermodynamics: work and heat	Chapter 2	
Th	19	Heat capacity and gas expansions, Calorimetry	Chapter 2	Q1
T	24	Second Law of Thermodynamics: Entropy	Chapter 3	
Th	26	Second Law of Thermodynamics: Carnot engine, entropy change	Chapter 3	HW2
T	31	Third Law of Thermodynamics, Gibbs free energy	Chapter 3	
	February			
Th	2	EXAM 1 (in-class)		EXAM
T	7	Phase diagram	Chapter 4	
Th	9	Phase equilibrium, ideal solutions, chemical potential	Chapter 5	
T	14	Thermodynamics of mixing, real solutions	Chapter 5	HW3
Th	16	Colligative properties, electrolyte solutions, biological membranes	Chapter 5	
T	21	PROBLEM SESSION/Q2	Chapter 5	Q2
Th	23	Chemical equilibrium	Chapter 6	
T	28	Chemical equilibrium	Chapter 6	HW4
	March			
Th	2	EXAM 2 (in-class)		EXAM
T	7	UF Spring Break		
Th	9	UF Spring Break		
T	14	Electrochemistry		
Th	16	Chemical kinetics	Chapter 21	
T	21	Effect of temperature and PES	Chapter 21	HW5
Th	23	Reaction rate theories, reactions in solution	Chapter 21	
T	28	PROBLEM SESSION		
Th	30	PROBLEM SESSION/Q3		Q3
	April			
T	4	Reaction mechanisms	Chapter 21	
Th	6	Reaction dynamics	Chapter 21	HW6
T	11	Catalysis	Chapter 22	
Th	13	EXAM 3 (in-class)		EXAM
T	18	REVIEW		
W	26	FINAL EXAM: ASSEMBLY EXAM: ECO 2023		EXAM