

CHM 4411 – Physical Chemistry, Thermodynamics and Kinetics
Spring2018

Instructor: Coray Colina

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

T 10:30 – 11:30 a.m., Th 3:00 pm– 4:00 pm, or by appointment.

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

TAs: Vinicius Cruzeiro, Farhad Ramezanghorbani Emails: vwcruzeiro@ufl.edu, farhad.r@chem.ufl.edu

Office Hours: TBD. **please fill the poll by Th 01/10/18.**

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: There are a number of Physical Chemistry books on the market. For example, “Physical Chemistry, 10th Ed.” By: Atkins and de Paula. This book is a suggestion, but any book should be sufficient. However, you must use a book throughout the semester. 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 6th, March 1st and April 17th. Doing well on midterm exams requires mastery of qualitative, conceptual material.

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

Final Exam: The final exam is scheduled for Friday May 4th from 10:00 am to noon. 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 the average of the three highest scores from the midterms and final exam. 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 4 homework assignments throughout the semester. Homework assignments will be worth 5 points each. ***Please write your name and UFID clearly on each page.***

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 the homework assignments must be turned in *individually*, thus you must turn in your own work to receive any credit! Any sort of plagiarism will not be tolerated. 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.*

Quizzes:

There will be 3 quizzes assignments throughout the semester. Quizzes will be worth 10 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%

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. You should be focusing on understanding and learning the concepts being taught rather than trying to memorize all the equations and derivations. '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 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 <https://counseling.ufl.edu> or call (352) 392 1575 during regular service hours (8 am– 5 pm). For other hours or on weekends call the Alachua County Crisis Center (352) 264 6789.

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://sccr.dso.ufl.edu/process/honor-code/>

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.

On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied:

THE PLEDGE

“On my honor, I have neither given nor received unauthorized aid in doing this assignment.”

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 macroscopic thermodynamic properties

Tentative Lecture Schedule:

	January		
T	9	Introduction and the Ideal gas	
Th	11	Real gases	
T	16	Kinetic gas theory, Maxwell distribution	
Th	18	First Law of Thermodynamics: work and heat	HW1
T	23	Heat capacity and gas expansions, Calorimetry	
Th	25	Second Law of Thermodynamics: Entropy / Q1	Q1
T	30	Second Law of Thermodynamics: Carnot engine, entropy change	
	February		
Th	1	Third Law of Thermodynamics, Gibbs free energy	
T	6	EXAM 1 (in-class)	EXAM
Th	8	Phase diagram	
T	13	Phase equilibrium, ideal solutions, chemical potential	
Th	15	Thermodynamics of mixing, real solutions	HW2
T	20	Colligative properties, electrolyte solutions , biological membranes	
Th	22	Chemical equilibrium /Q2	Q2
T	27	Chemical equilibrium	
	March		
Th	1	EXAM 2 (in-class)	EXAM
T	6	UF Spring Break	
Th	8	UF Spring Break	
T	13	Electrochemistry	
Th	15	Chemical kinetics	
T	20	Effect of temperature and PES	
Th	22	Reaction rate theories	HW3
T	27	Reactions in solution	
Th	29	reactions in solution /Q3	Q3
	April		
T	3	Reaction mechanisms	
Th	5	Reaction dynamics	HW4
T	10	Catalysis	
Th	12	Problem session	
T	17	EXAM 3 (in-class)	EXAM
Th	24	REVIEW	
	May		
F	4th	FINAL EXAM	FINAL