CHM 4411: Thermodynamics and Kinetics

Term: Fall 2024

Instructor: Ramón Alain Miranda Quintana

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Class schedule: T,R | Period 3 - 4 (9:35 AM – 11:30 AM), LEI 207

Course philosophy: I can summarize this course with two ("linearly dependent") statements: 1- Thermodynamics and kinetics are simple and universal theories. 2- Math is incredibly fun and an extremely convenient way to learn about physics and chemistry. I'm fully convinced of these and, hopefully, by the end of the term you'll be as well.

Office hours: I'll leave Wednesdays 1-3 pm free so if you want to meet we can schedule a meeting (individually or in groups) in my office. Pratiksha will also be available for office hours, Tuesdays 2-4 pm. While these will be the official dates, please, if you want to meet at other day/time you can send either (or both) of us a message and we could arrange other sessions.

Prerequisites: This class makes extensive use of mathematics (integration, differentiation, trigonometric functions, etc.). If you are not up to speed in your math skills, you need to work on that in the first week of the semester**.** I'll refresh some math concepts and "tricks" during the lectures, and we'll practice the necessary math skills in the homework assignments along the course. Be sure you feel comfortable with these concepts so you can concentrate on the physical chemistry.

Books: The material we cover is available on any thermochemistry textbook for undergraduate level students. I will also share notes and materials that will complement the

more “traditional” topics with some new concepts and ideas. A list of recommended books includes:

Physical Chemistry, by Silbey, Alberty, Bawendi.

Physical Chemistry by P. Atkins.

Course objective and goals:

This course will give cover thermochemistry and chemical kinetics from a chemist’s point of view (but also with a good dose of math). A tentative list of topics that we will cover includes: laws of thermodynamics, ideal and real gases, solutions, states variables and state functions, calorimetry, chemical potential, single- and multi-component systems, equilibrium and equilibrium constants, phase diagrams, phase transitions, colligative properties, basic notions on statistical thermodynamics, reaction rates, temperature and reactions, catalysis, reaction mechanisms. We’ll also (briefly) go into some more advanced physics and math topics that will provide a more “rounded” picture of thermodynamics and kinetics. I’ll explicitly mention in class when the material is a bit more advanced.

Evaluations and grading:

We will have frequent set of homework problems. Homework due date will be announced in class and posted on the class calendar. **Late homework will not be accepted**. For most of the problems you will be asked to provide the full derivation, using SI units. Just giving the final answer to a problem is not enough, I’m more interested in your derivations and reasoning than in just a final number. (As a matter of fact, I’ll try to avoid numbers as much as possible, math/physics with letters is so much better!) It is expected that the students will collaborate on some of the problems but, unless otherwise indicated, the homework must be delivered individually.

Cheating on an assignment will result in a grade of zero.

The grades will be determined as:

Homework----70%

Partial exams (3)----30%

Letter grade	From	To

A	87	100
A-	84	86.99
B+	81	83.99
B	78	80.99
B-	75	77.99
C+	72	74.99
C	69	71.99
C-	66	68.99
D+	63	65.99
D	60	62.99
D-	50	59.99
E	0	49.99

More information on current UF grading policies for assigning grade points can be found at: link to the university grades and grading policies.

Accommodations for students with disabilities: Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center. Click here to get started with the Disability Resource Center. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

Honor pledge: UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor 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: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code specifies a number of behaviors that are in violation of this code and the possible sanctions. Click here to read the Honor Code. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the

instructor or TAs in this class.

CampusResources:

Health and wellness:

U Matter, We Care: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services.

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website.

University Police Department: Visit UF Police Department website or call 352-392-1111 (or 9-1-1 for emergencies).

UF Health Shands Emergency Room / Trauma Center: For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Road,
Gainesville, FL 32608; Visit the UF Health Emergency Room and Trauma Center website.

Academic Resources:

E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: Visit the Student Honor Code and Student Conduct Code webpage for more information.

On-Line Students Complaints: View the Distance Learning Student Complaint Process.

Attendance:

See https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Tentative schedule:

Week1: Introduction to the course

Week2: Math preliminaries, introduction to states and state variables

Week3: Gases and Laws of thermodynamics 1 (HW1)

Week4: Gases and Laws of thermodynamics 2

Week5: Gases and Laws of thermodynamics 3 (HW2)

Week6: Gases and Laws of Thermodynamics 4 (Exam1)

Week7: Equilibrium and change 1

Week8: Equilibrium and change 2 (HW3)

Week9: Equilibrium and change 3

Week10: Equilibrium and change 4 (HW4)

Week11: Equilibrium and change 5 (Exam2)

Week12: Kinetics (HW5)

Week13: Kinetics

Week 14: Kinetics (HW6)

Week15: Kinetics (Exam3)