CHM 4411: Physical Chemistry - Thermodynamics and Kinetics

Spring Semester 2023 (4 credits)

Instructor:	David Wei, 311D Chemistry Lab Building (CLB), wei@chem.ufl.edu, 352-392-2050
Lectures:	T and R: 2-3 period (8:30-10:25 AM) Location: LEI207
Office hours:	M and R (1:00-2:00 PM) or by appointment Location: round table outside of CLB311D
TA office hours:	Dinushika Kotudura Arachchige, kotuduradinushik@ufl.edu Kyle Morgan, kyle.morgan1@ufl.edu Time: TBA Location: CLB313
Aims:	To provide students with a solid understanding of the concepts of physical chemistry and their application to chemical systems.
Textbook:	Peter Atkins, Julio De Paula, and James Keeler Physical Chemistry 11th Ed. Oxford University Press, ISBN # 0198769865.
Homework:	Problem sets will be made available throughout the semester, which will be graded. Assignments should be hand-written or printed and turned in **on the due date**. Please write your name and UFID clearly on each page.
Exams:	The course consists of **three** in-class **practice exams** during the semester as well as a comprehensive final. The exams will cover homework problems and will emphasize understanding of the lecture materials and problem solving. All exams will be closed book. **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. **Exam I**: Thursday. Feb 2 in class **Exam II**: Tuesday. Mar 2 in class **Exam III**: Thursday Apr 6 in class **Final comprehensive exam**: Wednesday May 3 3:00-5:00 PM, LEI207.

Grading:	The final comprehensive exam is worth 220 pts. The total points for homework are 80 pts: each one is worth maximum point if turned in on time, and late submission will incur a 2 pts deduction per day. The assignments will also be graded for content. **Total = 220 + 80 = 300 points** **Proposed Grade Levels:** A: 270 – 300 A-: 252 – 269 B+: 234 – 251 B: 216 – 233 B-: 204 – 215 C+: 192 – 203 C: 180 – 191 C-: 168 – 179 D+: 159 – 167 D: 150 – 158 E: 149 and below
Course policies:	Attendance will not be recorded, but participation in lectures and demonstration periods is important in assimilating the course material. Since exams are during normal class hours, make-up exams are granted **solely** at the discretion of the instructor. Any request for make-up exams should have a legitimate excuse, and be made to Dr. Wei no later than 1 week prior to the exam date. Students should also familiarize themselves with the UF Student Honor Code posted on the web at www.chem.ufl.edu/~itl/honor.html. Students with disabilities must first register with the Dean of Students Office; the Dean of the Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation.
Canvas e-learning site	All communications must be done through the e-learning site, including homework, deadlines, grades, and announcements. It is your responsibility to check this site for updates. Please do not email the instructors (or the TAs) personal email accounts.
Online course evaluation:	Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/.

COVID-19	If you have following symptoms, please do not come to class: Fever of 100.4 degrees Fahrenheit or higher New cough or a cough that gets worse Difficulty/hard time breathing New loss of taste or smell Sore throat New nasal congestion/stuffy or runny nose Nausea, vomiting, or diarrhea Muscle pain Extreme fatigue/feeling very tired New severe/very bad headache Chill

Tentative Lecture Schedule CHM 4411

Introduction
Ideal and real gases
Kinetic gas theory, Maxwell distribution laws and molecular collisions
First Law of Thermodynamics: work and heat
Heat capacity and gas expansions, Calorimetry
Second Law of Thermodynamics: Entropy
Second Law of Thermodynamics: Carnot engine, entropy change
Third Law of Thermodynamics, Gibbs free energy
Phase diagram
Phase equilibrium, ideal solutions, chemical potential
Thermodynamics of mixing, real solutions
Colligative properties, electrolyte solutions
Colligative properties of electrolyte solutions, biological membranes
Chemical equilibrium
Electrochemistry
Chemical kinetics
Effect of temperature and PES
Reaction rate theories, reactions in solution
Reaction mechanisms
Reaction dynamics
Surface Science and Catalysis
Catalysis: heterogeneous catalysis and photocatalysis
Physical chemistry for nanoscience and nanotechnology
Review