CHM 431
Physical Chemistry I
Fall 2024 Course Syllabus

Instructor:

Prof. Dugan Hayes
Beaupre 374E
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401-874-5516
Office hours: Tu, Th 10am

Required texts:

Thermodynamics, Statistical Thermodynamics and Kinetics (Fourth Edition) by Thomas Engel and Philip Reid, Pearson, 2019

Co-/Prerequisites:

CHM 192 or 112, MTH 142, PHY 112 or 204

Scheduling:

MWF, 9-10am in Beaupre 105

Overview:

Physical chemistry is the study of the application of the principles of physics to chemical phenomena. In a simple sense, we can think of physical chemistry as subdivided into three topics: thermodynamics, quantum mechanics, and kinetics. These subtopics are actually very much interrelated, and it is a goal of both CHM 431 and CHM 432 for you to understand and appreciate the relations.

This semester we will be concerned with the principles contained in the laws of thermodynamics that govern the macroscopic behavior of chemical systems. A major goal for CHM 431 is to understand the three laws of thermodynamics and how to apply the laws to chemical systems. These laws allow us to rationalize equilibrium phenomena, including both phase and chemical equilibria. Understanding the thermodynamic basis of equilibrium is another course goal.

Physical chemistry has the reputation of being a challenging course due to the inherently abstract nature of many of the concepts presented and the heavy reliance on (multivariable) calculus and differential equations. However, there is a straightforward way to be successful in this course: doing the homework. Problem sets will be posted about once a week, and the homework problems will be representative of the kinds of questions you will be given on the exams. Solutions to the problem sets will be posted after several days, but it is ***imperative*** that you complete (or at least make a wholehearted effort to complete) the homework before consulting the solutions. Understanding a solution to a problem is far less difficult than finding the solution yourself, which is what you will be doing during the exams.

Grades:

Your final grade will be calculated from the following:

- Four one-hour exams 67%
- Final exam 33%

If you must miss an exam for religious observance or a university-sanction event, please notify me as soon as possible (e.g., within the first week of class). For unplanned by excused absences (see below), reach out to me directly by email to discuss options for making up an exam. If classes are canceled on an exam date (e.g., due to weather), the exam will be given on the next date the class meets.

The CHM 431 Brightspace page:

All written materials, including the syllabus, problem sets and solutions, and exams and solutions, will be posted to the CHM 431 Brightspace page.

Viral illness precautions:

The University is committed to delivering its educational mission while protecting the health and safety of our community. Students who are experiencing symptoms of viral illness should NOT go to class/work. The CDC says people with these types of illnesses should stay home until they have been fever-free without medication for at least 24 hours and their symptoms have been improving. If you are unable to attend class, please notify me prior to the start of class by email (dugan@uri.edu).

Excused absences:

Absences due to serious illness or traumatic loss, religious observances, military service, or participation in a university sanctioned event are considered excused absences. Students are responsible for work missed during an excused absence but will not be penalized by grading or assignment/exam make-up policies. Students should notify faculty in advance of absences due to religious observance or university-sanction events, and as soon as possible for other absences. See University Manual sections 8.51.11-8.51.16 for details.

Land acknowledgement:

The University of Rhode Island land acknowledgment is a statement written by members of the University community in close partnership with members of the Narragansett Tribe. The statement recognizes and pays tribute to the people who lived on and stewarded the land on which the University now resides. The statement seeks to show gratitude and respect to Indigenous people and cultures and build community with the Narragansett Nation and other Native American tribes.

University of Rhode Island Land Acknowledgment

The University of Rhode Island occupies the traditional stomping ground of the Narragansett Nation and the Niantic People. We honor and respect the enduring and continuing relationship between the Indigenous people and this land by teaching and learning more about their history and present-day communities, and by becoming stewards of the land we, too, inhabit.

Mental health and wellness:

We understand that college comes with challenges and stress associated with your courses, job/family responsibilities and personal life. URI offers students a range of services to support your mental health and wellbeing, including the URI Counseling Center, TELUS Health Student Support app, the Wellness Resource Center, and Well-being Coaching.

Anti-bias:

We respect the rights and dignity of each individual and group. We reject prejudice and intolerance, and we work to understand differences. We believe that equity and inclusion are critical components for campus community members to thrive. If you are a target or a witness of a bias incident, you are encouraged to submit a report to the URI Bias Resource Team at www.uri.edu/brt. There you will also find people and resources to help.

Disability, Access, and Inclusion services for students:

Your access in this course is important. Please send me your Disability, Access, and Inclusion (DAI) accommodation letter early in the semester so that we have adequate time to discuss and arrange your approved academic accommodations. If you have not yet established services through DAI, please contact them to engage in a confidential conversation about the process for requesting reasonable accommodations in the classroom. DAI can be reached by calling 401-874-2098, visiting web.uri.edu/disability, or emailing dai@uri.edu.

Material covered (dates subject to change):

09/04 – 09/09	Chapter 1	Fundamental Concepts of Thermodynamics
09/11 – 09/18	Chapter 2	Heat, Work, Internal Energy, Enthalpy, and the 1st Law
09/20 – 09/25	Chapter 3	State Functions: Internal Energy and Enthalpy
09/25 – 10/02	Chapter 4	Thermochemistry
10/04 – 10/11	Chapter 5	Entropy and the 2nd and 3rd Laws
10/11 – 10/23	Chapter 6	Chemical Equilibrium
10/25 – 10/28	Chapter 7	The Properties of Real Gases
10/30 – 11/04	Chapter 8	Phase Diagrams
11/08 – 11/22	Chapter 9	Ideal and Real Solutions
11/22 – 12/02	Chapter 10	Electrolyte Solutions
12/02 – 12/09	Chapter 11	Electrochemical Cells, Batteries, and Fuel Cells

Important dates:

09/04	First class
09/25	Last day for dropping without a "W"
09/30	Exam 1
10/14	No class (Indigenous Peoples' Day)
10/15	Monday classes meet on a Tuesday
10/18	Last day to drop classes
10/21	Exam 2
11/06	No class (Tuesday classes meet on a Wednesday due to Election Day)
11/11	No class (Veterans Day)
11/13	Exam 3
11/27, 11/29	No class (Thanksgiving recess)
12/09	Last class
12/11	Exam 4
12/13*	Final Exam, 8-10am

*Check online for date/time change