Syllabus (Spring 2019)

Chemistry 561: Physical Chemistry I

The policies and regulations contained in this syllabus are subject to change at any point. Such changes will be announced in class and/or posted on the course website. The syllabus has been compiled to be as complete as possible but is by no means a binding document.

General Info

Instructor:	Prof. **Jörg C. Woehl**
Office:	Chemistry Building (CHM), Room 343
Office hours:	Open door and by appointment
Email:	woehl@uwm.edu
Phone:	414-229-5223

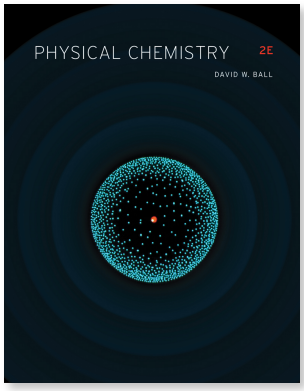
Class Meeting Times:	Monday, Wednesday, and Friday, 10:00-10:50 am
Discussion Group:	Friday, 1:00-1:50 pm
Class Location:	CHM 197
First Day of Class:	Wednesday, January 23
Last Day of Class:	Wednesday, May 8
Midterm 1 (in-class):	Monday, March 4, 10:00-10:50 am
Midterm 2 (take-home):	Friday, April 12; due Friday, April 19 at 10:00 am
Final Exam:	Thursday, May 16, 7:30 am-9:30 am (CHM 197)

Course Objectives

This lecture course covers most topics of classical thermodynamics and its applications in the chemical sciences. It also introduces the basic concepts that will form the foundation for "Chemistry 562: Physical Chemistry II", in which quantum chemistry, statistical thermodynamics, and kinetics will be discussed. At the end of this course, you will have gained a thorough understanding and practical knowledge of thermodynamics - a topic that is central to all of chemistry as well as the natural and applied sciences.

Required Textbook

David W. Ball: "Physical Chemistry" (2nd ed.), Cengage, 2014. Chapters 1-8. ISBN 9781133958437.
Available through UWM's Virtual Bookstore uwm.ecampus.com.
This textbook will also be the required text for "Chemistry 562: Physical Chemistry II".



Recommended, but optional:
"Student Solutions Manual" (2nd ed.), Cengage, 2014. ISBN 9781285074788. UWM Libraries Call Number QD453.3 .B352x 2015 (on course reserve).
Available through UWM's Virtual Bookstore uwm.ecampus.com.

Supplemental Textbooks

- Donald A. McQuarrie and John D. Simon: "Physical Chemistry: A Molecular Approach", University Science Books, 1997. UWM Libraries Call Number QD453.2 .M394 1997 (on course reserve)
- Peter Atkins and Julio de Paula: "Physical Chemistry" (9th ed.), W. H. Freeman and Company, 2010. UWM Libraries Call Number QD453.2 .A88 1998 (6th ed.). Part 1: "Equilibrium" (Chapters 1-6).
- Robert J. Silbey, Robert A. Alberty, and Moungi G. Bawendi: "Physical Chemistry" (4th ed.), John Wiley & Sons, 2005. Part One: "Thermodynamics" (Chapters 1-8).
- Horia Metiu: "Thermodynamics", Taylor & Francis, 2006.
- Donald A. McQuarrie: "Mathematical Methods for Scientists and Engineers", University Science Books, 2003. UWM Libraries Call Number QA37.3 .M36 2003 (on course reserve). Relevant for this course are Chapters 1, 2, 6.

Course Prerequisites

"Chemistry 561: Physical Chemistry I" (Chem-561) requires junior standing and a grade of C or better in the following courses: Chem-104, both Physics-210 and Physics-215, and Math-233. It is also strongly recommended that ElecEng-234 or Math-234 are taken prior to Chem-561. If you do not have the proper prerequisites, you need to obtain my consent to take this course by filling out a form available at the Chemistry main office.
The prerequisite courses Chem-104, Physics-210, Physics-215, and Math-233 may not be taken for credit subsequent to the earning of credit in Chem-561!
In order for you to be successful in this course you will need to be at ease with elementary algebra as well as differential and integral calculus. If you are not sufficiently familiar with these topics, you should consider taking Chem-561 at a later time, after you have acquired these skills.

Lectures

You are expected to attend all lectures and discussion groups. There is generally a strong correlation between students who receive good grades and those who attend class and discussion groups on a regular basis. Please contact me (preferably by email) if you are unable to attend a class or discussion group.
Before attending a lecture, you should prepare the material by reading the corresponding textbook sections and lecture notes so that you can follow the presentation more easily and ask questions about topics that you have not (or not fully) understood. Also, work through the example problems scattered throughout the text; then, try to solve them on your own. Working problems is the best way to learn and check your comprehension of the material. We will work on problem solving during the discussion sections. I will sometimes suggest a number of simpler practice problems on the course website.

Course Website

Canvas: uwm.edu/canvas. For information on how to use Canvas, please visit v.

Lecture notes, problem sets with solutions as well as other course material will be made available on Canvas. It is expected that you visit the course website regularly as important information and announcements may be posted there as well.

Problem Sets
Problem sets will be assigned prior to and discussed during discussion sections. Additional practice problems will be assigned as (ungraded) homework. You may work on assigned problems and problem sets either on your own or in groups with other students; I highly recommend working in groups as it allows you to discuss the topics with others and to formulate strategies for problem solving, which reinforces your understanding of the material. Solutions to problem sets will be posted on Canvas.

Grading
The course will be graded based on problem sets and examinations as follows:

Math Test (in-class)	5%
Midterm 1 (in-class)	30%
Midterm 2 (take-home)	30%
Final Exam (in-class)	35%
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Total	100%

The *Math Test* is an in-class test covering the mathematical background needed for Chem-561 (see course prerequisites).

Midterm 1 is an in-class exam and will be held during regular lecture time. Only a calculator (programmable or non-programmable) and a single sheet of paper with handwritten notes (recto-verso) are allowed. No books or other material are admitted.
If you know that you will miss Midterm 1, please contact me as soon as possible (preferably by email). If you are missing Midterm 1 for a valid and justifiable reason, I will make arrangements so that you can take a make-up exam within one week after the scheduled date. If you miss Midterm 1 without justified excuse, you are not eligible for taking a make-up exam.

Midterm 2 is a take-home exam and will be handed out and posted to Canvas after the lecture. The midterm will cover all topics discussed in class and problem sets in a format similar to the problem sets. No class will be held on Wednesday during midterm week.
No time extensions or make-up exam will be given for the take-home midterm. If you are unable to turn it in during class, you may upload it to the Canvas dropbox.

The *Final Exam* is comprehensive. Again, only a calculator (programmable or non-programmable) and a single sheet of paper with handwritten notes (recto-verso) are allowed. No books or other material are admitted.
If you are unable to take or complete the final exam due to illness or other unusual and substantiated cause beyond your control, an incomplete ("I") will be given *if you can provide proof for such cause*. According to UWM policy, a course marked incomplete

must be completed (in this case by taking a make-up final exam) during the next succeeding semester, excluding summer sessions and UWinterim; otherwise, the grade of "I" will lapse to "F".

Tentative Schedule

Week		Topic	Reading
1	Jan 22 - Jan 27	Introduction	Woehl "MathTools" (on Canvas); McQuarrie "Math. Meth." Ch. 1 and 6.1-6.5 (on Canvas)
2	Jan 28 - Feb 3	**Math Test** The Properties of Gases	Chapter 1
3	Feb 4 - Feb 10	The Properties of Gases; The First Law	Chapter 2
4	Feb 11 - Feb 17	The First Law	
	Feb 18	Last day to drop full-term courses without a "W" on record.	
5	Feb 18 - Feb 24	The First Law	
6	Feb 25 - Mar 3	Entropy and the Second Law	Chapter 3
	Mar 4	**Midterm 1 (in-class)**	
7	Mar 4 - Mar 10	Entropy and the Second Law	Chapter 4
8	Mar 11 - Mar 17	Entropy and the Second Law	
	Mar 17 - Mar 24	**Spring Recess**	
9	Mar 25 - Mar 31	Entropy and the Second Law; Entropy and the Third Law	
10	Apr 1 - Apr 7	Phase Equilibria	Chapter 6 (skip Ch. 5 for now)
	Apr 7	Last day to drop or withdraw from full-term courses	
11	Apr 8 - Apr 14	Phase Equilibria	
	Apr 12 - Apr 19	**Midterm 2 (take-home))** - no class on Wed, Apr 17	
12	Apr 15 - Apr 21	Multicomponent Systems	Chapter 7
13	Apr 22 - Apr 28	Multicomponent Systems	

Week		Topic	Reading
14	Apr 29 - May 5	Chemical Equilibrium	Chapter 5
15	May 6 - May 8	Chemical Equilibrium	
	May 19	**Final Exam**	

Workload
Besides attending lectures and discussion groups, you should expect to take at least 50 hours over the course of the semester reading the textbook and lecture notes and solving simple example problems to double-check your comprehension of the material.
Weekly homework problem sets and practice problems will be given, which will take you at least 5 hours each although the exact amount of time will vary by student and by week and will depend largely on your mathematical background.
You should reserve at least 10 hours to study for and take the final exam.
All told, this class is likely to take about 150 hours of your time.
This workload is only an estimate and will vary from student to student. Also, it should be understood that you are assessed on your performance, not on the time put into the course.

Policies
If you will need accommodations in order to meet any of the requirements of this course, please contact me and the UWM Accessibility Resource Center (ARC) as soon as possible. Special accommodations for students with disabilities can be provided, but their timely implementation can only be insured if the ARC is contacted ahead of time. For details see uwm.edu/arc/getting-started/.
Department of Chemistry and Biochemistry policies are posted on bulletin boards in the department.
UWM policies related to students with disabilities, religious observances, students called to active military duty, incompletes, discriminatory conduct, academic misconduct, complaint procedures, grade appeal procedures, and final examination requirements can be consulted at uwm.edu/secu/syllabus-links/.

Academic Misconduct
Cheating on an exam or other graded material will automatically result in a grade of zero (as a minimum consequence); failure in the course and referral to the Dean may also occur. Academic dishonesty in any form will not be tolerated.

> *"Academic misconduct is an act in which a student seeks to claim credit for the work or efforts of another without authorization or citation, uses unauthorized materials or fabricated data in any academic exercise, forges or falsifies academic documents or records, intentionally impedes or damages the academic work of others, engages in conduct aimed at making false representation of a student's academic performance, or assists other students in any of these acts."*

“Prohibited conduct includes cheating on an examination; collaborating with others in work to be presented, contrary to the stated rules of the course; submitting a paper or assignment as one's own work when a part or all of the paper or assignment is the work of another; submitting a paper or assignment that contains ideas or research of others without appropriately identifying the sources of those ideas; stealing examinations or course materials; submitting, if contrary to the rules of a course, work previously presented in another course; tampering with the laboratory experiment or computer program of another student; knowingly and intentionally assisting another student in any of the above, including assistance in an arrangement whereby any work, classroom performance, examination or other activity is submitted or performed by a person other than the student under whose name the work is submitted or performed.”

(From: Office of the Provost and Vice Chancellor)