

Syllabus (Fall 2019)

Chemistry 765: Statistical Thermodynamics

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: By appointment
Email: woehl@uwm.edu
Phone: 414-229-5223

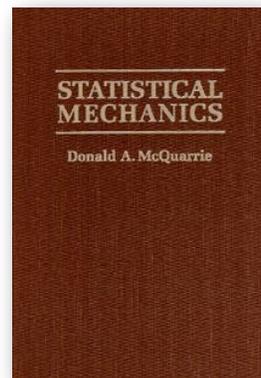
Class Meeting Times: Monday and Wednesday, 11:00 am - 12:15 pm
Class Location: CHM 195
First Day of Class: Wednesday, September 4
Last Day of Class: Wednesday, December 11
Midterm (take-home): Wednesday, November 6; due November 13 at 11:00 am
Final Exam (take-home): Saturday, December 14; due Friday, December 20 (mailbox)

Course Objectives

This lecture course covers the fundamental principles of statistical mechanics, with applications to topics of physiochemical interest. The focus will be on equilibrium systems whose particles can be treated as being essentially independent.

Required Textbook

Donald A. McQuarrie: "Statistical Mechanics" (640 pages), University Science Books, 2000. ISBN 978-1-891389-15-3. Hardcopy available through UWM's Virtual Bookstore uwm.ecampus.com. In addition, RedShelf offers the text as an eBook for purchase or rent: www.redshelf.com/book/918/.



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)
- Terrell L. Hill: "An Introduction to Statistical Thermodynamics", Dover Publications, 1987. [UWM Libraries Call Number QD501 H573](#).
- Richard C. Tolman: "The Principles of Statistical Mechanics", Dover Publications, 1987. [UWM Libraries Call Number QC175 .T62](#).

- Donald A. McQuarrie: “Mathematical Methods for Scientists and Engineers”, University Science Books, 2003. [UWM Libraries Call Number QA37.3 .M36 2003](#) (on course reserve)

Course Prerequisites

“Chemistry 765: Statistical Thermodynamics” (Chem-765) requires graduate standing and a grade of C or better in Chem-661.

Lectures

Your attendance of all lectures is expected. Before attending a lecture, you should prepare by reading the corresponding textbook sections so that you can follow the presentation more easily and ask questions about topics that you have not (fully) understood. This is a graduate level class, and I expect you to take the necessary steps to take ownership of the material. You know best whether you have truly understood a particular topic and whether you need to read up on it using a different textbook from the library, try to solve more on problem sets, or seek the help of your instructor; please use the available options accordingly.

Course Website

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

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

There will be a few homework assignments at irregular intervals. You are required to turn them in by the due date, but they will not be corrected and no grade will be given. Working on these problem sets will help you in preparing for the midterm and final exam; solutions to the homework assignments will be provided on the course website.

Grading

The course will be graded as follows:

| | |
|-----------------------|------|
| Midterm (take-home) | 50% |
| Final Exam (in-class) | 50% |
| ===== | |
| Total | 100% |

The *Midterm* is a take-home exam and will be handed out in class and posted to Canvas after the lecture. It will cover all topics discussed in class and problem sets in a format similar to the problem sets. No class will be held on Monday 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 a take-home exam and is comprehensive. You can put it in my mailbox on or before the due date.

Tentative Schedule

| Week | | Topic | Reading |
|------|-----------------|--|---|
| 1 | Sep 4 - Sep 8 | Introduction | Chapter 1 |
| 2 | Sep 9 - Sep 15 | The Canonical Ensemble | Chapter 2 |
| 3 | Sep 16 - Sep 22 | The Canonical Ensemble; Other Ensembles and Fluctuations | Chapter 3 |
| 4 | Sep 23 - Sep 29 | Other Ensembles and Fluctuations | |
| | Sep 30 | Last day to drop full-term courses without "W" on record | |
| 5 | Sep 30 - Oct 6 | Boltzmann Statistics | Chapter 4 |
| 6 | Oct 7 - Oct 13 | Ideal Monoatomic Gas | Chapter 5 |
| 7 | Oct 14 - Oct 20 | Ideal Diatomic Gas | Chapter 6 |
| 8 | Oct 21 - Oct 27 | Ideal Polyatomic Gas | Chapter 8 |
| 9 | Oct 28 - Nov 3 | Kinetic Theory of Gases | "The Kinetic Theory of Gases" (posted on Canvas); Chapter 7 |
| 10 | Nov 4 - Nov 10 | Midterm (take-home) Wednesday Nov 6 - no class on Monday, Nov 11 Kinetic Theory of Gases | |
| | Nov 10 | Last day to drop or withdraw from full-term courses | |
| 11 | Nov 11 - Nov 17 | Chemical Equilibrium | Chapter 9 |
| 12 | Nov 18 - Nov 24 | Chemical Equilibrium | |
| 13 | Nov 25 - Nov 26 | Crystals | Chapter 11 |
| | Nov 27 - Dec 1 | Thanksgiving Recess | |
| 14 | Dec 2 - Dec 8 | Crystals | |
| 15 | Dec 9 - Dec 12 | Crystals | |
| | Dec 14 | Final Exam (take-home) | |

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)