

# Final Course Outline

## Thermodynamics Lecture

### CHEM 234

Gregor Kos

September 14, 2018

## 1 Course description

CHEM234 is an introductory course in Physical Chemistry focusing on thermodynamics, i.e., the transfer of energy (e.g., heat) that accompanies chemical and physical change. Thermodynamics allows for the quantitative evaluation of equilibria and the determination of the direction of natural change. Thermodynamics provides a universal (mathematical) framework to discuss processes as diverse as gas chemistry, phase transitions, electrochemistry... .

Topics covered in this course include the properties of gases, internal energy, enthalpy & the First Law, entropy, free energy & the Second and Third Laws, phase equilibria, simple mixtures and chemical equilibria.

## 2 Course administration

**Instructor:** Gregor Kos, [gregor.kos@concordia.ca](mailto:gregor.kos@concordia.ca)

**Office:** SP-275.29

**Office hours:** Wed, 15:30–17:00 & Fri, 10:00–11:30; and by appointment.

**Prerequisites:** CHEM205, 206; PHYS204, 206, 224, 226; MATH 203, 205  
or equivalents for all prerequisite courses.

**Class time:** Thu, 18:00–20:30

**Room:** CC 314 LOY

**Course website:** <http://moodle.concordia.ca> (automatic enrolment)

**Course text:** Peter Atkins and Julio De Paula, Physical Chemistry, Volume 1: Thermodynamics and Kinetics, 10ed, 2014, WH Freeman, ISBN-10: 1464124515, ISBN-13: 978-1464124518; available in the University Book Store

## 3 Clickers

The iClicker system will be used during lectures and tutorials for discussion questions and short quizzes. **You need to bring your own, registered clicker to lectures. You cannot use the REEF app!** You also need to register your clicker through Moodle. **Clicker usage will start on 10 Sep 2018 in tutorials and 13 Sep 2018 in class.** No accommodations will be made for forgotten clickers.

## 4 Assessment

During the lecture two assignments and one midterm exam will be given. Together with the cumulative final exam and the tutorial (scheduled separately) the the final mark will be calculated:

- Assignments (2, take-home): 10%
- Clickers: 5%
- Midterm (in-class): 25%
- Final (centrally scheduled): 40%
- Tutorial: 20%

**A passing grade for the combined marks of midterm and final is required to pass the course**, i.e., the contribution to the course mark from midterm and final must be at least 33% of the course grade. **A passing grade for the tutorial is also required.**

**For the midterm and the final exam, a single letter-sized page with notes of any kind is allowed.** Bring your draft to class for practice sessions and update it frequently before the exams. You may use programmable calculators only after a hard reset in front of the instructor before the exam.

Assignments handed in after the posted deadline will receive a 20% deduction. If they are more than a week late, you will receive a grade of zero for the assignment. **Please see me before the deadline or after (with a doctor's note only) for extensions without deductions.**

## 5 Important dates

Date	Event
6 Sep 2018	Classes start
10 Sep 2018	Tutorials start
4 Oct 2018	Deadline Assignment 1
14 Oct 2018	Deadline to complete CHEM 101 quiz
18 Oct 2018	Midterm exam
14 Nov 2018	Deadline Assignment 2
TBD	Final exam

## 6 Attendance

### 6.1 Lecture

**I strongly suggest to attend classes regularly.** To be excused from the midterm (no supplemental) or final examination (as per university regulations), you must present a doctor's note or other suitable official excuse. Marks for a missed midterm with an official excuse will be added to the final exam; without excuse a grade of zero will be given for the missed midterm.

## 6.2 Tutorial

**Attendance at the tutorials is mandatory.** For any missed tutorial a doctor's note or other official note for the day of the tutorial is the only acceptable excuse. No supplemental quizzes or other graded course work will be scheduled in case of a missed tutorial, but marks will be re-distributed equally.

### **Tutorial times (starting Mon, 10 Sep 2018)**

CHEM234-01T-TUT, Mon, 13:15 – 14:30 (CC 204 LOY)

CHEM234-02T-TUT, Tue, 13:15 – 14:30 (CC 425 LOY)

CHEM234-51T-TUT, Tue, 18:00 – 19:15 (CC 405 LOY)

CHEM234-03T-TUT, Wed, 13:15 – 14:30 (CC 425 LOY)

CHEM234-04T-TUT, Thu, 13:15 – 14:30 (CC 425 LOY)

## 7 Course content

Chemistry CHEM234 is an introduction to thermodynamics. The course will closely follow selected topics from Chapters 1–6 of the assigned textbook. In preparation for the course, I strongly suggest to review the following chapters from General Chemistry. Do not forget to extensively practice your problem-solving skills.

- Stoichiometry (Zumdahl, Chapters 3 & 4 )

- Gases (Zumdahl, Chapter 5)
- Thermochemistry (Zumdahl, Chapters 6 & 17)
- Liquids and Solids (Zumdahl, Chapters 10)
- Properties of Solutions (Zumdahl, Chapters 11)
- Chemical Equilibrium (Zumdahl, Chapter 13)

## 7.1 Chapters covered in detail

Chapter 1 – The Properties of Gases (1A and 1C)

Chapter 2 – The First Law

Chapter 3 – The Second and Third Laws

Chapter 4 – Physical Transformation of Pure Substances

Chapter 5 – Simple Mixtures

Chapter 6 – Chemical Equilibrium (6A and 6b)

## 7.2 Preparatory Reading

The recommended sections are preparatory reading; **these sections do not represent all material covered!** Please refer to your lecture notes, assignments, practice problems, in-class discussions for the complete material covered.

<b>Content</b>	<b>Preparatory Reading</b>
Introduction to the course	Course outline
Prerequisites and skills to succeed	
The perfect gas	1A & 1B
Real gases	1C
The First Law 1	2A & 2B
The First Law 2	
Thermochemistry	2C
The Second and Third Laws 1	3A & 3B
The Second and Third Laws 2	3A & 3B
Helmholtz and Gibbs energies	3C
Combining the First and Second Laws 1	3D
Combining the First and Second Laws 2	3D
Phase diagrams	4A & 4B
Phase transitions	
Simple mixtures, properties of solutions	5A & 5B
Phase diagrams of binary systems.	5C
Activities	5E & 5F
Chemical equilibrium 1	6A & 6B
Chemical equilibrium 2	6A & 6B

## 8 Mandatory Quiz and Seminar

As part of this course, you are required to

1. attend a Chemistry and Biochemistry Departmental Seminar on the academic conduct code and the appropriate use of information sources.
2. pass the online quiz associated with this seminar (the passing grade for the quiz is 100%). **The deadline to take and pass the quiz is Sunday, October 14, 2018 at 11:55 pm.**

**Note:** This is not the University's quiz you may have been asked to take when you first registered and logged into the myConcordia portal; the one you must take is similar, but graded by the Department of Chemistry and Biochemistry, and you cannot take it until after you have attended the seminar.

The aim of this seminar is to clarify the academic conduct code in terms of what practices will be considered unacceptable with regards to work submitted for grading in Chemistry and Biochemistry courses. You are only exempt from repeating the seminar and the quiz if you have done both in Fall 2013 or more recently [\*], otherwise you are required to repeat both this term.



This short seminar (1 hour) will be held at the following times (note that **late-comers will not be admitted**):

<b>Date</b>	<b>Time</b>	<b>Place</b>
Mon, Sep 24	16:45-17:45	HC-155
Tue, Sep 25	16:45-17:45	CC-116
Tue, Sep 25	20:45-21:45	HB-130
Wed, Sep 26	16:45-17:45	HC-155
Wed, Sep 26	20:45-21:45	SPS-110
Thu, Sep 27	16:45-17:45	CC-115
Fri, Sep 28	16:45-17:45	HB-130

As space for each of the seminars is limited by the room size, please sign up to your preferred time as soon as possible (slots fill up quickly). Sign-up sheets are available two weeks in advance of the seminars outside SP 201.01 (Departmental office). Only sign up in available slots: rooms must not be filled over capacity!

**If you do not complete this course requirement, your final grade for the course may be lowered by one full letter grade with an incomplete (INC) notation until such time as this requirement is completed. Please refer to the undergraduate calendar (section 16.3.6) for details on removal of an incomplete notation.**

[\*] You are exempt, if you can locate your ID in the pdf file on the

departmental website at <http://www.concordia.ca/content/dam/artsci/chemistry/docs/Compliance-list.pdf>.

## **9 Plagiarism and other forms of academic dishonesty**

The Academic Code of Conduct can be found in section 17.10 of the academic calendar (<http://www.concordia.ca/academics/undergraduate/calendar/current/17-10.html>). Any form of unauthorized collaboration, cheating, copying or plagiarism found in this course will be reported and the appropriate sanctions applied. The mandatory seminar is a clear and fair opportunity to learn what our faculty regards as academic misconduct. Failure to take part in this learning opportunity and thus ignorance of these regulations is no excuse and will not result in a reduced sanction in any case where academic misconduct is observed.