

# CHM 328H: Modern Physical Chemistry

## Course Syllabus: Winter 2021

### I CONTACTS

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#### **INSTRUCTOR:**

*Name:* Jeremy Schofield

*Email:* jeremy.schofield@utoronto.ca

*Office:* Lash Miller, room 420E

*Classes:* online using Bb Collaborate.

- Synchronous delivery at 3 - 4 p.m. on Tuesdays and Thursdays.

*Tutorials:* online using Bb Collaborate

- Synchronous delivery at 12:00 – 1:00 p.m. on Wednesdays.

*Online student hours:* Fridays, 3 – 4 p.m. or by appointment.

#### **TEACHING ASSISTANT:**

*Name:* Kai Gu

*Email:* kai.gu@mail.utoronto.ca

### II COURSE OVERVIEW

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#### **COURSE DESCRIPTION:**

In CHM328 macroscopic phenomena are described from a microscopic point of view and to build a bridge between the quantum mechanics of atoms and molecules studied in CHM223 and CHM326 and the thermodynamic treatment of macroscopic systems studied in CHM222 and CHM151/CHM135.

#### **STUDENT LEARNING OUTCOMES:**

By the end of this course, students will be able to:

- Understand how kinetic theory can be used to predict macroscopic properties such as the thermodynamic pressure and energy of a system and chemical properties such as the law of mass action and reaction rates.
- Discuss the thermodynamics of non-ideal systems.
- Use ensemble theory to understand heat capacities, equilibrium constants and phase separation.

### PREREQUISITE COURSES:

This course assumes you have a basic understanding of elementary physics and physical chemistry. The language used to express the principles of thermodynamics is mathematical and involves multi-variable calculus. A modest level of mathematical sophistication is required for success in the course. The pre-requisites for the course are: CHM222 and CHM223.

### READINGS:

Required: Adapted ebook *Physical Chemistry*, by Ira Levine

- Available for purchase from the U of T Bookstore via the link:  
[https://www.campusebookstore.com/integration/AccessCodes/default.aspx?bookseller\\_id=96&Course=STG+CHM+328+CUSTOM+ETEXT+FOR+MODERN+PHYSICAL+CHEMISTRY&frame=YES&t=permalink](https://www.campusebookstore.com/integration/AccessCodes/default.aspx?bookseller_id=96&Course=STG+CHM+328+CUSTOM+ETEXT+FOR+MODERN+PHYSICAL+CHEMISTRY&frame=YES&t=permalink)

## III HOW THE COURSE IS ORGANIZED

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Course content is organized in content by week. For each week, there will be assigned reading material from the ebook and problems posted on Quercus for discussion in tutorials.

Students are expected to follow the live classes online, attend tutorials, write the weekly quizzes, read the assigned ebook material, and work through the assigned problem sets according to the posted dates.

### TUTORIAL OBJECTIVES:

Online tutorials will provide the opportunity for students to ask questions and receive feedback.

## IV EVALUATION/GRADING SCHEME

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- **Quizzes:** Online single-question weekly quizzes on Wednesdays worth 10% total\*.
- **Marked problem sets:** Two in total, due February 4 and March 18, 2021 worth 15% each.
- **Term tests:** Two in total, on Thursday, February 25 and Thursday, March 25, 2021 worth 20% each. Term tests will be scheduled to be completed during a 24-hour period and students will be granted a 2-hour window to complete them once started\*.
- **Final assessment:** To be held during final assessment period, worth 20% of final mark.

\*No resources such as lecture notes or internet allowed.

**Note:** if an unexpected technical issue occurs with a university system (e.g., Quercus services, network outage) that affects availability or functionality, it may be necessary to revise the timing or weighting of the assessments.

## V COURSE POLICIES

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- We will strive to answer all communications such as emails in a 24-hour period.
- The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.
- All work for the course must be submitted using Quercus.
- Normal University procedures should be followed to signal course absences and request make-up tests or exemptions from exams.

## VI TECHNOLOGY REQUIREMENTS

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This course requires the use of computers, and of course sometimes things can go wrong when using them. You are responsible for ensuring that you maintain regular backup copies of your files, use antivirus software (if using your own computer), and schedule enough time when completing an assignment to allow for delays due to technical difficulties. Computer viruses, crashed hard drives, broken printers, lost or corrupted files, incompatible file formats, and similar mishaps are common issues when using technology, and are not acceptable grounds for a deadline extension.

## VII INSTITUTIONAL POLICIES AND SUPPORT

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### ACADEMIC INTEGRITY

#### **On Academic Integrity:**

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (<https://governingcouncil.utoronto.ca/secretariat/policies/code-behaviour-academic-matters-july-1-2019>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In assignments:

1. Using someone else's ideas or words without appropriate acknowledgement.
2. Submitting your own work in more than one course without the permission of the instructor.

3. Making up sources or facts.
4. Obtaining or providing unauthorized assistance on any assignment.

On tests and exams:

1. Using or possessing unauthorized aids.
2. Looking at someone else's answers during an exam or test.
3. Misrepresenting your identity.

In academic work:

1. Falsifying institutional documents or grades.
2. Falsifying or altering any documentation required by the University.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see <https://www.academicintegrity.utoronto.ca/>).

## **COPYRIGHT**

This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session.

Course videos and materials belong to your instructor, the University, and/or other sources depending on the specific facts of each situation and are protected by copyright. Do not download, copy, or share any course or student materials or videos without the explicit permission of the instructor.

## **ACCESSIBILITY NEEDS**

Students with diverse learning styles and needs are welcome in this course. The University of Toronto is committed to accessibility: if you require accommodations for a disability, or have any other accessibility concerns about the course, please contact [Accessibility Services](#) as soon as possible.

## **ADDITIONAL SERVICES and SUPPORT**

The following are some important links to help you with academic and/or technical service and support

- General student services and resources at [Student Life](#)
- Full library service through [University of Toronto Libraries](#)
- Resources on conducting online research through [University Libraries Research](#)
- Resources on academic support from the [Academic Success Centre](#)
- Learner support at the [Writing Centre](#)
- Information for [Technical Support/Quercus Support](#)