APS110H1f2024 - Sept 4 2024

August 30, 2024 10:26 AM

Introductory day - APS110 Intro Chemistry and Materials Science

- **Section 3** - Prof Timothy P Bender - tim.bender@utoronto.ca - 'inbox' on Quercus

- **Land Acknowledgment**

I would like to acknowledge the land on which the University of Toronto operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Seneca, and most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and I am grateful to have the opportunity to work on this land.

- The world is going through some challenging times currently. I hope that as you gain the specialized knowledge from this and your other courses you'll always consider how you can apply it to improve society and the quality of life for everyone on the earth.

... slides from First Year Dean's office

Introduction

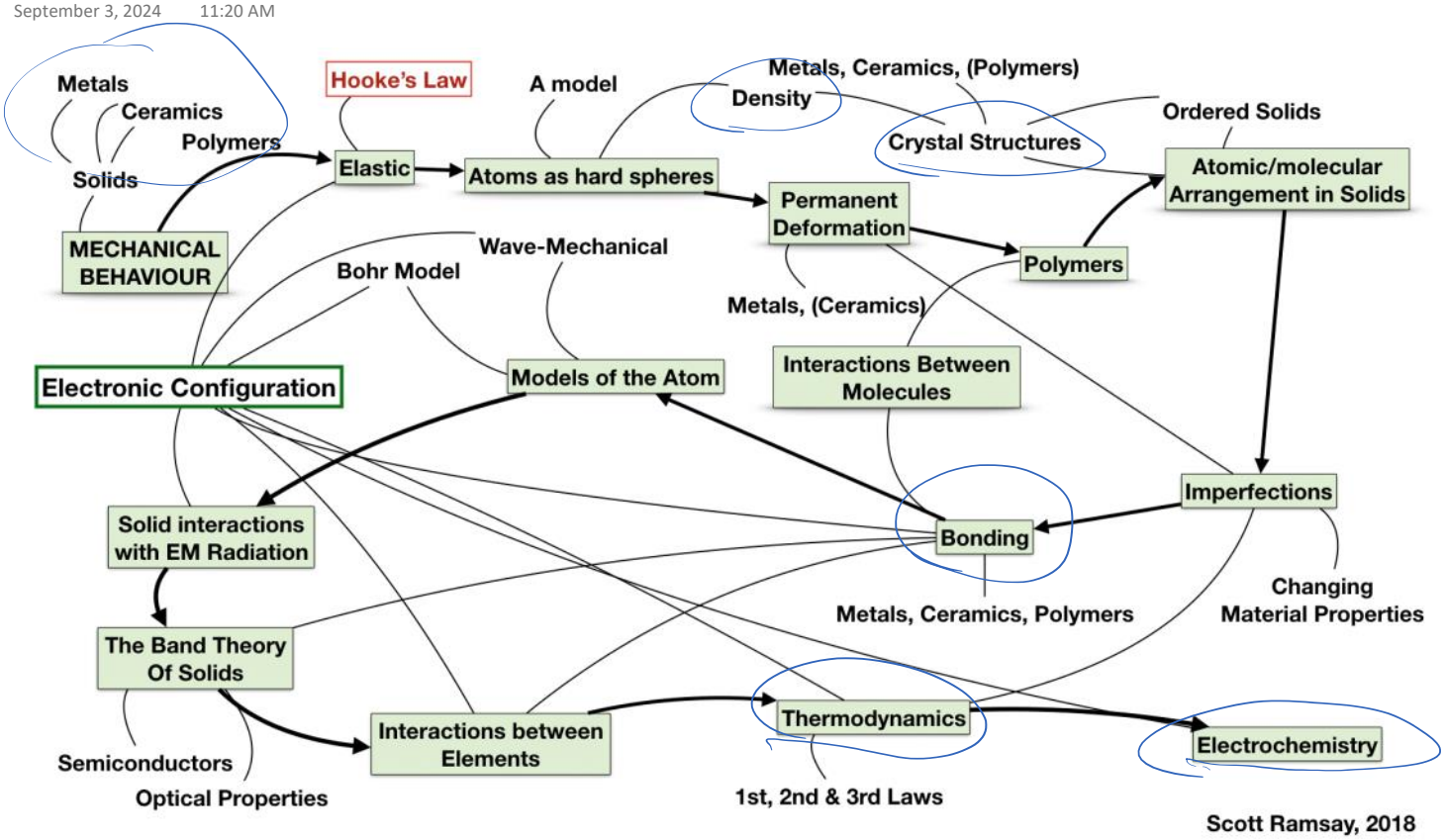
September 3, 2024 10:26 AM

mineral engineer
chamical engineer
→ material engineers

civil engineer
mechanical engineer
electrical engineer / comp engineer.

Introduction 2

September 3, 2024 11:20 AM



Syllabus

September 3, 2024 10:21 AM

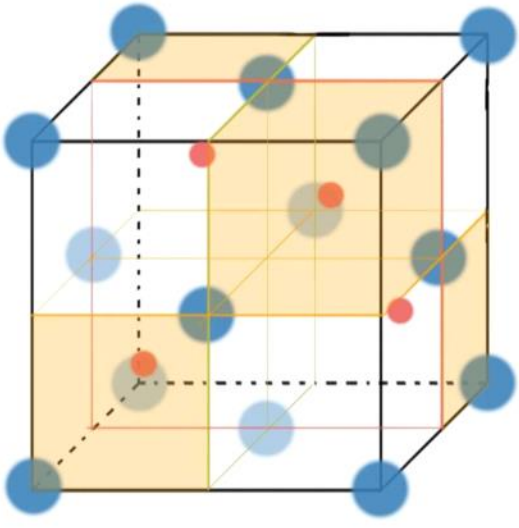
Course Syllabus for APS110/164 - Engineering Chemistry and Materials Science

Prof Timothy P. Bender **Prof Frank Gu**

Tim Bender and Frank Gu
Department of Chemical Engineering

Scott Ramsay **Prof Scott Ramsay**
Department of Materials Science & Engineering

Fall 2024



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1 Land Acknowledgment

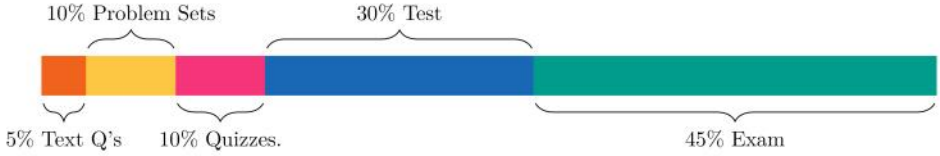
It is important to acknowledge the land that the University of Toronto itself is situated on. Therefore, we would like to acknowledge this land on which the University of Toronto operates. For thousands of years it has been the traditional land of the Huron-Wendat, the Seneca, and most recently, the Mississaugas of the Credit River. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

2 Who is going to teach you

Prof. Tim Bender, PhD | tim.bender@utoronto.ca | LEC0103
Prof. Frank Gu, PhD, PEng | f.gu@utoronto.ca | LEC0102
Prof. Scott Ramsay, PhD, PEng | scott.ramsay@utoronto.ca | LEC0101

3 Mark Breakdown

The final grade that you earn in this course will be distributed across several items, as shown here.



- **Online Textbook Questions**
  These are completed online through the TopHat textbook.
- **Problem Sets**
  These will be posted on Quercus at least one week prior to the due date and your answers must be uploaded to Quercus as a single PDF document. You may work together with classmates on these, but you must not copy one another directly.

- **Online Quercus Quizzes**
  These will be completed on Quercus as timed 30 minute quizzes. The quiz will be available for a 24 hour period on the posted date, however once you begin you will only have one 30 minute attempt at the quiz.
- **Term Test**
  The test will be in person and follow the same format as previous tests, typically 10 - 15 MCQ followed by 4-5 short answer questions. Typically the time to complete the test is one hour.
- **Final Exam**
  This is run during the final exam period, in person. It follows the same format as in previous years and is 2.5 hours in duration.

4 Course Level Learning Outcomes

These are the high level learning objectives. Be sure to familiarize yourself with the detailed learning objectives for this course. By the end of this course, students should be able to:

1. Articulate at least one logical characterization scheme for matter
2. Describe the uniaxial mechanical behaviour of metals, ceramics, and polymers
3. Describe the elastic behaviour of matter under shear loading
4. Distinguish between crystalline and non-crystalline matter in terms of long-range and short-range order
5. Explain and perform basic calculations involving the most common crystal structures of matter
6. Describe the generalized mechanical behaviour of plastic, elastomeric, and brittle polymers in uniaxial tension
7. Describe the mechanisms for elastic and permanent deformation in metals, ceramics, and polymers
8. Rationlize the optical and electrical behaviour of matter in terms of the Band Theory of solids

9. Explain, compare, and contrast the primary bonds as well as secondary bonds
10. Explain the zeroth, first, second, and third laws of Thermodynamics
11. Descibe the spntaneity of a process in terms of the change in entropy
12. Analyze and interpret a binary phase diagram

5 What you'll learn in this course

This course is structured around the principle of structure-property relationship. This relationship refers to an understanding of the microstructure of a solid, that is, the nature of the bonds between atoms and the spatial arrangement of atoms, which permits the explanation of observed behaviour. Observed materials behaviour includes mechanical, electrical, magnetic, optical, and corrosive behaviour. Topics covered in this course include: structure of the atom, models of the atom, electronic configuration, the electromagnetic spectrum, band theory, atomic bonding, optical transparency of solids, molecular bonding, hybridized orbitals, crystal systems, imperfections in solids, materials thermodynamics, free energy, phase equilibrium, and chemical equilibrium.

5.1 How all of that fits into this course

In the detailed learning objective/lecture schedule provided on Quercus you'll find a chronological listing of the topics that will be covered in this course. You'll notice that the topical sections seem to jump around a bit. Good observation! This is because there are so many interrelated concepts in this course (and with other courses) and we will move into new topics as our level of understanding grows and we encounter new unanswered questions. As we build increasingly detailed levels of understanding we'll be able to return to older topics with a new appreciation. Beautiful.

You will only be assessed on what is covered in the learning objectives.

6 What you should know before this course

We will assume that you have already learned some basic topics. Some of these topics are important enough that I will cover them again, however most will not and so if you are a little rusty on any of them you will want to review them. I am happy to suggest helpful resources if needed.

- The basic structure of the atom (protons, neutrons, electrons, atomic number)
- The periodic table
- Hooke's Law as applied to springs (F=Kx)
- Proficiency with arithmetic and trigonometry
- Proficiency with basic mathematical functions including the exponential function and the logarithmic function
- The Cartesian coordinate system

7 Things to help you succeed

7.1 Textbooks that you'll find useful

Required Textbook
We'll be using an online textbook, hosted by Top Hat. You'll need to purchase the online textbook and enroll in the course using the join code indicated on Quercus.

NOTE: you should only be charged $37.80 plus tax. Do not pay more than this. If Top Hat asks you for more than this, please let me know.

Other Texts An excellent textbook that you may want to refer to if you are thirsty for more information or just need another perspective on a topic is *Fundamentals of Materials Science & Engineering*, 4th or 5th Edition, by William D. Callister, Jr., John Wiley & Sons, Inc.

Callister provides excellent coverage of nearly all of the topics in this course, however, when we cover thermodynamics and chemical equilibrium you may need more than Callister has to offer.

For the thermodynamics section, please refer to the following freely available text on the Open Textbook Library:

- Entire Text: General Chemistry: Principles, Patterns, and Applications
- Direct link to thermodynamics chapter.
- Direct link to chemical equilibrium chapter.

7.2 Videos

All of the lectures in this course will be made available through Prof. Ramsay's YouTube channel along with short videos on all of the topics.

8 Other important things that you should know

8.1 Communication with instructors

You may contact the instructors via email and we will do our best to respond in a timely fashion, however, we do receive a high volume of emails and occasionally will unintentionally overlook an email. If you do not receive a response from either of us within 12 - 24 hours or so, please email again.

We also encourage you to post questions on the course discussion board where your classmates will then also be able to benefit from the responses.

Please review discussion postings before posting your own to avoid redundant topics.

8.2 Deadlines

A deduction of 20% of the total possible points on an assignment will be awarded for each day that an assignment is late, beginning at one minute after the deadline and again for every 24 hour period thereafter.

9 Mental Health and Wellness

As a university student, you may experience a range of health and/or mental health issues that may result in significant barriers to achieving your personal and academic goals. The University of Toronto offers a wide range of free and confidential services and programs that may be able to assist you. We encourage you to seek out these resources early and often.

- Student Life Website
- Health and Wellness Website

If, at any point during the year, you find yourself feeling distressed and in need of more immediate support, visit the Feeling Distressed Webpage: http://www.studentlife.utoronto.ca/feeling-distressed for more campus resources.

Off campus, immediate help is available 24/7 through Good2Talk, a post-secondary student helpline at 1-866-925-5454.

All students in the Faculty of Engineering have an Academic Advisor who can advise on academic and personal matters. You can find your department's Academic Advisor here:
http://undergrad.engineering.utoronto.ca/advising-support-services/academic-advising/

10 Institutional policies and support

10.1 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 www.governingcouncil.utoronto.ca/policies/behaveac.htm) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In papers and 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. Please also refer to:
www.utoronto.ca/academicintegrity/resourcesforstudents.html.

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (https://uoft.me/pdt-faq).

10.2 Inclusion

All students, staff, and faculty at the University of Toronto have a right to learn, work and create in a welcoming, respectful, inclusive and safe environment. In this class we are all responsible for our language, actions and interactions. Discriminatory speech or actions of any kind will not be permitted, and do not align with the values of our Faculty. As a class we will support each other's learning by creating an inclusive learning environment, one which is based on mutual respect for the dignity and worth of every person.

If you experience or witness any form of discrimination, please reach out to the Engineering Equity Diversity & Inclusion Action Group online, an academic advisor, a U of T Equity Office, or any FASE faculty or staff member that you feel comfortable approaching.

10.3 Accessibility needs

Students with diverse learning styles and needs are welcome in this course. Please feel free to approach me or contact Accessibility Services (accessibility.services@utoronto.ca) so we can assist you in achieving academic success in this course. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact Accessibility Services as soon as possible. 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 about Accessibility Services
- Information for Technical Support/Blackboard Support (Portal Info)

10.4 Copyright

If a student wishes to copy or reproduce lecture presentations, course notes or other similar materials provided by instructors, he or she must obtain the instructor's written consent beforehand. Otherwise all such reproduction is an infringement of copyright and is absolutely prohibited.

10.5 Recordings of online sessions

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 source depending on the specific facts of each situation, and are protected by copyright. In this course, you are permitted to download session videos and materials for your own academic use, but you should not copy, share, or use them for any other purpose without the explicit permission of the instructor. For questions about recording and use of videos in which you appear please contact your instructor.

September 4, 2024 3:43 PM

Eng Sci -

Track One -

CHE -

MSE -

Civ -

MEA -

MEC -

ECE -

Introduction 3

September 3, 2024 12:45 PM

Rough plan for tutorials is:

Short review (<10 min)

Mock quiz (~30 min, self-graded)

Problem solving with classmates/TA (~3 problems presented by TA)