CHM 458H1/1307 SYLLABUS (Winter 2022)

Soft Materials for Life, Energy, and the Environment

I. TEACHING TEAM

Instructor: Prof. Helen Tran
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Instructor Biography:

Dr. Tran is an Assistant Professor at the University of Toronto in the Department of Chemistry (cross-appointed in the Department of Chemical Engineering). She was an Intelligence Community postdoctoral fellow at Stanford University under the mentorship of Prof. Zhenan Bao in the Chemical Engineering Department, where she worked on stretchable and biodegradable electronics. She received her BS in Chemistry with a minor in Chemical Engineering from the University of California—Berkeley in 2009, conducting undergraduate research with Prof. Tsu-Jae King Liu (Electrical Engineering, Berkeley) and Prof. Christopher Schuh (Material Science, Massachusetts Institute of Technology). In the two subsequent years, Dr. Tran was a post-baccalaureate fellow and Scientific Engineering Assistant in Dr. Ronald Zuckermann's research group at the Molecular Foundry at Berkeley National Labs, exploring the self-assembly of biomimetic polymers into 2D nanosheets. She completed her PhD at Columbia University in 2016 under the supervision of Prof. Luis Campos, broadly investigating hierarchical ordering and periodic patterning in block copolymer systems. Also, she was selected as an AAAS IF/THEN Ambassador for her outreach endeavors, leading to media opportunities such as being featured on the CBS TV show Mission Unstoppable and on the Girl Scouts Cadette Badge Workbook for Exploring STEM Careers. Dr. Tran has been committed to scientific outreach, endorses communication among interdisciplinary disciplines, and continually strives to become a supportive mentor.

Student hours: Thursday, 4:30 pm ET
Student hours are designated times to clarify concepts, review course aims, discuss ideas, or just chat with Helen about fellowships, careers, etc!

Course meeting: Tuesday, 10 am - 12 pm ET
Location: Lash Miller LM 157

II. COURSE OVERVIEW

Course description: Welcome to Soft Materials for Life, Energy, and the Environment! In the framework of a dry lab that takes place during lecture, students will analyze and interpret characterization data, extending their existing knowledge of chemical fundamentals and experimental techniques to polymeric systems. Through a combination of lectures, dynamic collaborations, and self-paced assignments, students will actively engage with peers to understand course materials (including published literature), explore how polymer innovations are commercialized, and develop a toolkit for leveraging instrumentation to investigate hypotheses in research. Students will prepare a pitch for a polymer start-up as part of the course. Note that this course will include interactions

with peers, presentations to the group, and elements of a start-up pitch which may be unconventional for a chemistry course.

Learning Outcomes: At the end of the course, students will be able to link their knowledge of analytical techniques learning in the context of small molecules to polymers, identify an opportunity where polymer research may be translated for commercial applications, and analyze the efficacy of science literature to the general public.

Prerequisites (458): CHM247H1/CHM249H1/MSE245H1; CHM220H1/CHM222H1/CHM223H1/APS110H1
Recommended: CHM325H1; CHM342H1/CHM343H1; CHM457H1

Prerequisites (1307): None needed.

Readings: There is no dedicated text for this course.
Articles will be made available to complement lecture notes.
Important course materials will be regularly delivered on Quercus.
Check your email or Quercus daily for updates.

Honor code: Students are expected to contribute to a mutually respectful learning environment though intellectual honesty, dynamic discussions, and openness for peers, course assistants, and the instructor. Details are outlined at the end of the syllabus.

II. COURSE ORGANIZATION

The content of the lectures may change depending on course progress. Due to the interactive nature of the course, student must be present for modules 6, 8, 9, and 12 at minimum, as it will involve providing feedback and asking questions during the presentation. It is highly recommended that the students attend lecture in-person.

Text in blue/italics indicates item related to grading. Assignments are due the following Monday at 5 pm ET unless stated otherwise.

Module	Dates	Topics
1	Jan. 11	Course introduction + notable polymer start-ups / companies *Assignment: introduce yourself, questionnaire, scientific spotlight*
2	Jan. 18	Purification and molecular weight characterization *Assignment: problem set*
3	Jan. 25	X-Ray scattering *Assignment: problem set*
4	Feb. 1	Electron conducting polymers *Assignment: python project due February 21st 5pm ET.* *Partners for the start-up pitch will be assigned.* *Start-up pitch: 2-pager due March 21st 5pm ET.* *Start-up pitch: all presentations due March 28th 5pm ET.*
5	Feb. 8	Sequence-specific polymers *Assignment: submit quiz questions*
6	Feb. 15	Imaging *In-class quiz* *Partners for the journal club will be assigned.*

		Journal club: all presentations due March 7th 5pm ET.
7	Mar. 1	Mechanical characterization
8	Mar. 8	Peer presentations: 10 min journal club per group *In class assignment: feedback*
9	Mar. 15	Peer presentations: 10 min journal club per group *In class assignment: feedback*
10	Mar. 22	Hydrogels and crosslinked networks
11	Mar. 29	Recyclability and biodegradability
12	Apr. 5	Peer presentations: 5 min VC pitch competition per group *In class assignment: feedback*

IV. EVALUATION

Overview:

Online assignments – 40%
Quiz – 10%
Python project – 10%
Journal club – 20%
Start-up Pitch – 20%

Online assignments: Assignments will be accepted up to 2 days after for credit up to 50% (certain assignments may be excluded). Please ensure that your assignments are properly submitted. For some assignments, undergraduates will have a different rubric for grading than the graduate students, as this is a cross-listed course. For example, the "submit a quiz question" assignment will have different point distributions and metrics for undergraduates. Student must submit their own work. If answers were copied from previous years, the entire assignment will be an automatic zero and will be investigated.

Quiz: The quiz will be held in-person during module 6. It will be approximately 45 minutes.

Python project: Students do not need to know Python for this course. Students will learn how to use Python with this introductory project with step-by-step directions. The Scientific Spotlight will help students start using Python, if they did not previously use it. For the Python project, the student will receive a unique data set to complete calculations.

Journal club: The journal club will be an opportunity to explain the characterization techniques that the student learned in the previous modules in the context of a research project. The journal club will be completed with a partner randomly assigned by the instructor during module 6. Partners may be rearranged if students drop out of the course. Students will complete an attestation of work contributed by each partner.

Start-up pitch The start-up pitch involves preparing a 2 page executive summary and slide deck presentation, which will be presented to the class and invited experts. The start-up pitch will be completed with a partner randomly assigned by the instructor during module 4. Partners may be rearranged if students drop out of the course. Students will complete an attestation of work contributed by each partner.

IMPORTANT: 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

quizzes/term tests. Moreover, new content may be made available or new circumstances arise, which may slightly alter the course schedule and content.

V. COURSE POLICIES

Each week, a new module will be released on Quercus and you are expected to review the lecture notes as needed, participate in class discussions and submit any assignments according to the deadlines. Announcements will be made on Quercus, so please check the website regularly for updates. All course content presented synchronously will be uploaded to Quercus for asynchronous learning. Notably, important engagement from group work from synchronous learning enhances the students understanding of the course material; it is recommended student attend all course meetings, if possible. Students will need to collaborate (either asynchronously or preferably synchronously) on certain assignments, and will be expected to complete a presentation (different time zones will be accommodated). Students are encouraged to additionally attend the student hours, which may rotate times to accommodate students in different time zones. If the student is unable to attend the designated times by the instructor or course assistants, please email to schedule an appointment.

VI. TECHNOLOGY REQUIREMENTS

Specific guidance from the U of T Vice-Provost, Students regarding student technology requirements is available at https://www.viceprovoststudents.utoronto.ca/covid-19/tech-requirements-online-learning/. Advice for students more broadly regarding online learning is available at https://onlinelearning.utoronto.ca/getting-ready-for-online/. This course requires the use of computers. Computer viruses, crashed hard drives, 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

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 (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:

On quizzes and term tests:
1. Using or possessing unauthorized aids. Please note that the use of websites (such as Chegg.com or the course discussion board) to post quiz/term test questions or to post/access answers to questions is an academic offence under the University of Toronto's Code of Behaviour on Academic Matters. Alleged instances of this nature are forwarded to the Faculty of Arts & Science Student Academic Integrity office.
2. Looking at someone else's answers or collaborating/discussing answers during a quiz or term test.
3. Misrepresenting your identity.

In general 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 (www.academicintegrity.utoronto.ca/).

Plagiarism detection:
When appropriate, 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).

Copyright:
If a student wishes to copy or reproduce course content provided by instructors, the instructor's written consent must be obtained beforehand. Otherwise all such reproduction is an infringement of copyright and is absolutely prohibited. More information regarding this is available at https://teaching.utoronto.ca/ed-tech/audio-video/copyright-considerations/.

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 (https://studentlife.utoronto.ca/department/accessibility-services/) as soon as possible.

Accommodations for religious observances
Following the University's policies, reasonable accommodations will be made for students who observe religious holy days that coincide with the due date/time of an assignment, tutorial, class or laboratory session. Students must inform the instructor before the session/assignment date to arrange accommodations.

Additional services & 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

Acknowledgement of traditional lands
We wish 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.