

MSE 450: Polymer Science & Engineering

Instructor: Prof. Qian Chen

Form: Complete Online Teaching as required by the University

Instructor Email: gchen20@illinois.edu;Course Web Page: compass2g.illinois.edu**Textbook:**

There is no required textbook for this course, but a suggested reference is:

Essentials of Polymer Science and Engineering – Paul C. Painter and Michael M. Coleman, DEStech Publications, 2009; on reserve at Grainger Library.

Assignments:

There will be homework most weeks over the course of the semester. Late HW receives 1/2 credit. All students will write a term paper, due on **April 21st, 2021**. See instructions in Section III of “**ADDITIONAL NOTES FOR ONLINE TEACHING**”.

Exams: There will be one midterm and one final, both of which will be conducted **online**.

Tentative Exam Dates: March 3, 2020 **Final date:** TBA

Grading: 3 credit hours:

Midterm (30%) + Final (35%) + Homework (20%) + Term paper (15%)

4 credit hours:

Midterm (25%) + Final (35%) + Homework (15%) + Term Paper (25%)

Teaching Assistants (TA):

Alex Deptula, email: deptula2@illinois.edu

Lehan Yao, email: lehan2@illinois.edu

Lectures:

We will do synchronous zoom lectures at the designated lecture time: 11:00 am – 11:50 am (Central time) on Mondays, Wednesdays and Fridays. All zoom lectures would be recorded and uploaded to compass

Office hours:

Alex Deptula (TA)

Lehan Yao (TA)

We have two forms of office hours:

Form 1: Wednesdays 5–6 pm (Central time), by TAs through Zoom

Form 2: “Office Hour Forum” on Compass where you can ask any questions you may have on homework, or other issues relating to the class

- Alex or Lehan will be online at the usual office hour time (Wednesdays 5–6 pm) to respond to your questions as best and as quickly as they can. If you have questions outside of this time frame, you may still post in the forum and they will try to answer you in a timely manner, but emailing them is probably a better option.
- To post a question, click the “Create Thread” button and type your question in the subject box.

Topics

1. Introduction

What is a polymer? Chain architecture, chemical makeup, physical states. What are typical behavior patterns? viscous liquids, elastomers, fibers, semi-crystalline, liquid crystalline, glassy, conducting.

2. Synthesis and processing

Basic concepts: polymerization methods based on functional units; chains, gels, network, extent of reaction.

Different polymerization methods

3. Mechanical properties

Viscoelastic behaviors: elastic modulus, shear moduli,

Rouse, reptation, T dependence, time-temperature superposition; crazing.

4. Single polymer molecules

Conformations: random walk chain, good solvents.

Molecular weight: M_n , M_w , how to measure molecular weights

5. Characterization methods

Light scattering, fluorescence correlation spectroscopy

6. Thermodynamics of polymers

Mix, Flory-Huggins equation, Phase diagram

7. Applications

How to engineer thermodynamics

Biomaterials; electronic polymers; conducting polymers; biodegradability

Policy on conflicts or emergencies:

- (1) For time conflicts with other events (e.g. another scheduled exam), or an official UIUC activity (e.g. varsity athletics, band concert),
Regarding HW, please email official documentation (or scanned version) about the conflict at least **two weeks** before the homework due date. The HW due date will be extended.
Regarding the exam, please email official documentation (or scanned version) about the conflict at least **three weeks** before our exam date. An online make-up exam will be scheduled.

- (2) If you will not be able to make it to the exam or submit HW on time due to serious illness or other emergent personal crisis (e.g. car accident) that are not described in (1), you must send emails to the TAs (deptula2@illinois.edu, lehan2@illinois.edu) and the instructor (qchen20@illinois.edu) at the earliest possible opportunity, and submit a statement (or scanned version) from the professionals that are authorized to evaluate your situations (e.g. doctors, police). The statement needs to clearly explain that you are not physically capable of attending the exam or submitting HW on time. The HW due date will be extended for HW, and an online make-up exam will be scheduled for exam.

ADDITIONAL NOTES FOR ONLINE TEACHING

I. Homework Submission Instruction

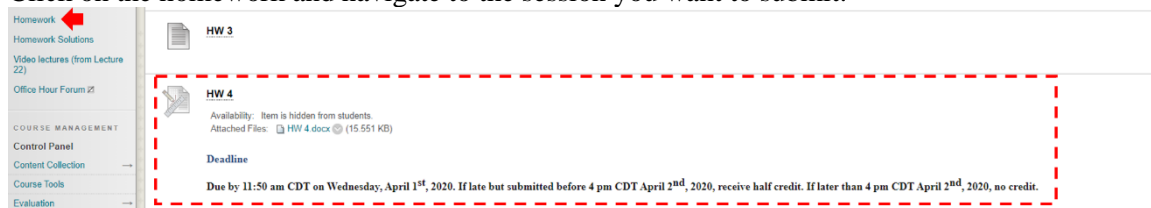
Homework will be given and submitted via Compass2g system.

Note:

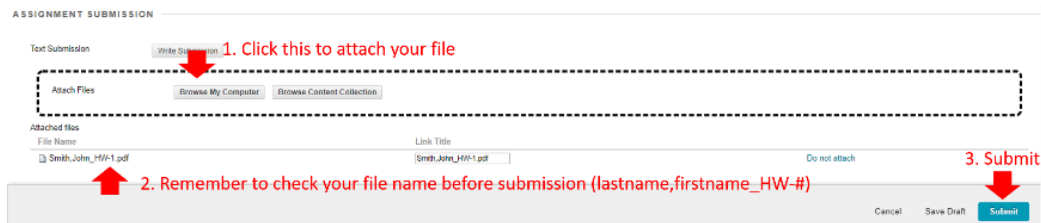
1. **Multiple attempts** are allowed for submission but **only the last attempt will be graded**.
2. Both pdf and word document are acceptable, but typed answer is preferred. If you decide to write your homework, it is suggested to write it electronically using a tablet. If you decide to scan your homework, **make sure your scanned document is readable** to avoid losing points.

Submission steps:

- Click on the homework and navigate to the session you want to submit.



- Upload homework following the **naming convention: lastname_firstname_HW#** (e.g., **Smith_John_HW1**).
- Click submit!



II. Midterm and Final Instruction (Online)

- Both exams will be held online and proctored via Zoom (more instructions to follow).

- The exams will be given on Compass and we will provide a sample exam two weeks ahead of time for you to check on the system.
- For questions during the exam, we will set an exam forum (the same format as office hour forum) accessible during the exam, you can post your questions on the exam content and the TA will answer them if appropriate. You also have the option to send “chats” to the TAs via the proctoring Zoom during the exam. Discussing answers on the exam questions will be prohibited and penalized.

III. Term Paper Instruction

- A term paper will be required for the class **due on 11 pm CST, April 21st, 2021. This is a hard deadline.**
- The term paper will be submitted to Compass after a plagiarism check offered by Compass.
- Students who are taking the course for **3 credit hours** will need to submit a critique of a paper (journal article) that is related to the topics covered in class. The review will be 3 pages (strict cut off), **double spaced**, Times New Roman 12 pt font, justified text alignment, with a maximum of 1 figure that is no larger than half the page.
Some journal that have appropriate articles include and not limited to, *ACS Macro Letters*, *Macromolecules*, *Soft Matter*, *Physical Review Letters*, *Nature Materials*, *Journal of Polymer Science*, *Journal of the American Chemical Society*, *Nature Chemistry*.
- Students who are taking the course for **4 credit hours** will need to submit a review of a topic in polymer science. This will account for 25% of your grade. The review will need to be at least 5 pages, **single spaced** with only text, Times New Roman 12 pt font, justified text alignment. You may add figures to your review and go beyond 5 pages, but the text alone needs to cover 5 pages. There is an upper limit of 8 pages total for the review.
- We will be using a Google Sheets document for students to sign up for articles and review topics. This will be a first-come, first-serve basis. Only edit the boxes associated with your name. DO NOT change anyone else’s. We can track changes on Google Sheets if any foul play occurs.
- If you have any questions, please feel free to email Prof. Chen, Alex or Lehan.