

**MSE/ChBE/CHEM/ME 4775 – Fall 2026**  
**Polymer Science and Engineering I**  
Location & Time TBD

- Instructor:** Prof. Scott Danielsen  
273A Paper Tricentennial Building  
scott.danielsen@mse.gatech.edu
- Teaching Assistant:** TBD
- Office Hours:** TBD
- Course Description:** This course is intended to cover the basic concepts of polymer science and engineering including polymer chemistry, structure, thermodynamics, mechanics, and dynamics.
- Prerequisites:** CHEM 1315 or CHEM 2312 (Organic Chemistry)  
MSE 3001 or CHBE 2130/2140 or CHEM 3411 or ME 3322  
(Thermodynamics)
- Textbook:** *Required:* None.  
*Suggested:* Introduction to Polymers, Young and Lovell, 3<sup>rd</sup> Edition  
Polymer Chemistry, Lodge and Hiemenz, 3<sup>rd</sup> Edition
- Course Website:** Canvas will be used to post important announcements as well as the syllabus, course schedule, lecture notes, homework, homework solutions, and other resources.
- Course Outcomes:** The primary course objectives are as follows:
- 1) Recall the chemical structure and formulas of common polymers.
  - 2) Distinguish between different polymerization reaction mechanisms, kinetics, and products.
  - 3) Predict conversion, molecular weights, and molecular weight distributions resulting from polymerization reactions.
  - 4) Interpret and analyze polymer characterization data to determine and communicate structural and physical properties.
  - 5) Calculate and model polymer chain dimensions and structural parameters using appropriate theoretical frameworks.
  - 6) Estimate the thermodynamic interaction and miscibility of polymer solutions and polymer blends.
  - 7) Differentiate the physical states and transitions of polymers.
  - 8) Predict how polymer properties affect the thermal and mechanical properties of polymer solutions, melts, and networks.
  - 9) Describe the viscoelastic behavior of polymers, construct basic viscoelastic models, and use available information on polymers to predict the response to applied deformation.
  - 10) Design and propose strategies for polymer synthesis, characterization, processing, and computational modeling for industrial or research applications with consideration of sustainability and social impact.

**Grades:** Your grade in the course will be determined based on your performance on homework, quizzes, and exams.

<u>Item</u>	<u>Percentage of Course Grade</u>
Homework, <i>250 points maximum</i>	25%
Quizzes, <i>50 points each</i>	15%
In-Class Midterm Exams, <i>150 points each</i>	30%
Take-Home Final Exam, <i>300 points</i>	30%

The course grading scales are:

A: 90-100%	Pass: 60-100%
B: 80-89%	Fail: 0-59%
C: 70-79%	
D: 60-69%	
F: 0-59%	

Final grades may be curved at the instructor's discretion but will not be curved to lower grades. Errors in grading must be addressed within 7 days after return by contacting the instructor and the TA via email. Disputes after this one-week period will not be considered. Errors in recording of grades to Canvas must be addressed by the final lecture by contacting the instructor and the TA via email.

**Lectures:** Attendance in lectures is highly recommended. Please be on time to minimize disruption to others. For most lectures, blank skeleton notes will be posted to Canvas ahead of time, which we will fill in during the class period. To prepare, it is encouraged to read the assigned textbook sections prior to class. Recordings of the lecture, barring technical difficulties, will be posted to Canvas. However, these should be used as a supplement rather than a replacement for lecture and can be withheld at any time at the instructor's discretion.

**Homework:** Homework assignments will be given throughout the term. Each question will be worth 10 points and graded on the binned scale: +10 for a fully or mostly correct answer, +5 for a mostly incorrect but on topic answer, and +0 for an off-topic or no answer. Periodic surveys on Canvas will provide additional points for completion. No late homework or surveys will be accepted, but while the overall homework score has a maximum of 250 points, there will be more than 250 points possible across all the assignments.

All homework must be entirely a student's own work. Discussion with other students on homework is highly encouraged but copying from one another or using generative AI resources will be considered academic misconduct. Note that since the homework represents 25% of the course grade, neglecting the homework will jeopardize your performance in the class. You can ask questions regarding your homework, although you should try to think about the problems before asking the instructor or the TA.

- Quizzes:** Short quizzes (15 min) will be conducted in-class through Canvas periodically throughout the semester. Quizzes will be non-cumulative and cover course material introduced since the last quiz or exam.
- Midterm Exams:** The two midterm exams will be in-class during regularly scheduled lectures, with a 1h 15min time limit (unless accommodations given by GT.) They will be closed book and closed notes except a single 8.5"x11" double-sided, handwritten notes sheet. The midterms will not be cumulative. Exam 1 will focus on polymer chemistry, covering approximately the first third of the course. Exam 2 will focus on polymer physics, covering approximately the second third of the course. Exams will include a mix of quantitative problems to solve as well as discussion questions. The use of a calculator is permitted and encouraged.
- Final Exam:** The final exam will be a cumulative take-home exam, due at the date and time of the scheduled final exam by the registrar. It will be considered open book and open notes, although it must be entirely a student's own work. No discussion with peers or copying from one another is permitted, subject to the Georgia Tech academic integrity policies.
- Make-up Policy:** Make-up quizzes or exams will only be permitted when absences are due to legitimate reasons such as illness, religious observance, or other events recognized by Georgia Tech as a valid excuse. In any situation, you must notify the instructor in advance of the scheduled assessment via email to schedule a make-up and provide documentation from Georgia Tech through the Dean of Students. If you do not contact the instructor in advance, it may not be possible to schedule a make-up quiz or exam. Whenever possible, make-up assessments will be administered during the week following the scheduled date of the original activity. Make-ups may be different from those administered during the regular period.
- Academic Integrity:** Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. All students in this class are expected to respect the Georgia Tech honor code and behave in a professional manner when it comes to academic integrity. Copying from other students (current or former), instructor/TA solutions from previous semesters, solution manuals, or websites is considered an honor code violation. Any students violating the honor code or suspected of academic misconduct will be turned over to the Office of Academic Integrity, Dean of Students to investigate the incident(s). Cheating off anyone else's work is a direct violation of the Georgia Tech Academic Honor Code and will be dealt with accordingly. For any questions involving any honor code issues, consult the instructor, the teaching assistants, or [honor.gatech.edu](http://honor.gatech.edu).
- Accommodations:** Georgia Tech encourages qualified persons with disabilities to participate in its programs and activities. If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at [disabilityservices.gatech.edu](http://disabilityservices.gatech.edu) as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. If you anticipate needing any additional accommodation in this course or

have questions about physical access, please tell the instructor as soon as possible. Finally, if you encounter extenuating circumstances that interfere with your ability to complete exams or homework as scheduled, please meet with the Dean of Students. The Dean's office is your best resource so that you do not need to discuss the details of your personal situation with the instructor.

**Expectations:**

At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.