

MSE6600 Advanced Polymer Processing, Fall 2026

Catalogue Data: Overview of common polymer processing techniques and recent advancement; Modeling of polymer processing with emphasis on how a sound model can be built; Computer aided engineering for polymer processing.

Scheduled Meeting times:

Class @ 11:00 am - 12:15 pm on Monday & Wednesday (Aug. 24, 2026 to Dec. 17, 2026)

Assigned classroom: [Clough UG Learning Commons 325](#)

Text: No designated textbook. Course notes will be provided.

Pre-requisite knowledge: Tensor algebra and calculus, some understanding of rheology and continuum mechanics

References:

- Z. Tadmor and C.G. Gogos, *Principles of Polymer Processing*, Wiley-Interscience, 2006.
- J.F. Agassant, P. Avenas, J.-P. Sergent and P.J. Carreau, *Polymer Processing: Principles and Modeling*, Hanser, New York, 1991.
- J. A. Dantzig and C. L. Tucker, *Modeling in Materials Processing*, Cambridge University Press, Cambridge, UK, 2001.
- D.G. Baird and D.T. Collias, *Polymer Processing Principles and Design*, Wiley, John & Sons, 1998.
- A.I. Isayev, ed., *Injection and Compression Molding Fundamentals*, Marcel Dekker, Inc., New York, 1987.
- C.L. Tucker, ed., *Fundamentals of Computer Modeling for Polymer Processing*, Hanser Publishers, Munich, 1990.
- S. Middleman, *Fundamentals of Polymer Processing*, McGraw-Hill, 1977.
- F.A. Morrison, *Understanding Rheology*, Oxford University Press, 2001.
- C.W. Macosko, *Rheology: Principles, Measurements, and Applications*, VCH, New York, NY, 1994.
- R.I. Tanner, *Engineering Rheology*, Second Edition, Oxford University Press, 2000.
- Assorted papers including
Y. Jaluria, “Fluid flow phenomena in materials processing – the 2000 Freeman scholar lecture”, *Journal of Fluids Engineering*, Vol. 125, pp. 173-210 (2001).

Instructor:

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Office hours (Fall 2025): [Wednesday & Friday 4:00-5:30 pm](#), or by appointment via email

Course Objectives:

By the end of the course, the successful student will be able to:

1. Describe common polymer processing techniques and recent advancement in polymer processing
2. Understand the general framework for building a sound model for polymer processing
3. Understand physical processing of polymer involving polymer chains as conformational coils
4. Understand mixing dynamics of polymer blends
5. Employ the Hele-Shaw flow model to analyze injection molding and compression molding
6. Analyze the free surface flow in extrusion and post extrusion processes
7. Analytically or numerically solve polymer flow and heat transfer problems
8. Simulate polymer processing problems using computer aided engineering

Topical Outline:

1. Logic for polymer processing
2. Review on continuum mechanics and polymer rheology
3. Deformation of polymer (both as a continuum medium and as a conformal polymer coil)
4. Mixing dynamics of polymer blends
5. How to build a sound model for polymer processing?
6. Dimensional, order-of-magnitude and scaling analyses
7. Numerical methods for polymer processing
8. Modeling of die flow
9. Modeling of molding processes
10. Modeling of elongational flow in polymer processing
11. Modeling of viscoelastic flow and hyperelastic deformation

Grading Breakdown:

- Course Participation: 7.5%
- Homework (8–10 assignments): 27.5%
- Midterm Exam: 27.5%
- Final Exam (cumulative): 37.5%

Grading Scheme (Grading will be no tougher than this): **A 90-100; B 80- 89; C 70-79; D 60-69**

Exam Dates:

- Midterm exam: **October 21, 2026 (11 am – 12:15 pm)**
- Final exam: **December 16, 2026 (11:20 am – 1:50 pm)**

Canvas will be used to provide some course information. Sample exams will be provided on Canvas; they are for your information only and may not correlate with actual test questions that you will see. Please note that if you understand and can work homework problems, you should do fine in this class.

Policy & Academic Honor Code:

- No late submission of homework/reports/papers will be accepted. Homework must be done individually by a student unless otherwise stated. The lowest grade of homework will be dropped in the calculation of the final course grade. If you missed an assignment, you would receive 0 for that assignment; in this case, the 0 grade of this assignment would be dropped.
- There will be 8-10 homework assignments during the semester. The last assignment may be due on the last Final Instructional Class Day.
- Exams will be closed-book. Details on exam format will be discussed in class before the exam. FINAL EXAM is comprehensive (includes all course contents).
- You must notify the instructor, in writing, of any scheduling conflicts (for acceptable absences per GT attendance policy <https://catalog.gatech.edu/rules/4/>) with exams/tests a MINIMUM of two weeks prior to scheduled exam dates and provide an Institute-issued documentation of excuse from Belonging & Student Support Office (or Dean of Student's Office).
 - The grade for the exam will be zero if you fail to show up to take the exam at the scheduled time without an Institute-issued documentation of excuse.
 - Belonging & Student Support Office (or Dean of Student's Office) may decline to issue a note of excuse when the situation is outside the guideline for acceptable excuses. Instead, it may provide a form letter stating that the instructor has the discretion to handle the situation – this type of form letter does not count.

- Attendance:
 - **Class attendance is required and will be enforced.** Students are expected not only to attend class but also to participate actively.
 - Each student is allowed up to two absences during the semester without deductions from attendance scores. For these first two absences, students do not need to notify the instructor by email or otherwise. Absences officially approved by the institute do not count toward these two allowed absences. For any additional absences to be considered excused, the student must request a formal memo from the Dean of Students' Office (or equivalent) and have it sent to the instructor.
 - Participation includes asking questions and engaging in class discussions. Attendance will be checked periodically by the instructor. Short quizzes may also be given without prior notice.
- The use of electronic devices including laptops, cell phones, netbooks, iPads, and other similar devices **is strongly discouraged during class lectures** unless the device is solely used for notetaking purpose.
- This course adheres to the principles outlined in the Student-Faculty Expectations Agreement, which promotes mutual respect and responsibility between students and faculty. Please review the agreement at <https://catalog.gatech.edu/rules/21/>
- Compliance with Georgia Tech's Academic Honor Code is required. Please read and understand this document (per the Georgia Tech Honor Code Website): <http://policylibrary.gatech.edu/student-affairs/academic-honor-code>).
- Plagiarizing is defined by Webster's as "to steal and pass off (the ideas or words of another) as one's own: use (another's production) without crediting the source." If caught plagiarizing, you will be dealt with according to the GT Academic Honor Code. Particularly for homework assignments, discussion with other students on the problem sets is encouraged but the final work you turn in must be your own.

Special Accommodations:

- If needed, we will make special accommodations for students with documented disabilities. These accommodations must be arranged in advance and in accordance with the Office of Disability Services (<http://disabilityservices.gatech.edu>).
- Scheduling conflicts in special circumstances for homework and exam should be noted in person to the instructor, at least 1 week in advance for homework and at least 2 weeks in advance for exam.