

Preparation & Reactions of Polymers Syllabus

CHEM/CHBE/MSE 6750 - 3 credit hours

T/Th 12:30PM - 1:45PM, MoSE 1224

Instructor Information

Instructor
Dr. Will Gutekunst
Office: MoSE 1100Q

Email
willgute@gatech.edu

Office Hours & Location
Tuesday 4:00-5:00PM or appointment

General Information

Description

CHEM/CHBE/MSE 6750 will present the fundamentals of synthetic polymer chemistry via step-growth and chain-growth (radical/ionic/organometallic) mechanisms. Topics will include polymerization reactions for most common classes of polymers, consideration of the thermodynamics and kinetics of polymerization, and post-polymerization reaction processes. Lectures will primarily follow the text with exclusion of specific portions. Supplemental material will be added occasionally from the primary literature to provide more recent developments in polymer synthesis.

In-Class Sessions

Lectures will be given in an in-person format in MoSE 1224. In the event that a student is unable to attend a class, accommodations can be made to record a lecture that can be shared afterwards.

Course Topics

- Introduction to Polymers
- Step Polymerization
- Radical Chain Polymerization
- Emulsion Polymerization
- Ionic Chain Polymerization
- Ring-Opening Polymerization
- Chain Copolymerization
- Organometallic Polymerization
- Reactions of Polymers and Polymer Post-Functionalization

Reading assignments for each Section can be found on Canvas in the Course Materials folder.

Pre- &/or Co-Requisites

Recollection of basic organic chemical reactivity and mechanisms will be needed, though brief review will occur in class when necessary.

Course Goals and Learning Outcomes

By the end of this course, you will be able to:

- Predict polymer structure given monomer(s) and reaction conditions
- Predict monomer(s) given a polymer structure and reaction conditions.
- Identify modes of polymerization for a given monomer structure
- Interpret basic thermal behavior of polymeric materials
- Identify mechanisms and potential side reactions of common polymerization techniques
- Predict expected molecular weight distributions given polymerization reaction conditions
- Design syntheses of target polymers from provided monomer building blocks and reagents

Course Requirements & Grading

Assignment	Possible Points
Take-Home Exams (2)	200
Special Topic Paper	100
Final Exam	100

Grading Scale

Your final grade will be assigned as a letter grade according to the following scale:

A	85-100%
B	72-84%
C	60-71%
D	50-59%
F	0-49%

While these cutoffs are guaranteed, adjustment to a lower range or curves on Exams may be applied.

Exams

Books, notes, and other resources may be used as needed for the Exams. Students are expected to work independently, following the GT Academic Integrity guidelines detailed below.

- **Exam 1 - Thursday, February 9th**
- **Exam 2 - Thursday, March 16th**

Exams will be uploaded at 12:30 PM to Canvas on the dates listed above and answers must be submitted by 5:00PM the following day. The scheduled class time will be made available to complete the exam.

The comprehensive final exam is scheduled for **Monday, May 1st at 11:20 AM.**

Special Topic Paper

A Technical Position paper (ca. 5-7 pages) will be required for this course and will be worth 100 points. Topic assignments will be made in early February and the paper will be due by Thursday, April 22nd. It is expected that students will use primary journals (e.g. J. Am. Chem. Soc., Angew. Chem., Macromolecules, ACS Macro

Let., Polym. Chem.) in researching their topics.

Course Materials

Course Text

Principles of Polymerization by George Odian (4th Edition)

Additional Materials/Resources

Selections from the primary literature will occasionally be used to highlight concepts in class. These will be uploaded to Canvas in the Lecture folder they were discussed.

Course Website and Other Classroom Management Tools

Resources for this class will be posted to the Canvas website (canvas.gatech.edu) in the Files section. Notes, literature, and other visuals used in class will be posted to the Lectures folder. The Syllabus and reading assignments are posted in the Course Materials folder. Practice exams will be posted before each exam to Canvas; Upon completion and grading of an exam, solutions will also be posted.

Course Expectations & Guidelines

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit <http://www.catalog.gatech.edu/policies/honor-code/> or <http://www.catalog.gatech.edu/rules/18/>. Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or <http://disabilityservices.gatech.edu/>, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter.

Attendance and/or Participation

There are no graded attendance requirements for the class. Students are expected to attend when possible and attendance will likely be critical to success in the course. While information can be gained from the posted handouts and textbook, commentary and questions answered during lectures will provide many more details to help connect the dots.

Collaboration & Group Work

Exams will be solely the product of individuals and collaboration is not permitted.

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

Make-up exams will be given as designated by the Institute's General Catalog, Rules and Regulations, Section IVB, and when arrangements have been made prior to the exam that must be missed because of a scheduled Institute activity or in response to an emergency.

Student-Faculty Expectations Agreement

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. See <http://www.catalog.gatech.edu/rules/22/> for an articulation of some basic expectation that you can have of me and that I have of you. 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.

Student Use of Mobile Devices in the Classroom

Mobile devices are to be turned to vibrate during class and should not be used for non-class purposes.

Food and Drink

As this class takes place close to lunch time, feel free to eat during class if needed. Please be courteous of others in the class.

Resources for Students

In your time at Georgia Tech, you may find yourself in need of support. Below you will find some resources to support you both as a student and as a person.

Academic support

- Center for Academic Success <http://success.gatech.edu>
 - 1-to-1 tutoring <http://success.gatech.edu/1-1-tutoring>
 - Peer-Led Undergraduate Study (PLUS) <http://success.gatech.edu/tutoring/plus>
 - Academic coaching <http://success.gatech.edu/coaching>
- OMED: Educational Services (<http://omed.gatech.edu/programs/academic-support>)
 - Group study sessions and tutoring programs
- Communication Center (<http://www.communicationcenter.gatech.edu>)
 - Individualized help with writing and multimedia projects
- Academic advisors for your major
<http://advising.gatech.edu/>

Personal Support

Georgia Tech Resources

- The Office of the Dean of Students: <https://studentlife.gatech.edu/content/get-help-now>; **404-894-6367**; Smithgall Student Services Building 2nd floor
 - You also may request assistance at https://gatech-advocate.symplicity.com/care_report/index.php/pid383662?
- Center for Assessment, Referral and Education (CARE) **404-894-3498**; <https://care.gatech.edu/>
 - Smithgall Student Services Building 1st floor
 - Students seeking assistance from the Counseling Center or Stamps Psychiatry need to visit CARE first for a primary assessment and referral to on and off campus mental health and well-being resources.
 - *Students in crisis may walk in during business hours (8am-4pm, Monday through Friday) or contact the counselor on call after hours at 404-894-2575 or 404-894-3498. Other crisis resources: <https://counseling.gatech.edu/content/students-crisis>*
- Students' Temporary Assistance and Resources (STAR): <https://studentlife.gatech.edu/content/star-services>
 - Can assist with interview clothing, food, and housing needs.
- Stamps Health Services: <https://health.gatech.edu>; **404-894-1420**

- Primary care, pharmacy, women’s health, psychiatry, immunization and allergy, health promotion, and nutrition
- OMED: Educational Services: <http://www.omed.gatech.edu>
- Women’s Resource Center: <http://www.womenscenter.gatech.edu>; 404-385-0230
- LGBTQIA Resource Center: <http://lgbtqia.gatech.edu/>; 404-385-2679
- Veteran’s Resource Center: <http://veterans.gatech.edu/>; 404-385-2067
- Georgia Tech Police: 404-894-2500; <http://www.police.gatech.edu>

National Resources

- The [National Suicide Prevention Lifeline](#) | 1-800-273-8255
 - Free and confidential support 24/7 to those in suicidal or emotional distress
- The [Trevor Project](#)
 - Crisis intervention and suicide prevention support to members of the LGBTQ+ community and their friends
 - Telephone | **1-866-488-7386** | 24 hours a day, 7 days a week
 - [Online chat](#) | 24 hours a day, 7 days a week
 - Text message | Text “START” to **687687** | 24hrs day, 7 days a week

Statement of Intent for Inclusivity

As a member of the Georgia Tech community, I am committed to creating a learning environment in which all of my students feel safe and included. Because we are individuals with varying needs, I am reliant on your feedback to achieve this goal. To that end, I invite you to enter into dialogue with me about the things I can stop, start, and continue doing to make my classroom an environment in which every student feels valued and can engage actively in our learning community.