Macro, Supra, & Nano Chemistry
CHEM 3346/CHEM 5342

The University of Texas at Tyler
Spring 2025 Syllabus

• INSTRUCTOR CONTACT INFORMATION AND OFFICE HOURS

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Email: btuten@uttyler.edu
Best method of contact is through email.

Office Hours:
MW 1:00–2:00 pm
T 11:00 am–12:00 pm
(Also by Appointment)

My classroom and teaching style will always be an "I-don't-get-it" safe place. Chemistry is hard, so ask plenty of questions! Thus, it is my policy to be available anytime I am at the University. I have an open-door policy – please stop by **anytime** you have questions or concerns and I will do my best to assist you whenever possible. I can also set up appointments if necessary. I want you to succeed and will help you how and when I can.

This is an upper level/graduate level class, therefore, it is vital that you be proactive and up to date on reading the textbook. I will announce in class and/or on Canvas the reading assignments.

• COURSE MEETING TIMES

Day	Time	Location
MWF	10:10–11:05 am	RBN 3035

• PREREQUISITES

- Organic Chemistry II (CHEM 3342)

• COURSE DESCRIPTION

While this course is called "Macromolecular, Supramolecular, and Nanochemistry" you will almost exclusively hear me refer to this course as just "Polymer Chemistry" as that is 1) easier to say and 2) a more accurate and encompassing phrase for what we will be learning in this class. The drastically overly simplified description of this course could be "the organic chemistry of huge molecules". The course will be roughly broken down into three themes: **Synthesizing Polymers**, **Characterizing Polymers**, and the **Physical/Material Properties of Polymers.** By the end of the semester, I will expect you to be competent in these three major aspects of macromolecular chemistry.

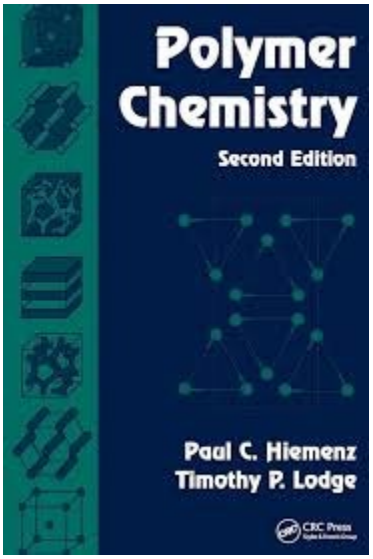
For CHEM 5342 Students: While the lecture and reading material will be the same as CHEM 3346, Exams, Quizzes, the Final Project, and Final Exam will have either additional questions and/or more challenging questions commensurate with a 5000 level course.

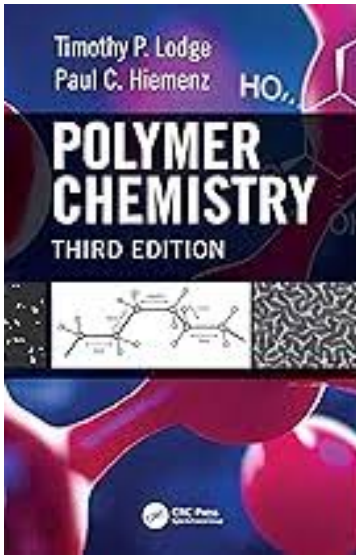
• CENSUS DATE AND LAST DAY TO WITHDRAW

Deadline for all registrations, schedule changes, and section changes is **Monday**, **January 27, 2025** and the last day to withdraw from the course is **Monday**, **March 31, 2025**.

• REQUIRED MATERIALS

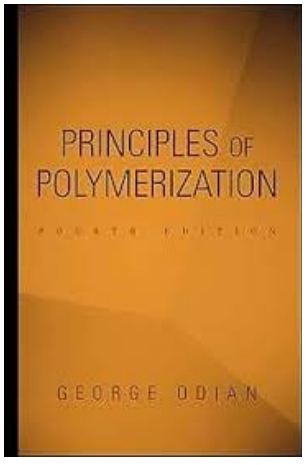
The textbook for this course is "Polymer Chemistry" by Timothy P. Lodge and Paul C. Hiemenz (any edition of this textbook will suffice. Pictured below are the 2nd and 3rd editions, respectively. If you wish to purchase this textbook, I find Amazon to be the best place to find this textbook. **However, I highly recommend you read through the Canvas "Course Resources" page before deciding to purchase this textbook.**





• ADDITIONAL RECOMMENDED BOOK OF INTEREST

Additionally, we will periodically reference "Principles of Polymerization" by George Odian. Instances in which we use this textbook, I will provide the necessary material.



• **COURSE GRADE**

Your course grade will be based on the following:

Semester Exams	**50%**
Quizzes	**20%**
Final Project.	**10%**
Final Exam*	**20%**

Semester Exams – There will be three (3) semester examinations throughout the course and will constitute 50% (each worth 16.6%) of your overall grade in the course. Polymer chemistry (much like organic chemistry) is a comprehensive subject. Thus, while each exam is not technically cumulative, the topics will build on the principles you have learned previously. Thus, it is critical that you do not dismiss previous topics. Always do your best on every task. Do not assume quizzes or exams will be curved!

Quizzes – There will be at least ten (10) quizzes (roughly one a week, excluding exam weeks) that will be completed predominately in class, however, some might be on Canvas. The material to be covered on these quizzes will typically follow the material we've covered in the previous week. However, I will announce the specifics and/or any changes to this pattern. The average of these quizzes will constitute 20% of your overall grade in the course. The quiz with the lowest score will be dropped.

Final Project – The Final project will be a comprehensive assignment to assess your overall ability to design, synthesize, and characterize a macromolecule.
For CHEM 3346 Students: You will be assigned a macromolecule and given many of its physical properties. You will then be asked to perform a retro synthesis on how you think this macromolecule was made and characterized using literature sources to back up your strategy.
For CHEM 5342 Students: you will be given a list of physical and material properties to target. You will then design a synthetic pathway and characterization plan of your choosing on how you think this goal could best be achieved based on literature procedures.
Both of these assignments will have large amounts of freedom (i.e. there won't be just one correct answer). A rubric and further details will be provided later in the semester.

Final Exam – The final exam is cumulative/comprehensive and will constitute 20% of your overall grade in the course.

*The final exam score, if higher than any individual semester exam score, will replace **only the lowest semester exam score**. If an exam is missed during the semester, that exam will be counted as the lowest exam grade. If more than one exam is missed, only one will be replaced by the final exam.

Grades will tentatively be based on the 90/80/70/60 scale but may be adjusted due to my evaluation of class as a whole.

IMPORTANT!!!

All potential points for the course have been outlined in this section. <u>There are no other points awarded and no extra credit to be given</u>. If you come prepared for class and keep up with the material outside of class, you should feel no desire to seek extra credit. Please do not ask for extra credit at any point during the semester.

• CANVAS COURSE WEBSITE

This course will be hosted on UT Tyler's Canvas server. You may access your Canvas account online at https://www.uttyler.edu/canvas.

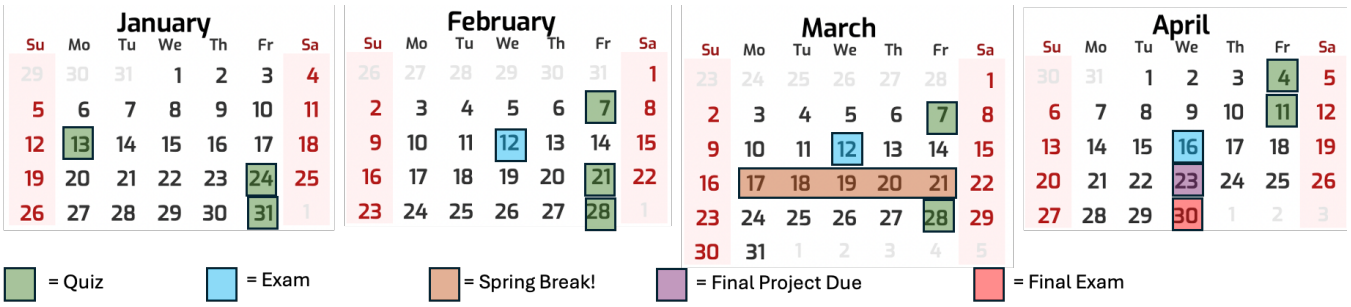
This site will contain a significant amount of information that will help you in this course in addition to being the medium through which you may access your current grade (**Note: Canvas will not automatically replace your final exam for the lowest exam grade. You will have to do that calculation yourself**.) Even though Canvas will attempt to calculate grades, I would always check them by doing the math yourself.

I will contact you through Canvas, so be sure you have your account to receive alerts. We are not responsible for you not receiving announcements pertaining to this course. Get into the habit of checking Canvas at least once a day or make sure your settings are such that announcements made regarding the course will be pushed to your email or mobile device.

• *TENTATIVE* LIST OF COURSE TOPICS

Weeks 1-2: Introduction to Macromolecules: Drawing, nomenclature, intro to number average and weight average molecular weight. ***Reading Chapter 1.1 – 1.7 (1.8 will also be useful, but we'll touch on this later)***
Weeks 3-4: Introduction to Step-Growth Polymerization: Thermodynamics and kinetics of step-growth polymerization, Carothers' equation, synthesis techniques/strategies. ***Reading: Chapter 2***
Weeks 5-6: Introduction to Chain Growth Polymerization: Thermodynamics and kinetics of chain growth. Free radical, cationic, and anionic polymerization synthesis/strategies. ***Reading: Chapter 3***
Weeks 7-8: Living Polymerizations: Introduction to reversible addition fragmentation chain transfer (RAFT) polymerization, atom transfer radical polymerization (ATRP), ring-opening metathesis polymerization (ROMP), and nitroxide mediated polymerization (NMP). ***Reading: Chapter 4 (skip 4.9, we'll touch on it later)***
Week 9: Advanced macromolecular synthesis strategies: Recap of polymer synthesis strategies and introduction to post-polymerization modification. ***Reading: Literature Hand-outs***
Weeks 10-12: Polymer characterization: Introduction to size-exclusion chromatography (SEC) for synthetic macromolecules, viscosity, light scattering, differential scanning calorimetry (DSC), and rheology. ***Reading: Chapter 9.1-9.3, 9.6, 9.8***
Weeks 13-14: Polymer properties: Crystallinity, cross-linking, and supramolecular interactions. Final Project preparation and review ***Reading: <u>Short</u> selected sections from Chapters 10, 11, 12, 13***

• ***TENTATIVE*** **COURSE SCHEDULE**



• **STUDENT LEARNING OUTCOMES**

By the end of this course, you should:

1. Have the ability to draw, name, and label macromolecular compounds. Understand the basic terminology and molecular weight conventions of macromolecules.
2. Be able to discuss and understand the difference between step-growth and chain growth polymerization. To understand the basic fundamentals on the synthesis of both classes of polymers.
3. Have an understanding of the characterization techniques unique to macromolecular systems as well as how "traditional" characterization techniques are implemented for polymers.
4. Be able to come up with a logical plan to synthesize and characterize macromolecules using the reactions and techniques learned in this course.

• **MOBILE DEVICE POLICY**

The use of mobile devices is strictly prohibited unless consent is given by the instructor. This includes texting, photography, videography, voice recordings, searching/browsing the internet, listening to music, and things like these. These actions can lead to distractions so please be courteous to your fellow classmates by silencing and refraining from using your mobile devices during the allotted class-meeting time. You get out of class what you put into it – limit your distractions and you will be better off in the course.

Cell phones, smart watches, and any similar electronic devices must be turned off and put away during exams and/or quizzes. If they are observed out in a visually accessible place (i.e. between legs, on the floor, etc.), it will be assumed that they are being used to cheat; your exam will be taken away, you will receive a zero score (0 points) for the assignment, and you will be referred to the Office of Judicial Affairs.

• **STUDENT ACADEMIC CONDUCT STATEMENT**

In this course, students are encouraged to study and to prepare for exams with one another. ***However, during exams, students are to work alone.*** ***Cheating will not be tolerated.*** The University regulations are very explicit about academic misconduct, and these regulations will be fully enforced. During this course, a code of honor will apply under which students are to work alone on exams and quizzes and neither give help to other nor receive help from others or from any unauthorized sources. Students also are expected to help enforce this code. The minimum penalty for cheating will be a zero on the assignment in question. **Maximum penalties, up to university expulsion, will be pursued in extreme or repeat cases.**

• UT TYLER HONOR CODE

Every member of the UT Tyler community joins together to embrace: Honor and integrity that will not allow me to lie, cheat, or steal, nor to accept the actions of those who do.

• MAKE-UP POLICY

If you must miss class for a legitimate reason (e.g., reasons outlined in the ***University Policies*** section), the instructor will grant a make-up for a missed quiz or exam, provided that the instructor is given at least two weeks advance notice of the absence. *Also, keep in mind that the instructor decides for himself if a student's excuse for being absent is legitimate!* Failed alarm clocks, being jailed, work conflicts, attending your crush's birthday party, etc. will not constitute legitimate excuses.

The following is from the UT Tyler Catalog:

> Class attendance is the responsibility of the student. When a student has a legitimate absence, the instructor may permit the student to complete missed assignments. In many cases, class participation is a significant measure of performance, and non-attendance may adversely affect a student's grade. When a student's absences become excessive, the instructor may recommend that the student initiate a withdrawal.

Unexcused absences and their relation to missed quizzes or exams will be treated as follows. The two lowest quizzes of each type will be dropped. Everyone has a bad day or is absent every now and then for reasons not outlined in the University Policies or Catalog, such as being ill or for a doctor's appointment. Therefore, **if a quiz is missed**, it will count as the quiz to be dropped. **If a semester exam is missed**, it will count as your lowest exam grade and the final exam will take the place of that semester exam as outlined in the ***Course Grade*** section.

• REGRADING POLICY

I will be very careful and consistent in the grading of your exams; however, errors in grading are possible. ***Questions concerning the grading of an exam should be submitted in writing before the next scheduled class meeting after the item was returned to you***. Alternatively, you may see me during office hours (or any other time you find me available) with the suspect assignment or exam in hand. All scores will be considered final one week after originally being returned to you.

• CONDUCT TOWARD OTHERS

As you know, this is a chemistry course. Chemists come from all walks of life (e.g. varying ethnicities, different religious beliefs, gender, etc.) and it is important as scientists to be able to work professionally with others in different environments. Under **no circumstances** will **any** derogatory remarks or actions toward race, gender, religion, or the like be tolerated in this course.

• TOBACCO-FREE CAMPUS

All forms of tobacco will not be permitted on the UT Tyler main campus, branch campuses, and any property owned by UT Tyler. This applies to all members of the University community, including students, faculty, staff, University affiliates, contractors, and visitors.

Forms of tobacco not permitted include cigarettes, cigars, pipes, water pipes (hookah), bidis, kreteks, electronic cigarettes, smokeless tobacco, snuff, chewing tobacco, and all other tobacco products.

There are several cessation programs available to students looking to quit smoking, including counseling, quitlines, and group support. For more information on cessation programs please visit www.uttyler.edu/tobacco-free.

• UNIVERSITY POLICIES (also listed on Canvas with hyperlinks)

- **Withdrawing from Class** - Students are allowed to withdraw (drop) from a course through the University's Withdrawal Portal. Texas law prohibits students who began college for the first time in Fall 2007 or thereafter from dropping more than six courses during their entire undergraduate career. The number includes courses dropped at other 2-year or 4-year Texas public colleges and universities. Make sure to consider the impact withdrawing from any course has on your academic progress as well as the financial implications. We encourage you to consult your advisor(s) and financial aid for additional guidance. CAUTION #1: Withdrawing before census day does not mean students receive a full refund. Please see the Tuition and Fee Refund Schedule. CAUTION #2: All international students must check with the Office of International Programs before withdrawing. All international students are required to enroll full-time for fall and spring terms.

- **Final Exam Policy**: Final examinations are administered as scheduled. If unusual circumstances require that special arrangements be made for an individual student or class, the dean of the appropriate college, after consultation with the faculty member involved, may authorize an exception to the schedule. Faculty members are required to maintain student final examination papers for a minimum of three months following the examination date.

- **Incomplete Grade Policy**: If a student, because of extenuating circumstances, is unable to complete course requirements by the end of the semester, then the instructor may recommend an Incomplete (I) for the course. The "I" may be assigned in lieu of a grade only when all of the following conditions are met: (a) the student has been making satisfactory progress in the course; (b) the student is unable to complete all course work or final exam due to unusual circumstances that are beyond personal control and are acceptable to the instructor; and (c) the student presents these reasons prior to the time that the final grade roster is due. The semester credit hours for an Incomplete will not be used to calculate the grade point average for a student.

  The student and the instructor must submit an Incomplete Form detailing the work required and the time by which the work must be completed to their respective department chair or college dean for approval. The time limit established must not exceed one year. Should the student fail to complete the work for the course within the time limit, the instructor may assign zeros to the unfinished work, compute the course average for the student, and assign the appropriate grade. If a grade has not been assigned within one year, then the Incomplete will be changed to an F or to NC, if the course was initially taken under the CR/NC grading basis.

- **Grade Appeal Policy**: - UT Tyler's Grade Appeal policy requires the completion of a Grade Appeal form for this action to take place. The grade appeal begins with the instructor of the course. If a student does not agree with the decision of the instructor, the student may then move the appeal to the department chair/school director for that course. If the student is still dissatisfied with the decision of the chair/director, the appeal moves to the Dean of the College offering that course, who has the final decision. Grade appeals must be initiated within sixty (60) days from the date of receiving the final course grade. The Grade Appeal form is found on the Registrar's Form Library.

- **Disability/Accessibility Services**: In accordance with Section 504 of the Rehabilitation Act, Americans with Disabilities Act (ADA) and the ADA Amendments Act (ADAAA), The University of Texas at Tyler offers accommodations to students with learning, physical and/or psychological disabilities. If a student has a disability, including a non-visible diagnosis such as a learning disorder, chronic illness, TBI, PTSD, ADHD, or a history of modifications or accommodations in a previous educational environment, the student is encouraged to visit https://hood.accessiblelearning.com/UTTyler and fill out the New Student application. The Student Accessibility and Resources (SAR) office will contact the student when the application has been submitted and schedule an appointment with the Assistant Director Student Accessibility and Resources/ADA Coordinator. For more information, including filling out an application for services, please visit the SAR webpage at http://www.uttyler.edu/disabilityservices, the SAR office located in the University Center, # 3150 or call 903.566.7079."

- **Military Affiliated Students**: UT Tyler honors the service and sacrifices of our military-affiliated students. If you are a student who is a veteran, on active duty, in the reserves or National Guard, or a military spouse or dependent, please stay in contact with your faculty member if any aspect of your present or prior service or family situation makes it difficult for you to fulfill the requirements of a course or creates disruption in your academic progress. It is important to make your faculty member aware of any complications as far in advance as possible. Your faculty member is willing to work with you and, if needed, put you in contact with university staff who are trained to assist you. Campus resources for military-affiliated students are in the Military and Veterans Success Center (MVSC). The MVSC can be reached at MVSC@uttyler.edu or via phone at 903.565.5972.

- **Academic Honesty and Academic Misconduct**: The UT Tyler community comes together to pledge that "Honor and integrity will not allow me to lie, cheat, or steal, nor to accept the actions of those who do." Therefore, we enforce the Student Conduct and Discipline policy in the Student Manual of Operating Procedures (Section 8).

- **FERPA** - UT Tyler follows the Family Educational Rights and Privacy Act (FERPA) as noted in University Policy 5.2.3. The course instructor will follow all requirements in protecting your confidential information.

- **Recording of Class Sessions**: Class sessions may be recorded by the instructor for use by students enrolled in the course. Recordings that contain personally identifiable information or other information subject to FERPA shall not be shared with individuals not enrolled in the course unless appropriate consent is obtained from all relevant students. Class recordings are reserved only for the use of students enrolled in the course and only for educational purposes. Course recordings should not be shared outside of the course in any form without express permission.

- **Absence for Official University Events or Activities**: All courses follow the practices related to approved absences as noted by the Student Manual of Operating Procedures (Sec. 1 -501).

- **Absence for Religious Holidays**: Students who anticipate being absent from class due to a religious holiday are requested to inform the instructor by the second class meeting of the semester.

- **Campus Carry**: We respect the right and privacy of students who are duly licensed to carry concealed weapons in all courses. License holders are expected to behave responsibly and keep a handgun secure and concealed. More information is available at http://www.uttyler.edu/about/campus-carry/index.php.