

Course number and name: MTSE 4050/5400: Polymer Science & Engineering

Credits: 3 Credits.

Lecture: MoWe 2:30 p.m. – 3:50 p.m.

Location: B157

Office Hours: Friday 2:00 pm - 3:00 pm. Please email the questions in advance.

Instructor's or course coordinator's name: Dr. Xiao Li

Office: E119, Discovery Park

E-mail: Xiao.Li@unt.edu **Phone:** 940-565-2603

Teaching Assistants: TBD

Text book, title, author, and year

Paul C. Hiemenz; Timothy P. Lodge, Polymer Chemistry, Taylor & Francis Group, 2nd Edition, 2006, ISBN-10:1-57444-779-3.

a. *Other supplemental materials*

Ulf W. Gedde, Polymer Physics, Kluwer Academic Publishers, 1st Edition, 2001, ISBN 0-412-62640-3.

Specific Course Information

a. *Brief description of the content of the course (catalog description)*

Polymer science & engineering focus on understanding basic principles of polymer physics. Topics include general introduction of polymers, polymerization, chemical structures, molecular architecture, bonding in polymers, structure isomerism, molecular weight, chain conformation, polymer solutions, glass transition, thermodynamics, mechanical properties, linear viscoelasticity, rubber elasticity, crystalline polymers, block copolymers.

b. *Prerequisites or co-requisites*

MTSE 3000. 3001

c. *Indicate whether a required, elective, or selected elective course in the program*

Required

Specific goals for the course

a. *Specific outcomes of instruction*

Specific Course Learning Outcome
1. Understand changes in molecular structure affect the polymer performance
2. Using classic polymer theories to calculate energy change for polymer solution and mixing two polymers; understand interaction parameter

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| 3. Understand the mechanical properties of polymers and associate them with their different states: glassy, rubbery, and viscous fluid states |
| 4. Understand a measurement of polymer at a certain temperature and time is equivalent to a measurement at a lower temperature and longer time . |

b. *Explicitly indicate which of the student outcomes listed in above outcomes are addressed by the course.*

**This course addresses ABET Student Outcome 7:
an ability to acquire and apply new knowledge as needed, using appropriate learning strategies**

List of topics to be covered

- I. Introduction
- II. Chemical structures
- III. Polymerization
- IV. Molecular architecture
- V. Structure isomerism
- VI. Molecular weight
- VII. Chain conformation
- VIII. Polymer solutions
- IX. Glass transition
- X. Mechanical properties
- XI. Linear viscoelasticity
- XII. Rubber elasticity
- XIII. Crystalline polymers
- XIV. Block copolymers

Specific requirements for graduate students: In addition to regular course assignments, participating graduate students are required to complete two more assignments:

1. A lab report based on a polymer lab tour, correlating the classical polymer-related theories or principles learned with solving experimental problems, such as based on what theories and parameters to select a suitable solvent to dissolve a specific polymer material.
2. A project presentation based on student's own research focus, correlating the classical polymer-related theories or principles learned with their own research projects, such as what polymer materials they used in their projects, and how/why this polymer can advance their research design.

Lecture Notes will be posted on Canvas: Lectures, homework assignments, solutions will be posted on Canvas. <https://unt.instructure.com/login/ldap>.

Notes:

1. The lectures will be delivered face to face. Canvas will be used as the communication tool as well for posting homework assignments, homework solutions, formula sheets; submitting

homework. Quizzes and exams will be conducted in person.

2. Each quiz will be limited to one or two problems with a time limit of 30 minutes. The content will be based on recent homework problems and sample problems gone over in class.
3. Each exam will include a combination of (A) short answer questions, and (B) quantitative problems.
4. There would be two exams, which will be weighted equally to determine the exam average component of the grade. Each exam builds up on understanding previous chapters and, hence, the final exam is progressively comprehensive.
5. For all exams and quizzes, you may use a calculator during the exam. Cell phones, other laptops, etc. will not be allowed.

Calculators: Programmable calculators are not allowed. Bring them to quizzes and exams. You must have an inexpensive scientific calculator that can solve:

Trig functions (SIN, COS, TAN)

Exponentials (e^x)

Square Root

x^y

Natural Logs (LN)

Logs (LOG)

Inverse

Cell Phones: Please remember to turn off phones prior to class. Cell phones are not allowed during quizzes or examinations.

Tentative Grading Scheme with weight percent contributions to the final grade (subject to change)

For undergraduate students:

Homework Average: 20%

Quiz Average: 20%

Exam Average: 60%

For graduate students:

Homework Average: 20% (including 5% from a lab report)

Quiz Average: 15%

Exam Average: 60%

Project presentation: 5%

Makeup Exam Policy: If a student cannot take an exam on the scheduled date due to some unavoidable circumstances, such as out of town business trip, sickness, etc., then he/she must notify the instructor *in writing* before the scheduled exam time to schedule a makeup exam. If allowed, a 5-10% penalty will be assessed.

Class Attendance is Mandatory. Please notify me if you have to miss a class or will be late.

Technical Assistance

Part of working in the online environment involves dealing with the inconveniences and frustration that can arise when technology breaks down or does not perform as expected. Here at

UNT we have a Student Help Desk that you can contact for help with Canvas or other technology issues.

UIT Help Desk: UIT Student Help Desk site (<http://www.unt.edu/helpdesk/index.htm>)

Email: helpdesk@unt.edu

Phone: 940-565-2324

In Person: Sage Hall, Room 130

Walk-In Availability: 8am-9pm

Telephone Availability:

- Sunday: noon-midnight
- Monday-Thursday: 8am-midnight
- Friday: 8am-8pm
- Saturday: 9am-5pm

Laptop Checkout: 8am-7pm

Disabilities Accommodation

The University of North Texas complies with Section 504 of the 1973 Rehabilitation Act and with the Americans with Disabilities Act of 1990. The University of North Texas provides academic adjustments and auxiliary aids to individuals with disabilities, as defined under the law. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please see the instructor and/or contact the Office of Disability Accommodation at 940-565-4323 during the first week of class.

Additional Policies

Authorized Absences and Extenuating Circumstances

Absences due to extenuating circumstances or participation in sponsored must be verified by the Dean of Students. Consideration of such absences will be made for quizzes and examinations, but not homework. For participation in sponsored activities, you must seek approval prior to the absence. For extenuating circumstances, you have 1 week to contact me and/or the Dean of Students to begin the process.

Absence for Religious Holidays

In accordance with state law, a student absent due to the observance of a religious holiday may take examinations or complete assignments scheduled for the day(s) missed, including those missed for travel, within a reasonable time after the absence. The student is responsible to notify the instructor of each class of the date of the anticipated absence as early in the semester as possible. Only holidays or holy days observed by a religion whose place of worship is exempt from property taxation under Section 11.20 of the Tax Code may be included. A student who is excused under this provision may not be penalized for the absence.

Academic Integrity – Plagiarism and cheating will NOT be tolerated.

Statement of Expectations for Student Conduct

You will be expected to conduct yourself in a professional manner. Academic dishonesty such as plagiarism and cheating will NOT be tolerated. Therefore, students are expected to be honest and ethical in their academic work. Academic dishonesty is defined as an intentional act of deception in one of the following areas:

- * cheating – use or attempted use of unauthorized materials, information or study aids
- * fabrication – falsification or invention of any information
- * assisting – helping another commit an act of academic dishonesty
- * tampering – altering or interfering with evaluation instruments and documents
- * plagiarism – representing the words or ideas of another person as one's own.

For more information about academic integrity and the University's policies and procedures in this area, please see the UNT academic manual. Any student in violation of these policies will be given an overall **F grade (Fail)**. In addition, your case will be forwarded to university administrators, and you may be subject to additional punishments/sanctions according to university policies. If you have any questions on this, please discuss with me or someone in the Office of Academic Integrity.