

## **Syllabus for ChEn/MatS 4214: Polymers**

**ChEn/MatS 4214: Polymers, Spring 2017**

**MWF 11:15 – 12:05, MCB 3-120**

### **Instructor:**

Prof. Xiang Cheng  
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Phone: 4-6165  
Office hour: Thu 4-5 pm

### **TAs:**

<b>Name</b>	<b>Email</b>	<b>Office hours</b>
Yangming Kou	kouxx036@umn.edu	Wed 3:30-5:30
Chance Parrish	parri150@umn.edu	Thu 10-12
Seunghwan Shin	shinx424@umn.edu	Thu 1-3

All TA office hours will be held in 161 Amundson Hall.

### **Brief course description:**

This is an introductory course to introduce most fundamental aspects of polymer science and engineering. In this course, we will cover the basics of both polymer chemistry and physics with an emphasis on material properties of polymers and their relation to microscopic structures. These include polymer synthesis, characterization and material processing.

### **Course objectives:**

The objectives of the course are to achieve a basic understanding of polymeric materials from different aspects. These include:

- 1) Learn the structural features of polymers (e.g. monomer units, chain architecture, regiochemistry), and the key concepts and terminology used in polymer sciences including molecular weight distributions and averages and relevant characterization methods.
- 2) Learn the principal synthetic methods and how these methods affect the polymer structures
- 3) Learn the microscopic structures of polymers in different states (amorphous/crystalline) and how these structures affect their macroscopic material properties.
- 4) Learn the main classes of polymers and their applications in various engineering problems.

### **Course prerequisites:**

The course prerequisites include an introductory course in Materials Science (MatS 3011 or equivalent). Basic knowledge of organic chemistry and thermodynamics (physical chemistry) is required.

### **Course website:**

This course will use Moodle to provide the syllabus, homework assignments and solutions, and your grades. With the exception of this syllabus, no handouts will be distributed in class. You can download the homework assignments from the website. The solution of homework assignments will be posted on Moodle too, shortly after the homework is due.

### **Textbooks:**

The required textbook for this class is “Polymer Chemistry” by Hiemenz and Lodge, 2nd ed., CRC Press, 2007. ISBN 1-57444-779-3. We will mainly follow the outline of the book for this course. Some of the homework problems will be assigned from the book.

Additional Reference Materials:

G. Odian, “Principle of Polymerization”, 3rd Ed. McGraw-Hill, 1991  
P.J. Flory, “Principles of Polymer Chemistry”, Cornell University Press, 1953  
P.G.- de Gennes, “Scaling Concepts in Polymer Physics”, Cornell University Press, 1979  
J. Brandrup & E.H. Immergut, ed., “Polymer Handbook”, Wiley, 3rd Ed. 1989

### **Homework:**

There will be 10 problem sets, due in class one week after being assigned. The homework will be posted on Friday and due the following Friday, with the exception of the first week and the exam weeks. The assignments will also be posted on the course Moodle website. Homework is due at the beginning of the class on the indicated date. **No late homework will be accepted without a valid medical excuse.**

Rules for Submission of Homework Problems

- 1) All assignments should be prepared on 8.5 x 11 paper with a clean edge.
- 2) Problem sets must be stapled together.
- 3) Student’s name and ID number should appear on the upper right corner of the first page. Student’s name should appear on all pages.
- 4) Write on one side of the paper and do not use any of the page as scrap paper.
- 5) Number the pages of the homework sequentially.

Each homework problem will be graded on a 3 pt scale with the following breakdown:

- 3 pts: Correct, complete and easy to follow, correct units
- 2 pts: Minor error or difficult to follow
- 1 pt: Major error
- 0 pts: Not submitted or lack of effort (at grader discretion)

Students may discuss the problem set with other students, but are required to work out and present their own solutions. Copying or paraphrasing solutions from the web, another source, or another student’s solution to a problem (or part of the solution) or permitting your own solution to be copied or paraphrased is considered scholastic dishonesty. The minimum penalty for all students involved is a grade zero for the problem (see the Scholastic Dishonesty section below). If you are in any doubt about what is allowed, consult the instructor. The solution to all of the problems on the homework will be posted on Moodle shortly after the due date.

### **Examinations:**

There will be three in-class midterm examinations on Mondays following the course schedule. **The final exam will be given according to the university schedule.** The final exam will be two hours and comprehensive.

All exams will be closed book. The examination paper will include a sheet of relevant formulas that may be needed for the solution of the problems. These “formula pages” will be posted on Moodle no later than 2 days before the examination. You can download this page as part of your preparation for the exam, but you **cannot** bring the downloaded page to the exam.

You may use a scientific calculator, but the calculator must not have a text memory, graphing capabilities, or the ability to compute integrals. If you are uncertain about the suitability of your calculator, bring it to

lecture at some point prior to the exam. We will inspect all calculators before the exams. Those students with unacceptable models may be forced to take the exam without a calculator. Communicating devices (cell phones, etc.) are not permitted during the examination and must remain in a sealed bag. Open possession of such items will be treated as a case of cheating even if the item was not used and the student will receive a zero for the exam.

No student will be permitted to take the exam before the scheduled time and **no makeup exams will be given**. Students who miss a midterm exam will be given a grade of zero unless personal illness or family emergency was the reason for missing the exam. Special arrangements will be made in such circumstances, provided that they are well documented. Students who miss more than two midterms (including two) or miss the final exam will receive F if there are not valid reasons or I if there are valid reasons.

### **Re-grading of Examinations and Homework:**

Students who wish to have their exam or homework re-graded must submit their request no later than one week after the exams/problem are returned. If you do not have a valid excuse for missing the lecture when the exams are returned, you will not be able to request a re-grade after the deadline has passed. The request should be in writing, indicating the possible error, and submitted directly to Prof. Cheng at the end of lecture or during his office hour. The entire exam/homework will be reviewed by Prof. Cheng for any other possible oversights, and a revised grade (which may be higher or lower) will be returned to the student. Submitting an altered exam for re-grading is a serious offense and the minimum penalty is an F for the course. **Homework and exam written in pencil will not be eligible for re-grade considerations.**

### **In-class Quizzes:**

Starting in the second week of class, we will give open-book, open-note quizzes at the start of some lecture periods (but not all). The quiz will cover the material covered in lectures since the previous quiz, typically the previous lecture, and emphasize qualitative understanding of the material and basic engineering calculations.

Students are required to use clicker to select the best possible answer. Each question will be graded on a 2pt scale:

2pt: Correct answer.

1pt: Wrong answer.

0pt: Not answered.

### **Clickers:**

Clickers will be used for in-class quizzes. The required device is the iClicker2, and it is sold at the campus bookstore. At the end of the semester, if your clicker is in good condition, the bookstore will buy back your used iClicker. **REGISTERING YOUR CLICKER:** You must properly register your clicker to receive credit. Registration is done through the course Moodle site. For directions to register your clicker go to <https://it.umn.edu/moodle-students-purchase-register>. This site includes answers to frequently asked questions and technical help via both a web link and a phone number. If you have any question about iClicker, please contact TA Yangming Kou (kouxx036@umn.edu).

### **Determination of Grades:**

In-class quizzes 5%

Homework = 20%

Mid-Term Exams (3x) = 15% each

Final Exam = 30%

The assignments in each category are weighted equally. For homework, this means each total grade on the assignment is weighted the same even if the number of problems (and thus the total grade) differs.

### **Grading Standards (definition of grades):**

A: Represents achievement that is outstanding relative to the level necessary to meet course requirements.

B: Represents achievement that is significantly above the level necessary to meet course requirements.

C: Represents achievement that meets the course requirements in every respect.

D: Represents achievement that is worthy of credit even though it fails to meet fully the course requirements.

F: Represents failure (or no credit) and signifies that the work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (see also I).

I: Assigned at the discretion of the instructor when, due to extraordinary circumstances sanctioned by the University, e.g., hospitalization, a student is prevented from completing the work of the course on time such as missing the final exam. Assignment of an I requires a written agreement between instructor and student. Failure to complete successfully the procedure outlined in the agreement will result in the I being administratively changed by the University Registrar to an F or N (depending on the grade base) one calendar year from the end of the semester for which the I grade was granted. For additional information, please refer to: <http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html>.

### **Student Conduct Code:**

The University seeks an environment that promotes academic achievement and integrity, that is protective of free inquiry, and that serves the educational mission of the University. Similarly, the University seeks a community that is free from violence, threats, and intimidation; that is respectful of the rights, opportunities, and welfare of students, faculty, staff, and guests of the University; and that does not threaten the physical or mental health or safety of members of the University community.

As a student at the University you are expected adhere to Board of Regents Policy: Student Conduct Code. To review the Student Conduct Code, please see: [http://regents.umn.edu/sites/default/files/policies/Student\\_Conduct\\_Code.pdf](http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf).

Note that the conduct code specifically addresses disruptive classroom conduct, which means "engaging in behavior that substantially or repeatedly interrupts either the instructor's ability to teach or student learning. The classroom extends to any setting where a student is engaged in work toward academic credit or satisfaction of program-based requirements or related activities."

### **Scholastic Dishonesty:**

Students are expected to do their own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis. If it is determined that a student has cheated, he or she may be given an "F" or an "N" for the course, and may face additional sanctions from the University. For additional information, please see: <http://policy.umn.edu/Policies/Education/Education/INSTRUCTORRESP.html>.

The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: <http://www1.umn.edu/oscai/integrity/student/index.html>. If you have additional questions regarding what would constitute scholastic dishonesty in the context of a particular class, e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam, please clarify with Prof. Cheng.

**Makeup Work for Legitimate Absences:**

Students will not be penalized for absence during the semester due to unavoidable or legitimate circumstances. Such circumstances include verified illness, participation in intercollegiate athletic events, subpoenas, jury duty, military service, bereavement, and religious observances. Such circumstances do not include voting in local, state, or national elections. For complete information, please see: <http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html>.

**Sexual Harassment:**

"Sexual harassment" means unwelcome sexual advances, requests for sexual favors, and/or other verbal or physical conduct of a sexual nature. Such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment in any University activity or program. Such behavior is not acceptable in the University setting. For additional information, please consult Board of Regents Policy: <http://regents.umn.edu/sites/default/files/policies/SexHarassment.pdf>.

**Equity, Diversity, Equal Opportunity, and Affirmative Action:**

The University will provide equal access to and opportunity in its programs and facilities, without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression. For more information, please consult Board of Regents Policy: [http://regents.umn.edu/sites/default/files/policies/Equity\\_Diversity\\_EO\\_AA.pdf](http://regents.umn.edu/sites/default/files/policies/Equity_Diversity_EO_AA.pdf).

**Disability Accommodations:**

The University of Minnesota is committed to providing equitable access to learning opportunities for all students. Disability Services (DS) is the campus office that collaborates with students who have disabilities to provide and/or arrange reasonable accommodations.

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact DS at 612-626-1333 to arrange a confidential discussion regarding equitable access and reasonable accommodations.

If you are registered with DS and have a current letter requesting reasonable accommodations, please contact your instructor as early in the semester as possible to discuss how the accommodations will be applied in the course.

For more information, please see the DS website, <https://diversity.umn.edu/disability/>.

**Mental Health and Stress Management:**

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance and may reduce your ability to participate in daily activities. University of Minnesota services are available to assist you. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website: <http://www.mentalhealth.umn.edu>.

**Academic Freedom and Responsibility:**

Academic freedom is a cornerstone of the University. Within the scope and content of the course as defined by the instructor, it includes the freedom to discuss relevant matters in the classroom. Along with this freedom comes responsibility. Students are encouraged to develop the capacity for critical judgment and to engage in a sustained and independent search for truth. Students are free to take reasoned exception to the

views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled.

Reports of concerns about academic freedom are taken seriously, and there are individuals and offices available for help. Contact the instructor, the Department Chair, your adviser, the associate dean of the college, or the Vice Provost for Faculty and Academic Affairs in the Office of the Provost.