Chemistry 276 Physical Polymer Chemistry
Spring 2017

Contact Information

Instructor: Chester Simocko, PhD

Office Location: Duncan 1

Telephone: (408)924-5496

Email: chester.simocko@sjsu.edu

Office Hours: Th 4:00 -5:30PM

Class Days/Time: Lecture TTh 6:00 – 7:15PM

Classroom: DH 415

Prerequisites: Satisfactory background in upper division chemistry or materials science or instructor consent.

Faculty Web Page and MYSJSU Messaging

Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the Canvas site associated with Chemistry 276. I will also use the email address listed on your mySJSU account regularly to send information on Chem 276. You are responsible for checking for messages on this email and the Chem 276 Canvas site on a regular basis to learn of any updates.

Course Description and Prerequisites

Techniques for characterizing molecular weights of polymers, their distribution functions, polymer chain statistics and solution thermodynamics. Prerequisite: Satisfactory background in upper division chemistry or materials science or instructor consent.

Physical Polymer Chemistry is designed to be an introductory course on polymer chemistry and will introduce you to basic concepts of polymers such as nomenclature, molecular weight distribution, and types of polymerizations as well as more advanced topics like viscosity, polymer characterization, phase behavior, and bulk properties.
Course Goals and Learning Objectives

Course Learning Outcomes (CLOs)

- Appreciation for the nature and scope of polymer chemistry.
- Application of key concepts from organic and physical chemistry including bonding, mechanisms, reactions, thermodynamics, spectroscopy, phase behavior, and sterepchemistry to polymeric systems.
- Identify polymers synthesized from their monomers
- Identify and draw repeat units and end groups of polymers
- Identify polymerizations as step, chain, or living type polymerizations
- Name polymers using systematic (IUPAC) nomenclature.
- Learn common names for some key polymers.
- Calculate molecular weights and their distributions for polymeric systems.
- Learn the theoretical foundations of chain, step, and living polymerizations.
- Predict compositions of block copolymer systems
- Characterize polymers via their spectroscopic, thermal, and physical properties
- Understand the basics of polymers amorphous and crystalline states

Program Learning Outcomes (PLOs)

Chemistry 276 satisfies the following Graduate Program Learning Outcome for the Chemistry Department:

Program Learning Objectives #2 - To demonstrate information literacy skills for acquiring knowledge of chemistry, both as a student and as a life-long learner.

Program Learning Objectives #5 - To communicate effectively, verbally and written, for the purposes of conveying chemical information to both professional scientists and to the public.

Required Texts/Readings

Textbook
Other Readings and supplies
Additional documents will be provided, usually posted on the Canvas site for this course.

Library Liaison
The Chemistry Library Liaison is Yen Tran (yen.tran@sjsu.edu)

Course Requirements and Assignments

Catalog Description Techniques for characterizing molecular weights of polymers, their distribution functions, polymer chain statistics and solution thermodynamics.

The scheduled time for this course is TTh 6:00-7:15PM in DH 415.

Tentative Course Calendar:
A tentative schedule for the semester appears at the end of this document. Note in particular the dates for the Midterm Exams.

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus. More details about student workload can be found in University Policy S12-3 at http://www.sjsu.edu senate/docs/S12-3.pdf.

NOTE that University policy F69-24, “Students should attend all meetings of their classes, not only because they are responsible for material discussed therein, but because active participation is frequently essential to insure maximum benefit for all members of the class. Attendance per se shall not be used as a criterion for grading.”
**Attendance Policy**

Beyond the initial day of class, roll will not be taken. However, attendance of the lectures is mandatory. If you miss a lecture, you are still responsible for all the material discussed in lecture (some of which may not be in the text). Note we will cover a significant amount of material during each class meeting. If you miss class meetings, it will be difficult to catch up due to the volume. Also, you are responsible for keeping up with any changes in the course or exam schedule, which otherwise will not be publicized outside of the lecture time. Please arrive promptly at 6:00PM. A tentative lecture and course schedule is found at the end of this syllabus.

**Grading Policy**

**GRADING (see below for numerical breakdown and percentages)**

There will be 3 Midterm Exams (each approx. 60min) given throughout the semester, each with a maximum score of 100 points. These exams will be open book. Each exam will be worth 20% of your grade. There is no final exam.

Homework will be due on the scheduled days and will be assigned out of the book. The problems appear on the schedule at the bottom of the syllabus. During the first 30 minutes of class I will randomly assign problems to students for them to do on the board and explain to the class. I will not assign a question to every student each class but will evenly spread them out over the semester so everyone has an equal number of opportunities at the board. Your homework grade will be based off of this, there is nothing to turn in. Homework is worth 10% of your grade.

The last 30% of your grade will be a review project. Each student will pick a topic from a list (I will provide the list of topics later in the semester) and write a review of the that topic on the research done in that field in the past 5 years. I will provide a more detailed description of the project later. This project will consist of a written paper and a 15-minute PowerPoint presentation.

Your final grade will be based on:
- 60% Midterm Exams (3 exams at 20% each)
- 30% Review Project
- 10% Homework

**TOTAL 500 points**

Grades will be assigned on a "+/−" system. The course grades will be assigned according the following ranges:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A+</td>
<td>100-97%</td>
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<tr>
<td>A</td>
<td>96-93%</td>
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<tr>
<td>A-</td>
<td>92-90%</td>
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<tr>
<td>B+</td>
<td>89-87%</td>
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<tr>
<td>B</td>
<td>86-83%</td>
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<tr>
<td>B-</td>
<td>82-80%</td>
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<tr>
<td>C+</td>
<td>79-77%</td>
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<tr>
<td>C</td>
<td>76-73%</td>
</tr>
<tr>
<td>C-</td>
<td>72-70%</td>
</tr>
<tr>
<td>D+</td>
<td>69-67%</td>
</tr>
<tr>
<td>D</td>
<td>66-63%</td>
</tr>
<tr>
<td>D-</td>
<td>62-60%</td>
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</tbody>
</table>
Any modifications will be in your favor, but you should not expect significant changes. Note that the "class average" for a given exam is not necessarily a "C" grade. Grades are assigned by these grade ranges, not by "curves."

It is possible to do poorly on one exam, but you may improve your overall grade by doing well in another exam. In assigning grades, only one set of criteria are applied equally to all students in the class - everyone has the same opportunity as everyone else to earn their grade.

Note that "incomplete" grades will only be considered if you have an unexpected situation or emergency that prevents you from finishing the semester. It is required that you have completed most of the course work with a passing grade until that point. A typical situation is a medical emergency that prevents you from taking the final exam - to be considered you must provide information and a means to verify the emergency. Poor performance in the class or inability to keep up with the material is not an acceptable reason for an incomplete or to drop the class.

In order to estimate your current grade in this course and progress towards your course grade, keep track of your hour exam, homework, and project scores as the semester progresses. Use the percentages above to calculate your grade percentage and compare them to table.

When exams are returned to you, you will usually find written comments on incorrect answers. Read these carefully since they not only provide feedback on those exam questions, but are intended to guide you for future exams. The keys for every exam will be posted shortly after the exam is given. Use this information for a self-assessment of your progress in Chem 276. Ask me questions if something is not clear.

EXAM POLICIES:

• Roll will be taken during exams.
• IDs may be randomly checked so always bring a picture ID.
• Seats will be assigned at my discretion.
• Calculators and books will be allowed during the exam. No use of computers or phones are allowed in exams. Anyone found violating this rule will receive, at minimum, an automatic score of "0 points" for the exam.

Other Class Policies:

Audio Recording: audio (only) recording is allowed. Note I do not allow video recording. See also University Policies below.
Cell Phones: Out of courtesy, turn these off during lectures and exams.
Computers: You may use your laptop only during class lectures, as long as you can do so in a way that is not distracting to other students. Computers or any web-enabled devices are not allowed during exams.
• Exam Makeup and Regrade Policy:
You are required to take all three of the exams. A makeup will only be considered if you
miss an exam due to an unforeseen emergency and provide a documented and verifiable
reason. In all cases, you must contact me as soon as reasonably possible. Before any action
will be taken, you will be required to provide a verifiable document describing your
emergency with the doctor’s name and phone number.

Any request for a regrade or recalculation of any exam must be made within one week after
the exam is returned in class (if you are not in class the day it is returned, it is your
responsibility to obtain your exam from me). No regrades will be considered beyond this
time. The exam must be left with me, and I will review the entire exam.

University Policies
As a student at SJSU, you should review these University Policies which apply to ALL
university courses.

http://www.sjsu.edu/gup/syllabusinfo/#GeneralExpectations

The topics include the following:

General Expectations, Rights and Responsibilities of the Student
Dropping and Adding
Consent for Recording of Class and Public Sharing of Instructor Material
Academic integrity
Campus Policy in Compliance with the American Disabilities Act
Student Technology Resources
SJSU Peer Connections
SJSU Writing Center
SJSU Counseling and Psychological Services

In addition to the university policies above, I have additional policies that apply specifically to
Chem 276. Please note the following:

Consent for Recording of Class and Public Sharing of Instructor Material

Audio recording of lectures is allowed. I do not allow video recording of lectures. Much
of the material I prepare for Canvas is prepared by me and is considered my personal
property. It may not be shared with anyone who is not enrolled in Chem 276.

Academic integrity
Your commitment as a student to learning is evidenced by your enrollment at San Jose
State University. The University Academic Integrity Policy S07-2 at
http://www.sjsu.edu/senate/docs/S07-2.pdf requires you to be honest in all your academic
course work. Faculty members are required to report all infractions to the office of
Student Conduct and Ethical Development. The Student Conduct and Ethical
Development website is available at http://www.sjsu.edu/studentconduct/.

Instances of academic dishonesty will not be tolerated. Cheating on exams or plagiarism
(presenting the work of another as your own, or the use of another person’s ideas without
giving proper credit) will result in a failing grade and sanctions by the University. For
this class, all assignments are to be completed by the individual student unless otherwise specified. If you would like to include your assignment or any material you have submitted, or plan to submit for another class, please note that SJSU’s Academic Integrity Policy S07-2 requires approval of instructors.

Campus Policy in Compliance with the American Disabilities Act

If you need course adaptations or accommodations because of a disability, or if you need to make special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible, or see me during office hours. Presidential Directive 97-03 at http://www.sjsu.edu/president/docs/directives/PD_1997-03.pdf requires that students with disabilities requesting accommodations must register with the Accessible Education Center (AEC) at http://www.sjsu.edu/drc/ to establish a record of their disability.

•Emergencies and Building Evacuations

If you hear a continuously sounding alarm, or are told to evacuate the building by an Emergency Coordinator, walk quickly to the nearest exit. Take your personal belongings as you may not be allowed to return. Follow the instructions of the Emergency Coordinators. Be quiet so you can hear instructions. Once outside, move away from the building. Do not return to the building unless the Police or the Emergency Coordinator announces that this is permissible.

Study Tips for Chem 276

Study Guide:

Chem 276 will cover a wide range of polymer topic. This course will fill the role of an introductory polymer course and will cover topics from nomenclature to polymerization mechanisms to polymer characterization. I expect you to read the textbook as we cover the material. Because of the wide range of material, do not wait until the last minute to study for the exam. Do not neglect to study for exams because it is open book. The book is nearly 700 pages long, if you don’t know where to find or how to use the material it won’t do you any good. Plus, since I know that you have the book, I will design the exams around that fact.

<table>
<thead>
<tr>
<th>Date</th>
<th>Chapter Title</th>
<th>Reading in Text*</th>
<th>Assignment</th>
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</thead>
<tbody>
<tr>
<td>Jan 26</td>
<td>Concepts and</td>
<td>1.1-1.3</td>
<td>1.1-1.3</td>
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<td>Date</td>
<td>Chapter Title</td>
<td>Reading in Text*</td>
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<td>Jan 31</td>
<td>Nomenclature</td>
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<td>Feb 2</td>
<td><strong>HW Discussion 1</strong> Step Polymerization</td>
<td>3.1-3.3</td>
<td>3.1-3.5, 3.7, 3.8, 3.10</td>
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<td>Feb 7</td>
<td>Step Polymerization</td>
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<td>3.1-3.5, 3.7, 3.8, 3.10</td>
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<td>Feb 9</td>
<td><strong>HW Discussion 2</strong> Radical Polymerization</td>
<td>4.1-4.6</td>
<td>4.1-4.6, 4.8</td>
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<td>Feb 14</td>
<td>Radical Polymerization</td>
<td>4.1-4.6</td>
<td>4.1-4.6, 4.8</td>
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<td>Radical Polymerization</td>
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<td>Feb 21</td>
<td>Ionic Polymerizations, Stereochemistry and Coordination Polymerization</td>
<td>5.1-5.3, 6.1-6.5</td>
<td>5.1, 5.2</td>
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<td>Feb 23</td>
<td><strong>HW Discussion 3</strong> Stereochemistry and Coordination Polymerization</td>
<td>6.1-6.5</td>
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<td>Feb 28</td>
<td>Ring-Opening Polymerization</td>
<td>7.1-7.5</td>
<td>7.1-7.3</td>
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<td>Mar 2</td>
<td><strong>Exam 1</strong></td>
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<td>Mar 7</td>
<td><strong>HW Discussion 4</strong> Copolymerization</td>
<td>9.1-9.5</td>
<td>9.1-9.4</td>
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<td>Mar 9</td>
<td>Copolymerization</td>
<td>9.1-9.5</td>
<td>9.1-9.4</td>
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<td>Mar 14</td>
<td>Theoretical Description of Polymers in Solution</td>
<td>10.1-10.4</td>
<td>10.1-10.3</td>
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<td>Mar 16</td>
<td><strong>HW Discussion 4</strong> Number-Average Molar Mass, Scattering Methods</td>
<td>11.1-11.6, 12.1-12.4</td>
<td>11.1-11.4, 12.1-12.3</td>
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<td>Apr 4</td>
<td><strong>Exam 2</strong></td>
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<td>Date</td>
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<td>Apr 11</td>
<td><strong>HW Discussion 5</strong> Chemical Composition and Molecular Microstructure</td>
<td>15.1-15.7</td>
<td>15.1-15.4</td>
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<td>Apr 13</td>
<td>Chemical Composition and Molecular Microstructure</td>
<td>15.1-15.7</td>
<td>15.1-15.4</td>
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<td>Apr 18</td>
<td>The Amorphous State</td>
<td>16.1-16.4</td>
<td>16.1-16.5</td>
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<td>Apr 20</td>
<td><strong>HW Discussion 6</strong> The Crystalline State</td>
<td>17.1-17.8</td>
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<td>Apr 25</td>
<td>The Crystalline State</td>
<td>17.1-17.8</td>
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<td>Apr 27</td>
<td>Multicomponent Polymer Systems</td>
<td>18.1-18.3</td>
<td>18.1-18.4</td>
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<tr>
<td>May 2</td>
<td><strong>HW Discussion 7</strong> Presentations</td>
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<tr>
<td>May 4</td>
<td>Presentations</td>
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<tr>
<td>May 9</td>
<td>Presentations</td>
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<tr>
<td>May 11</td>
<td>Presentations</td>
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<tr>
<td>May 16</td>
<td><strong>Exam 3</strong></td>
<td></td>
<td>Review Paper Due</td>
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</tbody>
</table>

*In addition, topics which are not found in the text may be covered in the lectures.*