

## Chemistry 5861: Polymer Science I - Polymer Chemistry Syllabus for Fall 2003

Professor: Dr. Allen D. Hunter (Room 5015, Ward Beecher Hall), 742-7176, [adhunter@cc.ysu.edu](mailto:adhunter@cc.ysu.edu)

Textbook: "Polymer Chemistry" by Malcolm P. Stevens, 3<sup>rd</sup> Edition (2<sup>nd</sup> Edition OK).

Lecture: Monday, Wednesday, and Friday: 12:00 to 12:50, WB 2008.

Lab: Tuesday: 8:00 to 10:50, WB 6035.

Office Hours: Monday, Wednesday, and Friday 11:00 to 12:00 and Tuesday & Thursday 17:05 to 17:35 and 18:25 to 18:55, or by appointment (I'll be in my office, WB 501, or the Advanced Synthesis or X-Ray labs). If you find me in a meeting, please interrupt! These Friday lectures are contingent on the Oral Communication and Writing Intensive components being approved.

Intensive Components: This course is designed to help meet your upper level requirements for both an Oral Communication Intensive and a Writing Intensive component of the General Education Model (<http://www.cc.ysu.edu/ger/>). As such, both oral communication and writing assignments are fully integrated into the course to develop your writing and oral communication skill in a fashion appropriate to a professional Chemist (or someone in an allied discipline). As such, you will each carry out 5 projects (some individually and some as teams) that will require you to prepare a written report and give a PowerPoint presentation followed by a question period for the class. The class as a "team of the whole" will also prepare a more extensive report describing the results of their lab work in the format of a full paper in the American Chemical Society Journal "Macromolecules" and do a joint PowerPoint presentation on its results. The final exam will be an open book take home exam in which the student will write short 3 page miniature essays on 3 questions chosen out of 5.

Web Page: <http://www.as.ysu.edu/~adhunter/Teaching/Chem5861/index.html>

Course Description: \*5861 *Polymer Science I: Polymer Chemistry and Plastics*. Theoretical and practical aspects of the preparation, characterization, structure-property relationships, morphology, and uses of both the major commercial and newer polymers. Three hours lecture and three hours laboratory. This course is designated as both oral communication intensive and writing intensive. Prereq. or Concurrent: CHEM 3720 and CHEM 3739 or 3737 or consent of the department chair. 4 s.h.

Lecture(s)	Chapter(s)	Title
1 - 5	1	Introduction to Chemistry 5861 and Basic Principles of Polymer Chemistry
6 - 112	2	Molecular Weight and Polymer Solutions
13 - 19	3	Chemical Structures and Polymer Morphology
20 - 25	4	Chemical Structure and Polymer Properties
26 - 35	5	Polymer Characterization
36 - 45	6 - 17	Individual Polymers and Special Topics

\* This schedule is tentative and the order and relative weighting of topics may be revised as the class progresses.

<b>GRADING SYSTEM</b>	<b>TOTAL POINTS</b>
Project Report I (25 points for Written and 25 for Oral presentation)	50
Project Report II (25 points for Written and 25 for Oral presentation)	50
Project Report III (25 points for Written and 25 for Oral presentation)	50
Project Report IV (25 points for Written and 25 for Oral presentation)	50
Project Report V (25 points for Written and 25 for Oral presentation)	50
Lab Report (50 for Lab Technique and Effort, 50 for Written, and 50 for Oral presentation)	150
Take Home (Essay Type) Final Exam	100
<b>Total (250 points for Written, 150 points for Oral, 50 Points for Lab Technique &amp; Effort), A 90 - 100%, B 78 - 89%, C 65 - 77%, D 50 - 64%, F Below 50%</b>	<b>500</b>

**Reports:** To train you to make effective oral and written reports in a style appropriate for a professional chemist, in the first few weeks you will be given training in how to design and execute a professional oral and written report using Microsoft PowerPoint and Word, respectively. The content and topics for these reports will be announced as the class progresses from current topical areas of polymer chemistry and the expected format of the final lab paper can be found at: <http://www.as.ysu.edu/~adhunter/Teaching/Chem5861/Chem5861.MacromoleculesPaperFormat.doc>.

**Exam:** The final exam is comprehensive and will be open book and take home. You will have to answer 3 out of 5 questions poised on the exam and answer each with a concise essay including diagrams as appropriate.

**Lab:** The lab is integral to the course and will follow the collaborative discovery research model.

**Attendance:** Lecture attendance is mandatory and students are responsible for all information, material, and announcements made in class. Typically, the oral reports will be presented on Mondays except for the final oral lab report which will be presented in the final lab class on Tuesday.

**Assigned Problems:** I will assign problems from the text and on handouts regularly. These will not be graded but are very important since these are the questions on which most of the exams will be based!

**Academic Honesty:** In accordance with university policy and professional standards, the highest levels of academic integrity are expected in this lecture and lab. The code of student conduct will be strictly enforced. Academic dishonesty will result in reductions in grades and/or expulsion from this class and/or the university.

### **Chemistry 5861L, Polymer Chemistry I Laboratory, Fall 2002**

#### **Laboratory Research Project, Structure Property Relationship Study**

**Outline of Research Project Concept:** This research project is designed as a rigorous polymer research project, but is at a scale appropriate for our course. It will be carried out on a group basis. Thus, the group will decide on the target polymer system, how the research problem will be addressed, and the roles of each of the project participants. Each of you are seniors or graduate students and will in a very short time be working in higher level academic research labs, in industry, or in other professional settings. This project concept was chosen to help you build your individual research skills and rounded expertise in polymer science and to build your team work and project presentation skills while allowing each student to emphasize their own areas of interest.

**Project Topic:** The overall project must be a structure-property relationship study focusing on one class of structurally related polymer. Various routes to the “parent” polymer of this series should be employed and one of these methods should be used to prepare a series of different derivatives of this parent polymer in which one structural characteristic is systematically varied. The complete range of polymer characterization tools available at YSU (and perhaps at neighboring institutions and at participating/collaborating companies) should be employed.

**Project Definition:**<sup>1,2</sup> Using this assignment document as a starting point, the group should meet to design the overall project scope and goals and their individual roles, determine what literature review needs to be done and carry it out, design the specific experimental procedures, determine what materials need to be ordered or obtained within YSU, determine all safety issues in advance and obtain the requisite training, MSDS sheets, etc.,

**Project Reporting:**<sup>3</sup> As with any professional project, each stage along the way as well as the final project materials needs to be fully documented. Keep minutes of each of your team meetings to document all main decisions made and the major points of controversy and the basis on which they were decided. Further, keep detailed records of all materials that had to be ordered or obtained within YSU (for a final project budget and the supplies and materials report), all raw data collected (whether in your lab books or spectra, etc.), all contacts with non-YSU collaborators (if any), copies of all references used, etc. This will not only facilitate your writing of the final project report but is also good professional practice.

**The Interim Project Materials:** At the end of each week, the team will meet to discuss that week’s progress and define the next weeks goals and activities. On the first day of each week, the project team will meet to present a short progress report to the Chemistry 5861 Polymer Science Director (Hunter) that will include what was accomplished the previous week, the goals and activities planned for the coming week, and to discuss opportunities and challenges. This weekly oral report should include a 5-15 minute “chalk talk” and draft copies of the interim project documents. At least 3 drafts of the final project report should be handed in to the instructor in the 9<sup>th</sup>, 11<sup>th</sup>, and 13<sup>th</sup> weeks and a report outline is required by the 7<sup>th</sup> week.

**The Final Project Materials:** The final project materials will have several components. One will be a paper written in the format of *Macromolecules* as described in the separate handout. The group will also present a 45 minute PowerPoint report summarizing their results. Both of these will be emailed to [adhunter@cc.ysu.edu](mailto:adhunter@cc.ysu.edu). All materials prepared must be handed in well labeled sample vials and all raw characterization data needs to be included in the package that is handed in.

**The State of the Laboratory:** While this research project is in progress and especially when you are done, ensure the laboratory and instrumentation spaces are in immaculate condition!

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<sup>1</sup> With careful project design and careful choice of the literature assignments, there can be a high degree of synergy between the Literature Projects and the Laboratory Project - keep this in mind as you design each of these Chemistry 5861 components.

<sup>2</sup> If an appropriate research topic is chosen, it might eventually lead to a publication after several classes work and/or a formal student project....

<sup>3</sup> As the project progresses, keep a record of specific changes in this project description that you would recommend for future years as an annotated copy of this printed document.