

CHEM 770/7700 Course Outline 2017
Principles of Polymer Science

Time/Place: Tuesday & Thursday, 8:30-9:50, Room PHY 150 (Starting Thursday September 7)

Instructor: Mario Gauthier, C2-169, 888-4567, Ext. 35205, e-mail: gauthier@uwaterloo.ca

Course web site: <http://www.science.uwaterloo.ca/~gauthier/Chem370/index.html>

Course content

1. Basic definitions: Monomers, polymers, polymerization reactions. Polymer structure, nomenclature. Molecular weight distributions and average molecular weights.
2. Molecular weight measurements: Colligative properties, osmometry, light scattering, viscosity, gel permeation chromatography.
3. Step-growth polymerization. Types of reactions. Reactivity, kinetics. Molecular weight distribution and control, branching and cross-linking. Polymerization equilibria. Preparation of polyesters, polycarbonates, polyamides.
4. Radical chain polymerization. Types of polymerization reactions (bulk, solution, heterogeneous). Polymerization kinetics and energetics, molecular weight distribution. Preparation of polyethylene, polystyrene, vinyl polymers.
5. Emulsion polymerization. Initiators, surfactants and other components. Polymerization rate. Molecular weight and particle size control.
6. Polymer isomerism and conformation. Dimensions of macromolecules: end-to-end distance, radius of gyration. Thermodynamic treatment of rubber elasticity.

Evaluation

Mid-term exam (2.5 hours duration): 40%

Final exam (2.5 hours duration, only on second half of the course): 40%

Term paper (topic related to the course and relevant to the student's research, or else to be assigned by the instructor): 20%. See term paper handout for details.

Prerequisites: CHEM 254 (Thermodynamics), 264 (Organic chemistry) or equivalents.

Texts (on reserve at library for 3-hour loans – Look under CHEM 370)

"Principles of Polymerization" 4th ed., G. Odian, Wiley: New York, 2004. QD281.P6O3 2004.

Available in both printed and e-book forms.

"The Elements of Polymer Science and Engineering" 3rd ed., A. Rudin and P. Choi, Academic Press: Orlando, 2013. QD381.R8 2013.

THE FINE PRINT:

Required University of Guelph and University of Waterloo Statements for Course Outlines

For University of Waterloo Students

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check [the Office of Academic Integrity](#) for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read [Policy 70, Student Petitions and Grievances, Section 4](#). When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. [Check [the Office of Academic Integrity](#) for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to [Policy 71, Student Discipline](#). For typical penalties, check [Guidelines for the Assessment of Penalties](#).

Appeals: A decision made or penalty imposed under [Policy 70, Student Petitions and Grievances](#) (other than a petition) or [Policy 71, Student Discipline](#) may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to [Policy 72, Student Appeals](#).

Note for students with disabilities: [AccessAbility Services](#), located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Turnitin.com and alternatives: Text matching software (Turnitin) will be used to screen assignments in this course. This is being done to verify that use of all material and sources in assignments is documented. In the first week of the term, details will be provided about the arrangements for the use of Turnitin and alternatives in this course.

Note: students must be given a reasonable option if they do not want to have their assignment screened by Turnitin. See [Academic Integrity - Guidelines for Instructors](#) for more information.

For University of Guelph Graduate Students

E-mail Communication: As per university regulations, all students are required to check their <mail.uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its students.

When You Cannot Meet a Course Requirement: When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. See the graduate calendar for information on regulations and procedures for Academic Consideration.

Drop Date: The last date to drop one-semester courses, without academic penalty, is Thursday, 3 November 2017. Two-semester courses must be dropped by the last day of the add period in the second semester. Refer to the Graduate Calendar for the Schedule of Dates.

Copies of out-of-class assignments: Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

Accessibility: The University of Guelph is committed to creating a barrier-free environment. Providing services for students is a shared responsibility among students, faculty and administrators. This relationship is based on respect of individual rights, the dignity of the individual and the University community's shared commitment to an open and supportive learning environment. Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability should contact the Centre for Students with Disabilities as soon as possible.

For more information, contact CSD at 519-824-4120 ext. 56208 or email csd@uoguelph.ca or see the website: <http://www.uoguelph.ca/csd/>

Academic Misconduct: The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisort.

The Academic Misconduct Policy is detailed in the Graduate Calendar.

Recording of Materials: Presentations which are made in relation to course work—including lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Resources: The Graduate Calendar is the source of information about the University of Guelph's procedures, policies and regulations that apply to graduate programs: <http://www.uoguelph.ca/registrar/calendars/graduate/current/>

CHEM 770/7700 TERM PAPER

Graduate students registered for credit (non-audit students) are required to write a term paper that will be worth 20% of the total course mark.

Topic: Should be related to the course material (i.e. one of the topics listed in the course outline) AND, whenever possible, to your own thesis research. However it should **not** be a discussion of your own research – just rewriting that CHEM 794 report is not an option! For example, you may want to learn more about a specific characterization or polymerization technique you will use in your own research. If you do not have any idea about which topic to choose, come see me and I can help you select one (or else assign you one). **I must personally approve the topic of your term paper by Tuesday, October 3rd at the latest. Students who have not submitted a topic by then will receive a 25% penalty on their term paper (equivalent to 5% of the total course mark).** Do **NOT** wait until the last minute to seek approval, nor simply assume that whatever topic you selected will be appropriate.

Format: The paper should be 15-30 pages in length overall (double line spacing, figures included) and written in the format of a review with the following sections: Title page, table of contents, introduction, main body, conclusions, and cited references. The main body of the text should be in the format of a review paper, divided into sections discussing different aspects of the topic in an organized (coherent) fashion. The conclusions section should summarize the main points brought up in the review. The scope of the topic must be restricted so that you can find only ca. 10-20 references overall, and **NOT** all from the same 1-2 research groups. Note that the literature should be cited throughout the text (with the references appearing in numerical order), not simply provided as a bibliography. The source of any figure borrowed from the literature should be specified by adding a reference number to the caption. References to **web sites** are **forbidden**. You should limit yourself to peer-reviewed literature, considered much more reliable as a source of information.

Due date: All term papers are due at the last lecture, i.e. **Thursday, November 30th**. Please note that due to the tight exam schedule, no extensions will be granted to suit individual needs. Get started **early** so you do not run out of time! Both hard copy (paper) and electronic (Acrobat PDF or Microsoft Word) submissions will be required.

Grading of the papers will be based on the overall quality of writing, i.e. logical organization of the sections, quality of grammar and lack of typographical errors, quality and appropriateness of figures, etc. Do **NOT** simply cut and paste blocks of text from the references to assemble into your term paper – this is plagiarism! Always say it in your own words. Please note that if you have problems writing in English, you should seek the help of a qualified person to proofread your text before submission so that you are not penalized.

For detailed information on what is considered plagiarism at the University of Waterloo, please consult the following web site:

<http://www.uwaterloo.ca/academicintegrity/Students/index.html>

This includes many examples of what is considered academic misconduct at UW:

<http://subjectguides.uwaterloo.ca/gradguide>

PLAGIARISM DETECTION SOFTWARE (TURNITIN) WILL BE USED TO SCREEN TERM PAPERS IN THIS COURSE. THIS IS BEING DONE TO VERIFY THAT USE OF ALL MATERIAL AND SOURCES IN TERM PAPERS IS DOCUMENTED.