Instructors:  Professor Mitchell Winnik  m.winnik@utoronto.ca  
              Professor Eugenia Kumacheva  ekumache@chem.utoronto.ca

Lectures:    Tuesdays  5 - 7 pm, LM158
Tutorial:    Fridays  1 – 2 pm, TBA

[There is a tutorial time scheduled for the course, but there will be no regular tutorials. This time will be used for the mid-term test and for possible review sessions.]

Office hours:  For M.W.: LM520 4 to 5 pm on the Tuesdays of his lectures. For E.K., to be announced

Recommended text:

(Other useful text books: there are several)
Young, R.L.; Lovell, P.A. Introduction to Polymers, 2nd ed
Sperling, L.H., Physical Polymer Science, 2nd or 3rd ed.

Please note that you are responsible for all material presented in lecture, whether or not this topic is also presented in the recommended text.

Webnotes: For M.W.: PDFs of lecture notes will be posted prior on the “chm 426” website to each lecture. Please print these out and bring them to class.

www.chem.utoronto.ca ⇒ Course notes ⇒ chm 426
 [user name: “chm426” (one word, all lower case); password: (to be given out in lecture)]

Marking Scheme:

<table>
<thead>
<tr>
<th>Assignments and tests:</th>
<th>Quizzes</th>
<th>5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct 18 or 25, 1 – 2pm (1 hr)</td>
<td>Midterm test</td>
<td>25%</td>
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<tr>
<td></td>
<td>Term paper</td>
<td>30%</td>
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<td>Final exam</td>
<td>40%</td>
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Quizzes: There will be a 5 to 10-min quiz during lecture, starting in lecture 2. The lowest quiz mark will be dropped from the average.

Term Paper: Details of the term paper will be discussed in class. The term paper will be due the last day of fall session classes.
CHM426 and CHM1300: Polymer Chemistry & Chemical Properties of Polymers
Lecture/Topic Outline
Fall Term 2013

1. Introduction
   Classification of polymers
   General concepts of molecular weight distribution

2. Polymer synthesis: Step growth polymerization
   Statistics of step-growth polymerization

3. Polymer synthesis: Addition polymerization
   Anionic and cationic (living) polymerization
   Kinetics and mechanism of free radical polymerization
   Controlling Mn: chain transfer
   Copolymerization and reactivity ratios

4. “Living” Radical polymerization
   Nitroxide mediated polymerization (NMP, also called SFRP)
   Reversible addition-fragmentation transfer (RAFT) polymerization
   Atom transfer radical polymerization (ATRP)

4. Polymer synthesis: other topics
   Ziegler-Natta and metallocene polymerization of olefins
   Ring-opening metathesis polymerization
   Gel formation
   Kinetics of step-growth polymerization

5. Experimental determination of the sizes and shapes of macromolecules
   Conformation of macromolecules
   End-group analysis
   Osmometry
   Scattering techniques
   Viscometric techniques

6. Polymer solutions
   Polymer interactions in solutions; concentration regimes, solvent quality
   Solution and melt thermodynamics (Flory-Huggins theory)
   Solubility parameter approach
   Association in polymer solution and melts
   Phase separation

7. Polymers in the bulk state
   Melts and amorphous states
   Glass transition
   Crystalline polymers
   Morphology
   Macroconformation, packing, chain folding
   Kinetics of crystallization

--------- midterm test --- Friday afternoon October 18 or 25, at 1:00 pm -