DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus (revised Sept 2019)

Department of Chemistry

Chemistry 4502/5502
Polymer Science
Winter, 2020

Instructor(s): *Michael Freund* *michael.freund@dal.ca* *Chemistry 335*

Lectures: *8:35-9:55* *Chemistry Room 223*

Course Description

This course will cover aspects of synthesis, analysis, characterization, structure and uses of synthetic and naturally occurring macromolecules. Emphasis will be on the application of standard methods of organic synthesis, analytical separations, and physico-chemical characterization. In addition, students will carry out independent literature projects.

Course Prerequisites

CHEM 2201.03, CHEM 2301.03, CHEM 2304.03, and CHEM 2402.03 (grade of C- or better)

Course Objectives/Learning Outcomes

***Section 1**: Introduction to Polymers - Topics may include but are not limited to: history of polymers, types of polymers, molecular weights, morphology, testing and characterization, industrial and commercial uses, polymers and the environment (2-3 weeks)*

***Section 2**: Synthesis of Polymers - Topics may include but are not limited to: Chain growth methods, step growth methods, anionic and cationic methods, radical methods, ring opening methods, homogenous and heterogenous catalytic polymerizations, natural and biomedical polymers, organometallic polymers, inorganic polymers (3-4 weeks)*

***Section 3**: Conjugated Polymers and Applications - Topics may include but are not limited to: Polymer Solar Cells, Polymer Light Emitting Diodes, Polymer Field Effect Transistors, Polymer Sensors, Synthesis of Conjugated Polymers, Types of Conjugated Polymers, Characterization of Conjugated Polymers, The oligomer approach to conjugated polymers (3-4 weeks)*

Course Materials

***Suggested Texts** (for additional reading/perspective and advanced topics):*

"Polymer Chemistry" by Carraher, Jr.
"Introduction to Polymers" by Young and Lovell
"Synthesis of Polymers" edited by Schluter, Hawker, and Sakamoto.
"Design and Synthesis of Conjugated Polymers" edited by Leclerc and Morin
"Hand Book of Conducting Polymers" edited by Reynolds and Skotheim

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Course Assessment

Lectures will commence on January 6, 2020. The three term tests will be held in the regularly scheduled class time on January 28, February 27, and March 19, 2020; there is NO final exam to be scheduled by the registrar. Students will be required to submit a tutorial review on a selected topic in polymer chemistry, and a research proposal on such topic (Chem 5502 only). Students will give a 10-15 minute presentation on their topic. The overall grading scheme for the course is as follows:

4502		**5502**	
Term Tests (3 x 10%)	30%	Term Tests (3 x 10%)	30%
Tutorial Review	50%	Tutorial Review + Research Proposal	50%
Presentation	20%	Presentation	20%

Please note that while students in 4502 and 5502 share a similar curriculum, they will be treated as two independent cohorts with regard to the course requirements (grading, etc).

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	**B+** (77-79)	**C+** (65-69)	**D** (50-54)
A (85-89)	**B** (73-76)	**C** (60-64)	**F** (<50)
A- (80-84)	**B-** (70-72)	**C-** (55-59)	

Course Policies

TESTS (30%)

Term Tests: The term tests will test the students understanding of the material covered in the course up to the date of the test.

COURSE WORK (70%)

Tutorial Review, Research Proposal, and Presentation on a Current Research Topic

Tutorial Review*: Each student is required to submit a typed "Tutorial Review" (TR; 5 pages min., 10 pages max. including appropriate chemical drawings/figures/charts as needed) of an area of polymer chemistry. The area of review will be assigned by Dr. Freund on or before scheduled class on* ***January 30th, 2020****. The TR will be due in class* ***March 24th, 2020****. LATE REPORTS WILL NOT BE ACCEPTED. The TR should be formatted as a* ***Royal Society of Chemistry, Chemical Reviews****, Tutorial Review. Sections that could be included: Introduction, History, Synthesis, Characterization, Applications, Recent Advances, References. A min. of 20 to a max. of 40 references must be included. All reports must have a cover page with tile, name, date, and abstract (maximum 200 words). No two students will report on the same topic and students are to work independently on their review.*

Please ensure the review is in the proper RSC ChemRev format. Two columns per page. Use the template. Marks will be taken off for improper formatting. It is highly suggested that students start early on the review. Treat it like a real publication. Use proper referencing in the document. I suggest use the 'Mendeley" software which is free.

Plagiarism and Cheating

Students should familiarize themselves with the definitions and policy as well as the University discipline process and penalties.

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Course Content

January		February	
7	Introduction/History	20	**Study break**
9	Nomenclature	25	Organometallic and inorganic polymers
14	Properties	27	**Term Test 2**
16	Characterization		
21	Natural and biomedical polymers	March	
23	Synthesis and use overview	3	Electrochem/band structure primer
28	**Term Test 1**	5	Conjugated oligomers
30*	Step growth methods	10	Synthesis and characterization
		12	Organic electronics
February		17	Sensing
4	Anionic and cationic methods	19	**Term Test 3**
6	Radical and ring opening methods	24	*Presentations*
11	Catalytic polymerization (homogenous and heterogenous)	26	*Presentations*
13	Away	31	*Presentations*
18	**Study break**		

* Tutorial must be selected and approved