SC/CHEM 6330 (3 credits) Selected Topics in Inorganic Chemistry: Conjugated Materials

Term
Fall 2019

Time and Location
Lectures (CB122) TW 17:30-19:00

Prerequisite
BSc (or equivalent) in Chemistry

Course Instructor

Dr. Thomas Baumgartner
E-mail: tbaumgar@yorku.ca
Phone: ext. 44208
Office: LSB431B
Office hours: by appointment

Course Description

Introduction to the synthesis, properties and application of molecular and polymeric conjugated materials. Basic aspects of polymer synthesis and characterization; optoelectronic properties of functional organic and organomain group materials; recent advances in the application of organic electronics in light-emitting diodes, transistors, solar cells, sensors, and batteries. The following are the topics that will be covered in detail:

1. Introduction to Polymer Chemistry (Definition of important units/methods/properties)

- Step Growth and Chain Growth mechanisms
- Polymer microstructures/conformations
- Solution & bulk properties

2. Conjugated Polymers (Fundamentals)

- Specific polymer features
- Band theory (insulators/semiconductors/conductors)
- Electronic structure and optical response

3. Application of Conjugated Materials

- OLED/PLED/OFET/OPV/Sensors/Batteries
- Device set-ups and fabrication
- General materials' requirements

4. Classic Conjugated Materials

- Hydrocarbon based (polymers, oligomers & small molecules)
- Hydrocarbons with heteroatoms (N-, S-, P-based polymers, oligomers & small molecules)

5. State-of-the-art research in Conjugated Materials (student presentations)

Purpose and Objectives of the Course

The course is designed for graduate students specializing in synthetic inorganic, organic, and materials chemistry, but is also expected to be of interest to course-based Masters students. This course is expected to also be of high utility to graduate students arriving from other institutions where rigorous training on polymers and conjugated materials chemistry was not available, by providing a foundational basis for the fundamental concepts critical to the completion of their graduate degrees.

Textbooks

The course will be based in part on the following text books, but more so on review articles:

A. E. Tonelli, *Polymers from the Inside Out: An Introduction to Macromolecules,* Wiley-Interscience *ISBN:* 0-471-38138-1 – available at the Steacie library

R. J. Young, P. A. Lovell, *Introduction to Polymers*, 2nd Edition, CRC Press; ISBN: 978-1-439891-95-7 – available at the Steacie library

Baumgartner, Jaekle,
Main Group Strategies towards Functional Hybrid Materials; ISBN: 978-1-119-23595-8
(available online here: https://onlinelibrary.wiley.com/doi/book/10.1002/9781119235941)

Organization of the Course

Much of the lectures will be delivered by the Course Instructors but will require active participation of the students in the form of discussions as well as a formal presentation. Content slides will be posted ahead of the class on Moodle. It is the student's responsibility to sign up for an account. See https://moodle10.yorku.ca/moodle/ for details.

Evaluation

The level of proficiency in the material will be assessed through the elements listed below. The final grade for the course will be based on the following items weighted as indicated.

Assignments (4): 28%
Presentation: 26%
Class Participation: 10%
Final Exam (Research Proposal): 36%

Four assignments (7% each) will involve course-specific problems. The problem-set based assignments will reinforce the topics and concepts that align with the progress in class. Students will be expected to answer using concise, scientific writing.

The presentation (26%) will involve a 20 minute in-class lecture by each student on a topic that is arms-length to their respective thesis research topic. The topic can be selected from a list or chosen by the student (with approval from the instructor). Students will examine the peer-reviewed literature and extract

the appropriate information to be included as it relates to the course content. The presentation will form the basis for the final exam component.

The final exam (36%) will be in the form of a research proposal that pertains to the contents of the in-class presentation. The 5-page proposal is expected to follow NSERC rules for a Discovery Grant proposal using concise, effective scientific writing. For reference see here: http://www.nserc-crsng.gc.ca/ResearchPortal-PortailDeRecherche/Instructions-Instructions/DG-SD_eng.asp.

Grading Scheme, Assignment Submissions, Lateness Penalties, Academic Integrity

The grading system for the course follows the outline from the Faculty of Graduate Studies at York (e.g., A+ = 90-100%, A = 85-89%, A- = 80-84% B+ = 75-79%, B = 70-74%, C = 60-69%, F = 0-59%). Evaluation components will bear either a letter grade designation or a corresponding number grade.

(For a full description of York grading system see the Faculty of Graduate Studies http://gradstudies.yorku.ca/current-students/regulations/courses-grading/)

Proper academic performance depends on students doing their work not only well, but on time. Accordingly, the assignments must be received on the due date specified for the assignment, which are to be handed at class on the due date. Assignments should NOT be deposited in the Course Instructor's mailbox. **Assignments received later than the specified time on the due date will result in no credit (0%).** Exceptions to the lateness penalty will be entertained by the Course Instructor only when supported by written documentation (see above). The grading scheme will be adjusted accordingly.

Important Dates

September 4:	Classes start
October 12 – 18:	Reading Week (no classes)
November 12:	Student presentations start (in-class)
December 3:	Last class
December 19:	Research proposal due

Important Course Information

Students must make themselves aware of university policies on Academic Honesty/Integrity, Access/Disability, Student Conduct, Religious Observance and other matters. A periodically updated Information Sheet summarizing this information can be downloaded[a] and printed, and the Registrar's Office issues a list of Religious Observance Days.[b]

a) http://secretariat.info.yorku.ca/files/CourseInformationForStudentsAugust20121.pdf

b) http://registrar.yorku.ca/enrol/dates/religious-accommodation-guidelines-2018-2019

Academic Honesty

CEAS July 2019

During 2018-19 academic year, numerous students were found guilty of aiding and abetting in cases where they had uploaded assignments to websites like Course Hero, if their work was then submitted by a student who accessed this material. Members of the CEAS panel recommend that professors add the following to their course outlines in the section on Academic Honesty.

Numerous students in Faculty of Science courses have been charged with academic misconduct when materials they uploaded to third party repository sites (e.g. Course Hero, One Class, etc.) were taken and used by unknown students in later offerings of the course. The Faculty's Committee on Examinations and Academic Standards (CEAS) found in these cases that the burden of proof in a charge of aiding and abetting had been met, since the uploading students had been found in all cases to be wilfully blind to the reasonable likelihood of supporting plagiarism in this manner. Accordingly, to avoid this risk, students are urged not to upload their work to these sites. Whenever a student submits work obtained through Course Hero or One Class, the submitting student will be charged with plagiarism and the uploading student will be charged with aiding and abetting.

Note also that exams, tests, and other assignments are the copyrighted works of the professor assigning them, whether copyright is overtly claimed or not (i.e. whether the © is used or not). Scanning these documents constitutes copying, which is a breach of Canadian copyright law, and the breach is aggravated when scans are shared or uploaded to third party repository sites.