CHEM 295 – Organic Materials for Electronics
Fall 2018

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Office Hours: For *quick* questions, just drop by. Other times are *by appointment only*.

Class Meetings: 8:30 am – 9:45 am TR, Votey 223

UVM Holidays: Classes will not be held on: November 19 – 23

Recommended Texts: There are no required or recommended texts for the course. All course material is derived from the primary literature (i.e., peer reviewed journal articles). Students should expect to read a number of journal articles in preparation for each lecture and class time will be focused on a discussion of these assigned readings. Participation in this discussion is expected.

Course Description: As outlined below, the course will cover three main areas of organic electronic materials: OFETs, OPVs, and OLEDs. In each of these sections, we will survey the compounds that have been developed and highlight particularly exceptional materials. As this is a chemistry course, we will spend much of our time looking at the molecules themselves – what attributes of the molecules make them useful, how are they synthesized, etc. This will enable students from all backgrounds to understand what has been done, what is possible, and as a result provide a foundation for the design of novel electronically active molecules.

400-Point Scale:

Homework assignments	150 points	3 sets – one before each exam
Midterm Exams	150 points	September 27, October 25, November 15
Final Presentation	100 points	November 26 – December 7

Course Grading: Course grading will be structured according to the 400-point scale above. Failure to complete an assignment or quiz on the assigned date will result in a numerical score of zero. Proposals for "extra credit" will not be considered.

Tentative Outline:

1. Brief introduction to inorganic semiconductors

2. Organic Semiconductors for Field-Effect Transistors

- 2.1 Overview of device configuration and factors influencing performance of OFETs
- 2.2 p-Type Semiconductors
  - 2.2.1 Selected p-type small-molecule semiconductors
  - 2.2.2 Selected p-type polymer semiconductors
- 2.3 n-Type Semiconductors
  - 2.3.1 Selected n-type small-molecule semiconductors
  - 2.3.2 Selected n-type polymer semiconductors
- 2.4 Ambipolar Semiconductors
  - 2.4.1 Selected ambipolar small-molecule semiconductors
  - 2.4.2 Selected ambipolar polymer semiconductors

3. Organic Semiconductor Photovoltaic Materials

- 3.1 Organic solar cells by vacuum deposition
- 3.2 Organic solar cells by solution processing
  - 3.2.1 Dyes

3.2.2 Triphenylamine derivatives
3.2.3 Oligothiophenes
3.2.4 Linear D-A Oligothiophenes
3.2.5 Organic Molecule Acceptors
3.3 Brief discussion of photovoltaic polymers

4. Organic Electroluminescent Materials

4.1 Introduction to OLEDs
4.1.1 Anode and hole injection materials
4.1.2 Cathode and electron injection materials
4.1.3 Hole and electron transport materials
4.1.4 p- and n-type doping materials
4.2 Fluorescent and Phosphorescent Materials
4.2.1 Red materials
4.2.2 Green materials
4.2.3 Blue materials

Academic Conduct: Cheating or plagiarism will be considered grounds for failing the course (a numerical score of zero). All graded assignments must be your own work. Cases of cheating or plagiarism will lead to further disciplinary action, which may include dismissal from the University according to the rules set forth in the University of Vermont's *Code of Academic Integrity:*
http://www.uvm.edu/policies/student/acadintegrity.pdf

The instructor reserves the right to change everything, with appropriate notice.