ECE 693 Special Topic
Organic Electronic Materials and Devices

Instructor: Dr. Dawen Li, Associate Professor
Office: 2005 NERC
Phone: (205) 348-9930
Email: dawenl@eng.ua.edu

Course level: Graduate students

Pre-requisite: None

Lectures: TR 2:00 pm – 3:15 pm, room 1014, SERC

Office hours: TR 3:15 pm – 4:00 pm or per appointment

Course description

With an interdisciplinary nature, this course is designed to teach and prepare graduate students for the new era of organic and printed electronics. The objective is to provide students with a broad overview of organic electronic materials and devices with emphasis of research and practical applications. Topics covered on organic electronics include conjugated semiconducting materials (both small molecules and polymers), organic electronic & optoelectronic devices, such as thin-film transistors (OTFTs), light-emitting diodes (OLEDs), solar cells (OPV), etc., and technologies for high-speed printing on flexible substrates.

Topics to be covered (tentative, subject to change):

Part I: Organic Semiconducting Materials
1. Brief review of semiconductors and organic chemistry
2. Conjugated small molecules and polymers
3. Electronic structure: hybridization of atomic orbitals, molecular orbitals
4. Molecular structure-process-property relationships
5. Characterization: UV-vis, Cyclic Voltammetry, XRD, AFM, TEM
Part II: Organic Electronic Devices

6. Brief review of PN junction diode and MOSFET
7. Thin-film transistors
8. Light-emitting diodes
9. Solar cells (include hybrid perovskite PV cells)
10. Organic bioelectronics
11. Electrical measurement
12. Device stability

Part III: Flexible Electronics and High-Speed Printing

13. Organic devices on flexible substrate
14. Technologies of roll-to-roll printing
15. Stretchable electronics

Required textbook
No textbook required, lecture notes will be provided.

Reference book (on reserve in Rodgers Science & Engineering Library):

• Franky So (Editor), *Organic Electronics: Materials, Processing, Devices and Applications*, CRC Press, 2009

**Homework and exam policy**

Homework discussion in small groups is encouraged. However, each student must work through each paper review and presentation individually. Pop quizzes are possible to maintain class attendance and participation.

**Grading**

Homework (regular and paper review) ............................................ 20%
Topic presentation ............................................................................. 20%
Discussion and quiz ........................................................................ 10%
Midterm paper .................................................................................. 20%
Final exam ........................................................................................ 30%