

ECE 592-003

Intro to Organic Electronics & Liquid Crystal Displays: “Soft Electronics”

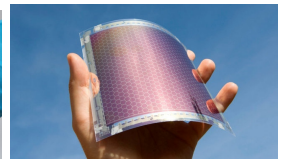
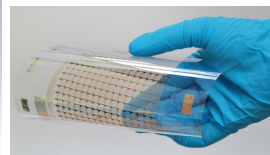
Instructor(s): Professor Michael Escuti, mjescuti@ncsu.edu

Objective or Description: This course focuses on the foundational principles of organic electronic and photonic devices, whose operation is fundamentally based on soft condensed-matter principles and materials. Liquid crystal displays (LCDs) became the primary display for computing and entertainment in the late 1990s, and much more recently organic light-emitting-diode (OLED) displays have appeared in our favorite mobile devices, including smartphones and smartwatches. Many academic research and small-scale commercial efforts have developed organic thin-film-transistors (OTFTs) and organic photo-voltaics (OPV) into viable technologies. We will focus on current research efforts in a variety of organic devices, including flat-panel-displays (LCDs and OLEDs), TFT-based electronics, and solar cells. We will build from the traditional foundation of EE students in semiconductor materials and address the differences in physical properties, fabrication processes, and device limitations/advantages.

Prerequisites: Knowledge of basic (i.e., undergraduate) electromagnetics and solid state electronics.

Textbook: A PDF coursepack will be provided.

Topics: Topics will include electronic transport and light emission, self-assembly and partial-order, lightwave propagation, and fabrication. We will focus explicitly on the optical and electronic aspects of four devices: (1) the two principle types of LCDs, (2) OLED displays, (3) polymer TFTs, (4) and OPV cells.



Grading: prelecture quizzes 8%, homework 12%, two tests 50% total, final paper/presentation 30%