

Description for EECS 598; W18

Course title: **Organic Electronic Devices and Applications**

Instructor: S. Forrest

Prerequisite(s): Senior level quantum mechanics, junior level electronic devices

Preferred meeting pattern(s): MW 10:30-12:00

Summary:

Today, there is a revolution in optoelectronics: OLED displays are used in billions of smart phones, televisions, tablets and smart watches worldwide. They are now coming into use in lighting for both residential and automotive applications. Organic solar cells are achieving 15% efficiencies, bringing them to the cusp of generating a new, ultralow cost renewable energy source. Contemporaneously, the fundamental understanding of organic semiconductors used in these emerging applications has been a subject of intense study for over 70 years, and in many cases is still not fully understood. In this course, we will trace the history, science and modern applications of organic electronic technology. Since some students have taken the first course on this topic in W17, only the first few weeks of the course will provide the fundamental physics of organics primarily as a review. This will include the basics of the optical and electrical properties of organic semiconductors. Next, we will discuss how organics are deposited and patterned to achieve thin film device structures. The bulk of the class material is concerned with device physics, engineering and applications. In particular light emission from OLEDs, their various structures and adaptations for high efficiency displays and lighting will be discussed. This is followed by a treatment of organic thin film transistor physics and applications for sensing, medical applications etc. The course is concluded by a comprehensive treatment of organic solar cells: their status, efficiency limits, reliability, as an energy harvesting technology will be described.