



**MT 261 January 3:0**

## **Organic Electronics**

### **Instructor**

Praveen C Ramamurthy  
Email: praveen@iisc.ac.in

### **Teaching Assistant**

Email:

**Department: Materials Engineering**

Course Time: Tue., Thu., 8:30 - 10 AM

Lecture venue: Lecture theatre, Department of Materials Engineering

Detailed Course Page: <http://materials.iisc.ernet.in/~praveen/>

## **Announcements**

### **Brief description of the course**

course will start with basics device physics and then discuss about organic electronics basics charge transport properties and application.

Anyone interested in device physics, solar cells, LED, transistor and sensors interest could take this course.

### **Prerequisites**

having an undergrad course in physics and chemistry is must

### **Syllabus**

1) Fundamental physics and electronic properties

• Introduction

• Atomic and Molecular Orbitals

• Potential Energy Curve

• Particle in a Box

• Schrödinger's equation

## 2) Fundamentals of Semiconductors

- What are semiconductors and their uses.

- Junctions --> Ohmic and Schotky Junction

- Introduction to I/V curve

- General Devices -> Diode, PV, Transistor, Sensor

## 3) Chemistry of Conducting Polymers

- Synthesis of conducting polymer

- Type of conducting polymer (AB and AA type)

- General synthesis methods for each type

- Characterisation of the polymer prepared including basic properties like resistance

## 4) Processing and Fabrication

- Spin coating

- Evaporation

- Sputtering

- Electrospinning

- Drop casting

- Templating

## 5) Charge Transport

- Generation of the charged species

- Conduction of the charges

- i) Species Present

- ii) Mechanism of Transport

- iii) Traps

- Collection of charges at the electrode

## 6) Organic Devices

• Conduction in Organic devices

• Conduction at the junction and electrode

• Space charge limited current

• Specific Organic devices

i) Transistors

ii) OPV

iii) OLED

iv) Sensors

## 7) Device Characterisation and Stability

• Quantum efficiency

• Impedance Spectroscopy

• CELIV

• Degradation issues

## 8) Modern devices

• Flexible Glass material

• Advance 2D and 3D materials

## **Course outcomes**

Fundamental understanding of organic electronics and appreciate importance of structure property relationship of molecules in devices like OPV, OLED, sensors and transistors.

## **Grading policy**

Research paper 30 %

Research project 40 %

Final exam 30 %

## **Assignments**

Research paper

in class home works

Group research projects

both review paper and project presentation

## **Resources**

Soft and hard copy of these books are made available to the students

• Handbook of Conducting Polymers Third Edition CONJUGATED POLYMERS THEORY, SYNTHESIS, PROPERTIES, AND CHARACTERIZATION Edited by Terje A. Skotheim and John R. Reynolds, CRC Press.

• Handbook of Conducting Polymers Third Edition CONJUGATED POLYMERS PROCESSING AND APPLICATIONS Edited by Terje A. Skotheim and John R. Reynolds, CRC Press.

• Organic Photovoltaics Mechanisms, Materials, and Devices by Sam-Shajing Sun Niyazi Serdar Sariciftci. CRC Press.

• Semiconductor Physics and Devices Basic Principles Donald A. Neamen, McGraw Hill publications.