SEMESTER S5

ORGANO ELECTRONICS (PEAGT 523)

Course Code	PEAGT 523	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	Nil	Course Type	Theory

Course Objectives:

1. This course is designed to provide a comprehensive understanding of organic semiconductors and action of various layers used in organic devices.
2. The students will gain the skills necessary to design and develop organic devices like OLEDs, OFETs and OPVs after the completion of the course.

KTU SPECIAL

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Basics of Organic semiconductor, conduction mechanism in organic semiconductors, Pi and Sigma electron band theory. Fundamentals of conducting polymers. Charge transport in conjugated polymers. Effect of solitons. Conduction mechanism in doped polymeric semiconductors. Luminescence, injection and transports properties in organic semiconductors.	9
2	Organic light emitting diodes (OLED) and Polymer light emitting diodes (PLED) – Basic device architecture, Single layer architecture and multilayer architecture, electrical properties and operating characteristics, Flexible display device architecture, Fabrication and characterization, Principle and architecture of organic transistors.	9

3	Basic principle and architecture of Plastic Solar cell. Charge transport, effects of excitation diffusion, dissociation and luminescence, Photogeneration	**9**
	process in organic heterojunction, photovoltaic cells. Processing of organic solar cells. Dye sensitization – dye sensitized solar cell.	
4	Essential characteristics and conductivity of electrode materials in organo electronic devices, Effect of Indium Tin Oxide (ITO) oxidative properties on efficiency and shelf life of organic electronic devices, Buffer organic layer protection to the active layer. Doping and for increased efficiency and shelf life– architecture. Devices fabrication- Thin film coating technique. Spin coating, dip coating, doctor blading screen printing, inkjet printing, vapor deposition. R.F and microwave plasma assisted film coating.	**9**

Course Assessment Method

(CIE: 40 marks, ESE: 60 marks)

KTU SPECIAL

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 subdivisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

	Course Outcome	Bloom's Knowledge Level (KL)
CO1	Understand the fundamentals of charge transport, energy levels and doping in organic semiconductors and conducting polymers. Exemplify the properties and applications of organic electronic devices.	**K1**
CO2	Understand the device architecture of organic devices.	**K2**
CO3	Distinguish action of different layers of organic devices	**K3**
CO4	Define the different techniques employed to design and develop organic devices like OLEDs, OFETs and OPVs.	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

KTU SPECIAL

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	2	1	1				1	2
CO2	3	3	3	3	2	1	1				1	2
CO3	3	3	3	3	2	1	1				1	2
CO4	3	3	3	3	2	1	1				1	2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Textbooks				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Supra molecular photo sensitive and electro–active materials	Nalwa,	Elsevier	2001
2	Organic Electronic Materials: Conjugated polymers and low molecular weight organic solid	R.Farchioni, G.Grosso	Springer series in materials science	2020
3	Organic electronics	Klauk Hagen	Wiley	2011

KTU SPECIAL

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Flexible flat panel display	Gregory Crawford	Wiley	2000
2	Thin film materials for large area electronics	Equer	Elsevier	2010
3	Advanced synthetic metals	Bernier	Elsevier	2020

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/112/105/112105271/
2	https://archive.nptel.ac.in/courses/112/105/112105271/
3	https://archive.nptel.ac.in/courses/112/107/112107256/
4	https://archive.nptel.ac.in/courses/112/105/112105248/ https://archive.nptel.ac.in/courses/103/103/103103145/

KTU SPECIAL