AMITY UNIVERSITY
UTTAR PRADESH

Course Title: Optoelectronics Devices

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
3	1	0	0	4

Credit Units: 4

Course Level: PG **Course Code: TELE711**

Course Objectives: The aim of this course is to provide the fundamental and advance concepts of optoelectronic devices and their applications

Pre-requisites: Basic Electronics, Optics and Laser

Course Contents/Syllabus:

	Weightage (%)
Module I: Optical processes in Semiconductors	**25**
Electron hole pair formation and recombination, Absorption in semiconductor, Effect of electric field on Absorption, Franz-Keldysh and stark effects, Absorption in Quantum wells and Quantum confined stark effect, relation between Absorption and emission spectra, Stokes shift in optical transition, Deep level transitions, Measurement of absorption and luminescence Spectra, Time resolved Photoluminescence.	
Module II: Materials Growth & Fabrication	**25**
Growth of optoelectronic materials by MBE, MOCVD, Plasma CVD, photochemical deposition. Epitaxy, interfaces and junctions (advantages/disadvantages of growth methods on interface quality, interdiffusion and doping. Quantum wells and band gap engineering Optoelectronic Materials and Devices Basic concepts on interaction of light with solids, Optical constants, absorption and emission properties. Photodiodes-their characteristics and fabrication. Photo detectors: various types of photodiodes, PV and PC devices, Solar cells, photoresistors.	
Module III: Organic Electronics	**25**
Molecular materials, Electronic state in conjugated molecules, Optical spectra of molecules, Electronic vibration transitions, the Franck Condon principle, Aromatic hydrocarbons, Conjugated polymer, Organic Semiconductors: Conductivity and Mobility of nearly-free Charge Carriers., Charge Carriers in Organic Semiconductors: Polarons, Shallow Traps and Deep Traps., Generation of Charge Carriers and Charge Transport: Experimental Methods. , The TOF Method: Gaussian Transport. Space-Charge Limited Currents. Band or Hopping Conductivity, Electric-field Dependence, Charge Transport in Disordered Organic Semiconductors., The Bässler Model.	
Module IV: Organic optoelectronic devices	**25**

Organic Light-Emitting Diodes (OLEDs).,The Principle of the OLED., Multilayer OLEDs. Structure, Fundamental processes Efficiency, Characterization of OLEDs, Organic photovoltaic diodes (OPVDs): Fundamental process, Exciton absorption, Exciton dissociation, Charge collection Characterization of OPVDs, Relevant performance parameters.	

Student Learning Outcomes: The student will be able:

- To explain the various optical process in semiconductors.
- To describe the fabrication techniques of optoelectronic devices.
- To describe the fundamentals of organic electronics.

To explain the organic optoelectronic devices.

Pedagogy for Course Delivery: Delivery of lectures with class notes followed by presentations and uploading course material on Amizone

Lab/ Practicals details, if applicable: NA

Assessment/ Examination Scheme:

Theory L/T (%)	**Lab/Practical/Studio (%)**	**Total**
100%	NA	100

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					**End Term Examination**
Components (Drop down)	Class Test	Home Assignment	S/V/Q	Attendance	
Weightage (%)	10%	10%	5%	5%	70%

Text Reading & References:

1. Pallabh Bhattacharya , Semiconductor Optoelectronics Devices,.(Pearson Education).

2. A. Yariv Saunders , Quantum Electronics, (Wiley).

3. A. Rogers, Essentials of Optoelectronics (Chapman Hall).

4. Jasprit Singh, Electronic & Optoelectronic properties of Semi conductor, (Cambridge University Press).