GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
SUBJECT CODE: 3173904

Semester – VII
SUBJECT NAME: PHOTONICS

Type of course: Optics

Prerequisite: Basic knowledge of electronics, optics, and nanoscience and nanotechnology

Rationale: To make the students understand the role of photonics and photonic based devices.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	**MODERN OPTICS** 1.1 Light, Light-material interaction 1.2 Electrodynamics: Maxwell's equations 1.3 Electromagnetic wave in different media 1.4 Polarization of light, Interference 1.5 Absorption, Dispersion and modulation of light 1.6 Plasmons 1.7 Quantum optics 1.8 Fiber optics and their applications 1.9 Lasers and their applications	**9**
2	**OPTOELECTRONICS** 2.1 Optical processes in semiconductors 2.2 Semiconductor optoelectronic Devices 2.3 Application of optoelectronic devices, 2.4 Optoelectronic tweezers.	**9**
3	**PHOTONIC MATERIALS AND DEVICES** 3.1 Photonic crystals, 3.2 Luminescence, Photorefractive materials 3.3 Photonic devices: LEDs 3.4 Solar cells 3.5 Photodiodes	**9**

	3.6 Photodetectors 3.7 Pphotoconductors 3.8 Laser diodes 3.9 Electro-optic and Magneto-optic devices	
4	**NANOPHOTONICS** 4.1 Nano photonics and its nature, 4.2 Device operation: Nano photonic AND gate & OR gate, 4.3 Adiabatic nanofabrication and Non-adiabatic nanofabrication's: near-field optical CVD and near field photolithography 4.4 A phototransistor, Charge coupled device.	**9**
5	**NANO BIOPHOTONICS** 5.1 Photobiology, 5.2 Photosynthesis, Photo excitation, 5.3 Optical fiber delivery system, 5.4 Optical Biosensors, 5.5 Laser activated therapy, laser surgery.	**6**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
35	35	30	0	0	

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. NANOMATERIALS,
   New Age International Publishers by A. K. Bandyopadhyay.

2. SOLID STATE PHYSICS,
   Wiley publication by Charles Kittle.

3. PHYSICS OF SEMICONDUCTOR DEVICES,
   Wiley publication by S. M. Sze and Kwok K. Ng.

4. ELEMENTS OF PHOTONICS, Vol. I,
   Wiley & Sons, by Keigo Iizuka
5. RECENT OPTICAL AND PHOTONIC TECHNOLOGIES,

INTECH, by KI Young Kim.

Course Outcomes:

Sr. No.	CO statement: After learning the course the students should be able to:	Marks % weightage
CO-1	Explain aspect of modern optics	25 %
CO-2	Explain various aspect of photonics and optoelectronics devices.	25 %
CO-3	Understand working and application of optoelectronic devices	25 %
CO-4	Understand Nano photonics and bio photonics with their applications	25 %

List of Open Source Software/learning website:

http://ocw.mit.edu/courses/materials-science-and-engineering/

http://www.nanosworld.com