Course Code	Course Title	L	T	P	C
1152EC146	NANOPHOTONICS	3	0	0	3

a) Course Category

Program Elective

b) Preamble

This course shall introduce the basic principles, applications and latest advances in the area of Nanophotonics. Student shall have a clear view about this excited new area and ready to contribute to the advances of photonic technology in the broad area of applications such as light-matter interactions, lithography, nanophotonic devices, nanophotonics in medicine, etc,.

c) Prerequisite

Basics Electronic engineering, Electromagnetics field.

d) Related Courses

e) Course Outcomes

Upon the successful completion of the course, students will be able to,

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Understand devices and general concepts used in nano-optics, nano-photonics and nano-opto electronics.	K2
CO2	Understand the basics of photonics, Building blocks of photonic circuits and its effects.	K2
CO3	Understand the basic functions, properties and different methods of nanolithography process.	K2
CO4	Describe broadly about the impact of biomedical research in biotechnology.	K2
CO5	Explore the scientific discoveries lead to technological inventions with nanophotonics.	K2

f)	Correlation of COs with POs													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														

CO2														
CO3														
CO4														
CO5														

g) Course Content

UNIT I INTRODUCTION 9

Introduction, Photonics, Nanophotonics, Frontierin Nanotechnology, Impact of Nanophotonics, Trends in Nanophotonics, Opportunities for Basic Research and Development of New Technologies, scope of nanophotonics, electron tunneling, photon tunneling.

UNIT II NANOPHOTONICS FOUNDATION 9

Photons and Electrons, Similarities and Differences - Free-Space Propagation - Confinement of Photons and Electrons. Nanoscale Optical Interactions - Axial Nanoscopic Localization - Lateral Nanoscopic Localization. Nanoscale Confinement of Electronic Interactions - Quantum Confinement Effects, Nanoscopic Interaction Dynamics, New Cooperative Transitions, Nanoscale Electronic Energy Transfer, Cooperative Emission.

UNIT III NANOLITHOGRAPHY 9

Introduction, Lithography, Two Photon Lithography,Near Field Lithography, Near Field Phase Mask, Soft Lithography, Plasmon Printing, Nanosphere Lithography, Dip-Pen Nanolithography, Nanoimprint Lithography, Photonically Aligned Nanoarrays.

UNIT IV NANOPHOTONICS FOR BIOTECHNOLOGY 9

Near-Field Bioimaging, Nanoparticles for Optical Diagnosticsand Targeted Therapy, Semiconductor Quantum Dots for Bioimaging, Biosensing - Photonic Crystal Biosensors, Optical Nanofiber Sensors. Nanoclinics for Optical Diagnostics andTargeted Therapy.

UNIT V NANOPHOTONICS AND ITS APPLICATIONS 9

Nanotechnology, Lasers and Photonics: Nanotechnology – Photonics – Nanophotonics, Optical Nanomaterials:Nanoparticle Coatings - Sunscreen Nanoparticles - Self-Cleaning Glass - Fluorescent Quantum Dots – Nanobarcodes - Photonic Crystals - Photonic Crystal Fibers, Quantum-Confined Lasers, Near-Field Microscopy, Nanolithography, Photonics in Future: Power Generation and Conversion - Information Technology - Sensor Technology – Nanomedicine

Total 45 Hrs

h) Learning Resources

Reference Books

1. Paras N. Prasad, “Nanophotonics”, John Wiley & Sons, Inc. 2004. ISBN:9780471649885.
2. Sergey V. Gaponenko, Introduction to Nanophotonics”, Cambridge University Press, 2010.
3. F. Graham Smith, Terry A. King and Dan Wilkins, “Optics and Photonics: An Introduction”, second edition, John Willey Sons limited, 2007.
4. Connelly, Michael J. “Semiconductor Optical Amplifiers” Springer 2002. ISBN: 978-0-306-48156-7.