

INDIAN INSTITUTE OF TECHNOLOGY KANPUR

DEPARTMENT OF PHYSICS

Course Title : **Photonic Devices**
 Course No. : **PHY 690V, semester: 2020-21-II**
 Instructor : **Dr. R.Vijaya**
 Contact details : **e-mail: rvijaya@iitk.ac.in, office: SL 217**
 Course schedule : **as per DOAA website**

(Any meetings for discussion beyond lecture hours are to be requested by e-mail)

Prerequisite : **Background of Electromagnetic Theory and Fundamentals of Optics/Photonics (as decided by instructor)**

Level : **PG level**

Credits : **L-T-P-D-[C]3-0-0-0-[9]**

Course Contents:

The course aims at providing the knowledge base of modern photonic devices through an in-depth analysis of the underlying physical concepts and the technological challenges. The course is targeted at students who are inclined towards practical aspects of photonics along with the basics.

Tentative plan of the course is as follows:

S. No.	Broad theme	Contents	Lectures (of 50 min. duration)
1	Light-matter interaction – a review	Review of wave equation, dispersion, interference and diffraction effects	4
2	Light source	Need for lasers	2
3	Periodic structures as optical devices	Optical multi-layers, diffraction gratings, photonic crystals	8
4	Integrated-optic devices	Coupled-mode theory, waveguides and couplers in silicon platform	8
5	Device applications	Devices for wavelength-, direction- and polarization-selection	6
6	Term papers	On selected devices	-
7	Novel devices	Plasmonic sensors, slow light devices	6
8	Device characterization	Measurement techniques related to time- and spectral-domain	6

Text books and References:

A single text-book may not *adequately* address all the topics of the course. Please refer to these books and other resources (review papers, tutorial papers etc) for getting the proper perspective:

1. Thomas P.Pearsall, Photonics essentials, 2ndEdn, Mc-Graw Hill (2010)
2. R.Menzel, Photonics, Springer (2001)
3. Grote and Venghaus, Fiber optic communication devices, Springer (2001)
4. Z. Zalevsky and I.Abdulhalim, Integrated nanophotonic devices, 2ndEdn, Elsevier (2014)
5. Larry A.Coldren, Scott W.Corzine and Milan L.Masanovic, Diode lasers and photonic integrated circuits, 2ndEdn, John-Wiley and Sons (2012)
6. Mark A.Mentzer, Applied optics fundamentals and device applications, CRC Press (2011)
7. A.Dmitriev (Ed.), Nanoplasmonic sensors, Springer (2012)
8. Jacob Khurgin and Rodney Tucker, Slow light, CRC Press (2008)

Evaluation and other matters: to be decided at the beginning of the semester.
