

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NECC507	Photonic Integrated Circuits	3	1	0	4

Course Objective
The objective of the course is to provide a thorough grounding in Photonic Integrated Circuits to address future needs of high-speed optical interconnect.
Learning Outcomes
At the end of the course, the student must be able to <ul style="list-style-type: none"> • Design and analysis all types of optical waveguides for photonic integrated circuits. • Understand concept of photonic waveguide components and applications. • Learn fabrication and characterization technology.

Module No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction and requirement of PICs; Optical Waveguides: Planar slab waveguides, symmetric and asymmetric waveguides; rectangular waveguides, Marcattili's method, Effective index method; graded index waveguides;	9L+3T	Acquire an understanding of the modes and propagation characteristics of optical waveguides.
2	Coupled mode theory and applications, loss in planar slab waveguide	6L+2T	Understand the working principle of Coupled mode theory
3	Numerical techniques and simulation tools for analyzing PICs;	3L+1T	Understand about the Numerical methods for optical waveguides.
4	Photonic waveguide components and applications - couplers, multimode interference-based couplers, SWG waveguide, tapers, bends, y- branch, gratings, switches, polarizers, filters, resonators, multiplexer/demultiplexer, optical Integrated optical systems and applications, optical interconnects.	9L+3T	Understand the working principle of optical passive components and its applications
5	Technology: materials-glass, lithium niobate, silicon, compound semiconductors, polymers; fabrication techniques - lithography, ion-exchange, deposition, diffusion process, and device characterization, packaging and environmental issues.	9L+3T	Acquire an understanding of the material, fabrications and characterization of photonics componets/devices.
6	More recent developments in PICs	06L+2T	Acquire an understanding of recent developments in PICs as thermal optical switches for data centers.
Total		42L+14T	

Textbook:

1. C R Pollock and M Lipson: Integrated photonics, Kluwer Academic Pub, 2003

Reference Books:

2. Govind P Agrawal: Lightwave technology: component and devices, John Wiley , 2004
3. Katsunari Okamoto: Fundamentals of Optical Waveguides Academic Press 2006