Course Type	Course Code	Name of Course	L	T	P	Credit
DP	NECC523	Photonic IC CAD Lab	0	0	3	1.5

Course Objective

- To equip students with the knowledge and skills required to design, simulate, and analyze various photonic components.
- To provide practical experience in optimizing photonic designs for improved performance and efficiency in real-world applications.

Learning Outcomes

Upon successful completion of this course, students will:

- Acquire proficiency in designing and simulating various photonic components. Develop practical skills in analyzing performance characteristics such as mode profiles, effective indices, propagation losses, and coupling efficiencies.
- Learn to optimize photonic device designs for enhanced performance and efficiency, preparing students for advanced photonic integrated circuits and optical communication systems applications.

Unit No.	Name of experiments.	Practical Hours	Learning Outcome
1	Study and analysis of TE mode in a symmetric step index planer waveguide.	03	To comprehend the fundamental aspects of TE modes in waveguides, enabling a thorough understanding of their physical principles and implications in more intricate guiding structures.
2	Study and analysis of TE/TM mode in rectangular waveguide.	03	To grasp the fundamental aspects of TM modes in waveguides, facilitating an in-depth understanding of their physical principles and implications in more complex guiding structures.
3	Analysis of propagation of Gaussian pulse in a coupled rib waveguide. Determine coupling length.	03	Understanding of waveguide theory and mode propagation. Ability to design and simulate waveguide structures. Familiarity with mode profiles and effective refractive index.
4	Design and study of bend waveguide for different radii.	03	Analysing bend loss in waveguides and understanding the impact of bend radius on propagation.
5	Design a Y-branch splitter with different branching angles and waveguide dimensions and observe the power distribution between branches.	03	Understanding power splitting in photonic circuits, designing and simulating Y-branch splitters, factors affecting thc splitting ratio and performance.
6	Design a directional coupler and simulate the coupling behavior and observe the power transfer between waveguides and study the effects of the gap and length of the coupler on coupling efficiency.	03	Understanding of the principle of directional coupling. Ability to design and simulate directional couplers. Insight into the dependence of coupling efficiency on physical parameters.
7	Design an MZI with specified arm lengths and refractive indices and simulate the interference pattern and analyze the output intensity and investigate the effect of phase differences on the output.	03	Understanding of interferometric principles in photonic circuits. Ability to design and analyze MZI structures.
8	To design and simulate a 1x2, 1xN optical switch.	06	Understanding optical switching mechanisms. Ability to design and simulate optical switches. Knowledge of factors affecting switch performance and efficiency.
9	Design a multimode interference (MMI) coupler and simulate the light propagation through the MMI coupler.	03	Understanding multimode interference principles, designing and simulating MMI couplers, and design parameters affecting MMI coupler performance.
10	Design a ring resonator structure with specified parameters simulate the resonator, and observe the resonance wavelengths. Also, analyze the Q-factor and the impact of coupling conditions.	06	Understanding of resonance in photonic structures. Ability to design and analyze ring resonators. Insight into quality factors and their dependence on design parameters.
11	To design and analyze a photonic crystal waveguide and observe the band gap	03	Simulate the waveguide and observe the bandgap properties. Analyze the guided modes and propagation characteristics.

	properties. Also analyze the guided modes and propagation characteristics.		
	Total	**42**	

Text Book:

1. Ghatak and K. Thyagarajan, An Introduction to Fiber Optics. Cambridge: Cambridge University Press, 1998.

Reference Books:

1. C R Pollock and M Lipson: Integrated photonics, Kluwer Academic Pub, 2003
2. Lorenzo Pavesi, David J. Lockwood, Silicon Photonics, Topics in Applied Physics Volume 94, 1/e, 2004, Springer Berlin, Heidelberg.