Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NECD510	INTEGRATED CIRCUITS FOR OPTICAL COMMUNICATION	3	0	0	9

Course Objective

The course objective is to impart knowledge on

- To employ op-amp for optical communication.
- Analyze Optical network Integrated Circuits.
- Analyze Optical amplifiers and Oscillators.

Learning Outcomes

At the end of the course, the student must be able to

- Understand the basic concepts of optical communication in IC
- Analyze the features of optical integrated circuits
- Derive mathematical models for Optical Amplifiers
- Design CMOS oscillators, Low power and high voltage multiplexer.
- Analyze PLL and high-speed transmitter circuits

Module No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Commercialization of Lithium Niobate Modulators: Early applications, CATV Signal Distribution, Requirement of IC, In Communication Systems: Examples related to Capacity and Coverage, Optical Bandwith, Transmission flatness, Insertion loss and polarization sensitivity, Reconfiguration Time, Number of Input and Output ports and Blocking Properties. Semiconductor Optical Amplifier Gate Switch Matrix	7	To have the review on concepts of communication systems
2	Features of Optical Integrated Circuits, Waveguide Theory, Design, And Fabrication, Grating Components for optical Integrated Circuits, Fabrication of Gratings, Passive Wave guide devices, Functional waveguide devices, Examples of Optical Integrated Circuits.	8	To acquire the knowledge on the design and fabrication of Optical ICs.
3	Transimpedence amplifiers: General Considerations, Open loop TIA, Feedback TIA, Supply rejection, Differential TIA, High performance techniques, Limiting amplifiers and output buffers: General considerations, Broadband techniques, Output Buffers-Distributed Amplification.	8	To gain the knowledge on the several amplifiers and buffer circuits used in optical communication
4	Ring oscillators, LC oscillator, Voltage controlled oscillators, Mathematical model of VCO, LC Oscillators: Monolithic inductors, Monolithic Varactors, Basic LC oscillators, Quadrature oscillators, Distributed Oscillators.	8	To have exposure on different optical oscillators
5	Phase locked loops: Simple PLL, Charge Pump PLL, Non ideal effects in PLL, Delay Locked Loops, Applications. Phase detectors and Frequency detectors for random data, CDR architectures, Jitter in CDR architectures, Multiplexers, Frequency dividers, Laser and modulator drivers.	8	To get the exposure on Phased locked loop and applications of it.
	Total	**39**	

Text book:

1. Behzad Razavi, "Design of Integrated circuits for optical communication", Wiley & Sons Ltd, 2012.
2. Horst Zimmermann,"Silicon Optoelectronic Integrated Circuits", Springer, 2018.

Reference books:

1. Hiroshi Nishihara, Masamitsu Haruna, and Toshiaki Suhara, "Optical Integrated Circuits", McGraw-Hill, New York, 2002.
2. Edmond J.Murphy(ed), "Integrated Optical Circuits and Components: Design and Applications", World scientific Publishing Ltd, U.S.A, 2020.