Course Type	Course Code	Name of Course	L	T	P	Credit
DP	NECC522	Optoelectronic and Photonic Devices Lab	0	0	3	1.5

Course Objective

- Learn principles and operation of various optical instruments used in optical communications and sensing.
- Gain proficiency in measuring and analyzing passive and active optical components.
- Develop skills to perform the experiment and have understanding on various optoelectronics and photonic devices for advanced optical communication and integrated photonics.

Learning Outcomes

Upon successful completion of this course, students will:

- Familiar with optical instrumentation and characterization techniques for various optical components.
- Develop advanced troubleshooting and optimization skills in optical communication systems.
- Enhance practical knowledge of photonics and fiber optic sensing technologies.

Unit No.	Name of experiments.	Practical Hours	Learning Outcome
1	Introduction to Various Optical Instruments.	03	To identify various optical devices and equipment along with their specifications, and to become familiar with the instruments required for experiments.
2	Characterization of various passive optical components.	03	Enhance the practical skills of students in optical setup, and understanding properties of passive components useful for various applications in Advanced optical communication and photonics.
3	To observe and characterize the Fiber Bragg grating (FBG) as an optical filter and sensors.	03	Develop an understanding of Fiber Bragg grating (FBG) for various applications in optical communications, instrumentation and measurement.
4	To study the different types of interrogation technique using FBG sensors and optical Interrogator (BraggMeter).		Develop an understanding of different interrogation techniques used in FBG based sensors.
5	To study the different types of fault in optical fiber under test, and its measurement using OTDR.	03	This experiment familiarizes students with the operation of OTDR for identifying fiber faults such as bends, breaks, and splice losses. Students develop skills in interpreting OTDR traces, troubleshooting optical networks, and applying corrective measures to ensure reliable optical communication systems.
6	To observe and characterize the gain of Semiconductor Optical Amplifier (SOA).	03	Students will develop skills in optimizing SOA performance for signal amplification in optical communication systems, gaining familiarity with measuring gain and spectral characteristics.
7	To perform the four-wave mixing operation using Semiconductor Optical Amplifier (SOA).	03	The experiment involves the understanding of nonlinear effects in optical devices and their applications in signal processing and wavelength conversion using SOA.
8	To observe and characterize the gain of EDFA (Erbium Doped Fiber Amplifier).	03	Develop an understanding of Erbium-Doped Fiber Amplifier (EDFA) for advanced optical fiber communication link.
9	To learn the splicing process of optical fibers.	03	The learning outcome includes mastering techniques for joining optical fibers, minimizing signal loss, and achieving high-quality connections. Students gain practical skills essential for maintaining and repairing fiber-optic networks.
10	Characterization of fiber optic sensors using Spectrometer.	03	Develop an understanding to characterizing a fiber optic sensors using a spectrometer for various applications chemical and biomedical fields.
11	Characterization of Electro-optic Modulator at different biasing conditions.	06	To develop the understanding of Electro-optic modulator biasing, and learn about its different parameters.
12	Setup and characterization of Microwave Photonic link.	06	The learning outcome of setting up and characterizing a microwave photonic link includes understanding the integration of microwave and optical systems, and

			analyzing link parameters such as gain, noise figure, and bandwidth.
	Total	**42**	

Text Books:

1. Ajoy K. Ghatak, K. Thyagarajan, "An Introduction to Fiber Optics, Cambridge University Press, 1998
2. Jasprit Singh, "Optoelectronics: An Introduction to Materials and Devices", McGraw-Hill Education, 1996

Reference Books:

1. Pallab Bhattacharya, "Semiconductor Optoelectronic Devices", Pearson Education, 2017
2. G. Keiser, "Optical Fiber Communications," 6th ed., McGraw-Hill Education, 2022
3. B. E. A. Saleh and M. C. Tech., "Fundamentals of Photonics," 3rd ed., Wiley, 2019