Devi Ahilya University, Indore, India Institute of Engineering & Technology				IV Year B.E. (Electronics & Instrumentation Engg.)			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
EIR8C3	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
OPTICAL INSTRUMENTATION	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives: To understand fundamentals of optical communication system, its various elements, and optical networking

Prerequisites: Basic knowledge of electromagnetic theory

COURSE CONTENTS

Unit I

Introduction to optical fiber communication system, Advantages of optical fiber communication over conventional electrical communication, review of optical fiber fundamentals, ray theory transmission, electromagnetic mode theory for optical propagation in optical waveguides, Types of optical fibers: step index fibers, graded index fibers, single mode fibers etc., polarization maintaining fibers, cut off wavelength.

Unit II

Transmission characteristics: fiber attenuation, absorption and scattering losses, fiber bend loss, fiber dispersion, intermodal and intra-modal dispersion, overall fiber dispersion, dispersion shifted fibers, dispersion flattened fibers, Wavelength division multiplexing.

Unit III

Optical sources: Lasers and LEDs: basic concepts, injection laser, characteristics, temperature dependence, dynamic response, noise, reliability, Optical detection principle, absorption, quantum efficiency, responsivity, large wavelength cut off, pin photodiode, avalanche photodiode, receiver: basic concepts and types of noise, basic concepts of optical networking and devices.

Unit IV

Fiber Optic Sensors: Basics of Optical fiber as sensing device, its advantages/disadvantages vis a vis other sensors, classification of fiber sensors, intensity, phase, frequency, wavelength modulated sensors, measurement of temperature, pressure, liquid level, displacement, flow, electric and magnetic fields.

Unit V

Characteristics of lasers, concepts of coherence, coherence length, directionality, application of laser in metrology: measurement of length, displacement, deformation, angle, profile, laser doppler and particle velocimetry, holography, Non-destructive testing using holography, Optical coherence tomography: biomedical applications.

Learning Outcomes:

Upon completing the course, students will be well versed with the fundamental concepts of optical instrumentation, and will be able to contribute to the current and upcoming advances in the technology.

RECOMMENDED BOOKS:

[1] John M Senior, Optical fiber Communication: Principles and Practice, Pearson Education -2006

[2] Gerd Keiser, Optical fiber communication, Fifth Edition McGraw Hill Education (India), 2013

[3] Eugene Hecht and A.R. Ganesan, Optics, Pearson Education, Twelfth Impression 2013

[4] Optical Metrology, Gasvik, John Wiley & Sons, Ltd, 2003

[5] Digital Holography, Jun-chang Li, Pascal Picart, John Wiley & Sons, Ltd, 2013

[6] Handbook of Fiber optics: Theory and applications, Chai Yeh, Academic Press