

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM

INTRODUCTION OF NEW COURSE

Course Title	Optical Fiber Sensors	Course Code	EC51XX			
Dept. / Specialization	ECE	Structure (LTPC)	3	1	0	4
To be offered for	UG/PG	Status	Core <input type="checkbox"/>		Elective <input checked="" type="checkbox"/>	
Faculty Proposing the course	Dr. Srijith K	Type	New <input type="checkbox"/>		Modification <input checked="" type="checkbox"/>	
Recommendation from the DAC		Date of DAC				
External Expert(s)	Prof. Balaji Srinivasan, Professor, EE, IITM Prof. Arup Lal Chakraborty, Professor, EE, IITGN					
Pre-requisite	CoT	Submitted for approval			49 th Senate	
Learning Objectives	Optical Fiber Sensors is intended to be a graduate level course that introduces the different types of fiber-optic sensing technologies and their applications in metrology, navigation, structural health monitoring and healthcare.					
Learning Outcomes	At the end of the course, the learners are expected to do the following: <ul style="list-style-type: none"> • To identify an appropriate fiber-optic sensing technique for a given problem • To understand the capabilities and performance limits of a given sensing system • To design the sensor system for a given application • To analyze the performance parameters of a given sensor system 					
Contents of the course <i>(With approximate break-up of hours)</i>	<p>Motivation for fiber optic sensors - Review of wave propagation in optical fibers - Optical receiver design - Noise in optical receivers (6L+2T)</p> <p>Sensor metrics: dynamic range, accuracy, precision, resolution, cross-sensitivity (2L)</p> <p>Intensity modulated sensors: Typical system configurations - SNR improvement through averaging, filtering and lock-in techniques - Evanescent wave sensing, Gas sensing using Absorption Spectroscopy (7L+3T)</p> <p>Interferometric sensors: Typical system configurations - phase stabilization issues, coherence issues, rotation sensing using Sagnac interferometers, Displacement/vibration sensing using Fabry-Perot resonators (7L+3T)</p> <p>Polarimetric Sensors - Faraday Effect - Current sensors - Highly birefringent PM fibers (2L+1T)</p> <p>Wavelength modulated sensors: Fiber Bragg gratings - Principles and characteristics - Interrogation techniques - Multiplexing FBG sensors - Structural health monitoring applications - Long period gratings - Biochemical sensing (9L+3T)</p> <p>Distributed fiber optic sensors: OTDR concept - SNR vs bandwidth tradeoff - dynamic range vs spatial resolution tradeoff - Distributed sensors based on Raman, Brillouin and Rayleigh scattering (9L+2T)</p>					
Text Book	<ol style="list-style-type: none"> 1. Francis T.S. Yu, Shizhou Yin, Paul B. Ruffin, "Fiber Optic Sensors", 2/e, CRC Press, ISBN-13 : 978-0367387563.2017. 2. K T V Grattan and B T Meggitt, "Optical Fiber Sensing Technology: Fundamentals", 1/e, Springer US, ISBN: 978-0792378525 2000. 					
Reference Books	<ol style="list-style-type: none"> 1. Ginu Rajan, "Optical Fiber Sensors: Advanced Techniques and Applications", 1/e, CRC Press, ISBN : 9780367656058 2015. 2. Z Fang, Ken K Chin, R Qu and H Cai, "Fundamentals of Optical Fiber Sensors", 1/e, Wiley Publications, ISBN : 978-1492656210 2012. 3. John Dakin and Brain Culshaw, "Optical Fiber Sensors", 1/e, Artech House, ISBN: 978-0890069325,1997. 4. A Othonos and K Kalli, "Fiber Bragg Gratings: Fundamentals and Applications in Telecommunications and Sensing", 1/e, Artech House, ISBN :978-0890063446, 1999. 					