

Course code	Course name	L-T-P-Credits	Year of Introduction
AE409	OPTICAL INSTRUMENTATION	3-0-0-3	2016
Prerequisite : Nil			
Course objectives			
<ul style="list-style-type: none"> To understand the basic concepts of fiber optics. To study optical communication and optical instruments. To provide basic knowledge in Laser and its application. 			
Syllabus			
Principle of Optical fiber - Numerical aperture - Types of optical fibers - Optical sources- Optical detectors - Fibre optic sensors - Different types of modulators – Interferometers - Interference filters - Optical spectrum analyzer - Lasers - Population inversion - Semiconductor lasers - Laser Doppler Anemometry - Medical application of lasers.			
Expected outcome			
<ul style="list-style-type: none"> At the end of the semester the students will have knowledge of optical fiber and optical instrumentation techniques. 			
Text Books/Reference books			
<ol style="list-style-type: none"> G. Keiser, “Optical Fibre Communication”, McGraw Hill, 1995. J.Wilson and J.F.B.Hawkes , “Optoelectronics: An Introduction”, Prentice Hall of India. John F. Ready, “Industrial Applications of Lasers”, Academic Press, 1978. John M. Senior, “Optical Fiber Communications-Principles and Practice”, Pearson Education Limited. K.Thygarajan and A.K.Ghatak , “Lasers: Theory and Applications “, Plenum Press. O.Svelto , “ Principles of Lasers “ ,Plenum Press. 			
Course Plan			
Module	Contents	Hours	Semester Exam Marks
I	Principle of Optical fiber – Acceptance angle and acceptance cone –Numerical aperture – V-number – Types of optical fibers (Material, Refractive index and mode) – properties- Optical sources-Optical detectors. Optical fiber production and fabrication.	6	15%
II	Fibre optic sensors – Fibre optic instrumentation system for measurement of fibre characteristics – Different types of modulators – Interferometric method for measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain – fiber optic gyroscope. Source coupling- Fiber connection-Splicing Techniques.	8	15%
FIRST INTERNAL EXAMINATION			
III	Interferometers – Fabry – perot and Michelson interferometers – Interference filters – Interferometric method of measurement – Interference filters – Interferometric method of measurement of optical components – Optical spectrum analyzer.	7	15%

IV	Lasers – Principles of operation – Einstein relations – Population inversion – Optical feedback – laser modes – Classes of laser – Solid state, gas and liquid dye lasers– Semiconductor lasers – Q-switching and mode locking – Properties of laser light.	6	15%
SECOND INTERNAL EXAMINATION			
V	Laser applications: Laser for measurement of distance, length, atmospheric effect and pollutants-Laser Doppler Anemometry (LDA) - Material processing: Laser heating, Melting, Scribing, Trimming, Welding.	8	20%
VI	Medical application of lasers- Laser and Tissue interaction-Laser diagnosis-Laser instruments for microsurgery, Removal of tumors of vocal chords, Brain surgery, dermatology, Oncology and Ophthalmology.	7	15%
END SEMESTER EXAMINATION			

QUESTION PAPER PATTERN:

Maximum Marks:100

Exam Duration: 3 Hours

Part A

Answer any two out of three questions uniformly covering Modules 1 and 2 together. Each question carries 15 marks and may have not more than four sub divisions.

(15 x 2 = 30 marks)

Part B

Answer any two out of three questions uniformly covering Modules 3 and 4 together. Each question carries 15 marks and may have not more than four sub divisions.

(15 x 2 = 30 marks)

Part C

Answer any two out of three questions uniformly covering Modules 5 and 6 together. Each question carries 15 marks and may have not more than four sub divisions.

(20 x 2 = 40 marks)