PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada–520010
Re-accredited at 'A+' by the NAAC

Paper – 9: INTRODUCTION TO FIBER OPTICS

Offered to : M.Sc.(PHYSICS)	Course Code : 22PH4S2
Course Type : SEC	Course : Introduction to Fiber optics
Year of Introduction : 2022	Year of offering : 2022
Year of Revision : 2022	Percentage of Revision : Nil
Semester : IV	Credits : 3
Hours Taught : 60 hrs. per Semester	Max.Time : 3 Hours

CourseDescription:

This courseisaimed to introduce studentsto the fundamentalsoffiber optic communications.The course will start with a refresher on the operation of key componentsneeded for an effective fiber optic communication system, and then show how these components interactat a system level.

CourseObjectives:

1. providesolidbackgroundtostudentsinwiderangingtopicsof fiber-optics.

2.Equippingthestudentswiththebasicunderstandingofopticalfibersandopticalfibercommunication

3.outlinestheadvantagesofafiberopticcommunicationsystem.

4.Variousmechanisms ofopticalsignalattenuationinanopticalfiberandpulsebroadeningthroughintermodaldispersioninanopticalfiber.

5.Totaldispersioninasinglemodefiberandwaveguidedispersioninvarioustypesofgraded indexfibersandopticalsourcesanddetectors

CourseOutcomes: Attheendofthiscoursethestudentsshouldbeableto:

CO1:Know about optical fibers, their applications in telecommunication and outlines the advantages of a fiber optic communicationsystem.

CO2:Gain knowledge about various mechanisms of optical signal attenuation in an optical fiber

CO3: Gain knowledge on Pulse broadening through intermodal dispersion in an optical fiber.

CO4:Understand total dispersion in a single mode fiber

CO5:Understandwaveguidedispersioninvarioustypesofgradedindexfibers

CO-POMATRIX								
22PH4S2	**CO-PO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**
	CO1	M						M
	CO2		L					M
	CO3		L					M
	CO4	M						M
	CO5	M						M

Syllabus		
Unit	**Learning Units**	**Lecture Hours**
I	Introduction,needforopticalcommunication,salientfeaturesofopticalfibers,raytheoryoflightguidance, numerical aperture, modes of a fiber, single and multimode fibers, step-index and graded-indexfibers.	12
II	Fiber fabrication techniques, Transmission characteristics of optical fibers, attenuation, pulse broadeningmechanism,intermodaldispersion,bitrate - lengthproduct,materialdispersion	12
III	Power associated with modes of dielectric symmetric planar waveguide, asymmetric planar waveguide,single polarization single mode waveguide, excitation of guided modes by prism coupling technique,radiationmodes,opticalfiberwaveguide,EHandHEmodes	12
IV	Optical fiber modes, field patterns, fractional power in the core, single mode fiber, cut-off wavelength,modefielddiameter,bendloss,spliceloss,waveguidedispersion,groupdelay,Totalchromaticdispersion,dispersion ingraded-indexandmultilayerfibers,opticalfibercomponentsanddevices,directionalcoupler,powersplitter,WDMcoupler,polarizationcontrollers,fiberBragg gratings	12

V	Detectorsforopticalcommunication,p-i-nphotodetector,APD,Systemdesign,dispersionandattenuationlimitedsystems,BER,powerbudgetingoffiberlink,recentadvances	12

Textbook:

1. A.K.GhatakandK.Thyagarajan,'IntroductiontoFiberOptics',CambridgeUniversityPress
2. B. E.A. SalehandM.C.Teich,'*Fundamentalsof Photonics*,'Wiley-Interscience
3. G.P.Agrawal,'*OpticalFiberCommunicationSystem*'Wiley-Interscience
4. G.Keiser, '*OpticalFiberCommunications*',McGrawHill
5. A.SnyderandJLove,'*OpticalWaveguideTheory*',ChapmannandHall
6. J.M.Senior, '*OpticalFiberCommunications*,'PearsonPrenticeHall

Web resources: Dr. Vipul Rastogi, Indian Institute of Technology, Roorkee, *NPTL video lectures*,URL:https://nptel.ac.in/courses/115107095/33#