Dr. Malarkodi

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Course Title	**FIBER OPTIC COMMUNICATION**		
Course Code	**ECPC28**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**ECPC12 & ECPC21**		
Session	**July - 2018**	**Sem/Section (if, applicable)**	**VII - A**
Name of Faculty	**Dr. G. Thavasi Raja**	**Department**	**ECE**
Email	**thavasi@nitt.edu**	**Telephone No.**	**0431-2503317**
Name of Course Coordinator(s) (if, applicable)			
E-mail		**Telephone No.**	
Course Type	☑ **Core course**	☐ **Elective course**	

Syllabus (approved in BoS)

Optical Fibers: Structure, Wave guiding. Step-index and Graded index optical fibers. Modal analysis. Classification of modes. Single Mode Fibers.

Pulse dispersion. Material and Waveguide dispersion. Polarization Mode Dispersion. Absorption, scattering and bending losses. Dispersion Shifted Fibers, Dispersion Compensating Fibers.

Optical sources: LEDs and Laser Diodes. Optical Power Launching and Coupling. Source to Fiber coupling, Fiber to Fiber joints. Misalignments. Schemes for coupling improvement.

Optical detectors: PIN and Avalanche photodiodes, Photo detector noise, Optical receivers. Digital link design: Power budget and Rise time budget. Attenuation and Dispersion limit.

WDM Concepts. Optical Amplifiers: EDFA. Nonlinear effects: Self Phase Modulation, Nonlinear Schrodinger Equation. Optical Soliton.

COURSE OBJECTIVES

- To expose the students to the basics of signal propagation through optical fibers, fiber impairments, components and devices and system design.

COURSE OUTCOMES (CO)	
Course Outcomes	**Aligned Programme Outcomes (PO)**
1. Recognize and classify the structures of Optical fiber and types	1
2. Discuss the channel impairments like losses and dispersion	2, 3
3. Classify the Optical sources and calculate various coupling losses.	2, 3
4. Classify detectors and to design a fiber optic link.	3,4
5. Familiar with concepts of WDM, optical amplifiers and Soliton Propagation.	3,4, 5

COURSE PLAN – PART II

COURSE OVERVIEW

This course deals with the fundamental of fiber optical communication and its design considerations of fiber optic systems. Students will get exposure about the application of optical fiber and will gain knowledge about the design of fiber optic systems using various communication fibers. They can learn about fiber losses, dispersion with how to overcome the losses, fiber sources and detectors and its principles.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1.	1st week 3 contact hours	Optical Fibers Structure, Wave guiding	C&T & PPT
2.	2nd week 3 contact hours	Step-index and graded index optical fibers	C&T & PPT
3.	3rd week 3 contact hours	Modal analysis, Classification of modes, Single Mode Fibers	C&T & PPT
4.	4th week 3 contact hours	Pulse dispersion, Material and waveguide dispersion, Polarization Mode Dispersion	C&T & PPT
5.	5th week 3 contact hours	Absorption, scattering and bending losses	C&T & PPT
6.	6th week 3 contact hours	Dispersion Shifted Fibers and Dispersion Compensating Fibers	C&T & PPT
		Assessment - 1	Written

7.	7th week 3 contact hours	Optical Power Launching and Coupling	C&T & PPT
8.	8th week 3 contact hours	Lensing schemes for coupling improvement, Fiber-to-fiber joints	C&T & PPT
9.	9th week 3 contact hours	Splicing techniques and Optical fiber connectors	C&T & PPT
10.	10th week 3 contact hours	Optical sources and detectors, Laser fundamentals	C&T & PPT
11.	11th week 3 contact hours	Semiconductor Laser basics, LEDs	C&T & PPT
12.	12th week 3 contact hours	PIN and Avalanche photodiodes, Optical Tx/Rx Circuits	C&T & PPT
		Assessment - 2	**Written**
13.	13th week 3 contact hours	Design considerations of fiber optic systems, Noise in detection process and Bit error rate	C&T & PPT
		CPA	**Written**
14.	14th week 3 contact hours	Optical receiver operation, Power Budget and Rise time Budget, WDM	C&T & PPT
15.	15th week 3 contact hours	Optical Amplifiers, Nonlinear effects, Soliton	C&T & PPT
16.	**End Semester Assessment**		**Written**

C&T – Chalk & Talk, PPT-Power point.

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date (tentatively)	Duration	% Weightage
1	Assessment 1 (Descriptive-written)	4th week Aug'18	60 mins	20%
2	Assessment 2 (Descriptive-written)	1st week Oct'18	60 mins	20%
3	Seminars/ Assignments/ Quiz	During regular hours		20%
CPA	Compensation Assessment* (Descriptive-written)	3rd week Oct'18	60 mins	Refer course policy
4	Final End Semester Assessment * (Descriptive-written)	1st week Nov'18	180 mins	40 %

Essential Readings: Text books, Reference books, website addresses and journals

Text Books

1. *G. Keiser, "Optical Fiber Communications (5/e)", McGraw Hill, 2013.*
2. *A. Ghatak & K. Thygarajan, "Introduction to Fiber Optics", Cambridge, 1999.*

Reference Books

1. *G. P. Agarwal, "Fiber Optic Communication Systems", (4/e), Wiley, 2010.*
2. *M. M. K. Liu, "Principles and Applications of Optical Communications", Tata McGraw Hill, 2010.*
3. *A. Selvarajan, S. Kar and T. Srinivas, "Optical Fiber Communication Principles and Systems", Tata McGraw Hill, 2006.*

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Feedback from the students through MIS and class committee meetings.

COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, academic honesty and plagiarism etc.)

MODE OF CORRESPONDENCE (email/phone etc)

All the students are advised to check their NITT WEBMAIL regularly. All the correspondence (schedule of classes/ schedule of assessment/ course material/ any other information regarding this course) will be intimated in Class Only.

ATTENDANCE

- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

ASSESSMENT POLICY

1. Attending all the assessments is MANDATORY for every student.
2. If any student is not able to attend any of the Continuous Assessments due to genuine reason, student is permitted to attend the **compensation assessment*** (CPA) with Corresponding weightage. (This is not valid for students who have attendance lag also.)
3. Please refer institute B.Tech Regulations/guidelines for grading policy.

ACADEMIC HONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, CC-chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programme.

ADDITIONAL INFORMATION
Queries may also be emailed to the Course Coordinator directly at thavasi@nitt.edu
FOR APPROVAL
Course Faculty ________ **CC-Chairperson** ________ **HOD** ________