Department of Electrical and Computer Engineering
New Jersey Institute of Technology
ECE 462: RF/ Fiber Optic Systems (3 credits, 3 contact hours, elective course)

Instructor: Dr. Edip Niver; email: niver@njit.edu; Tel.: (973) 596-3542

Text books W.B. Jones, Jr., Introduction to Optical Fiber Communication Systems,
Holt, Rinehart and Winston, Inc., 1988.[ISBN 0-19-510726-8]
Or any textbook on Fiber Optic Communication Systems

Course Description:

This course deals with waveguide properties of dielectric structures as applied to optical fibers. Provides understanding of operation principles of semiconductor optical sources and detectors, fiber based optical amplifiers and various components, rf/microwave modulation and demodulation of an optical carrier. Introduces design concepts in optical links and systems, transmitters and receivers. Provides introduction to usage of CAD software tools for rf/microwave simulations.

Prerequisite: ECE students - ECE 362 **Corequisite:** ECE 469 or instructor permission

Specific course learning outcomes (CLO): The student will be able to

1. Develop firm understanding of major properties of dielectric waveguide propagation;
2. understand and utilize the basic governing equations to analyze optical fibers, sources and detectors; design optical basic optical fibers and links and calculate fiber optic link characteristics;
3. understand limitations in design of systems and links based on specific fiber optic and semiconductor devices;
4. understand major principles of fiber optic system applications and industry trends.

Relevant student outcomes (ABET criterion 3):

(a) an ability to apply knowledge of mathematics, science, and engineering (CLO 1, 2, 3)
(b) an ability to design and conduct experiments, as well as to analyze and interpret data (CLO 1, 2, 3)
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability (CLO 3, 4)
(f) an understanding of professional and ethical responsibility (CLO 3, 4)
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (CLO 4)
(i) a recognition of the need for, and an ability to engage in life-long learning (CLO 3, 4)
(j) a knowledge of contemporary issues (CO 4)
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (CLO 3, 4).

Computer assisted design and course specific software:

PSpice, Microwave Office (AWR), Matlab, other pertinent RF/Microwave calculators.This course outline serves to provide a big picture of the course. Instructional materials such as textbooks, individual topics, and grading policy are subject to revision and changes by individual instructors.

Tentative Course Schedule	**Weeks**
Introduction to fiber optic systems and technology, system structure, modulation types, bandwidth, light and electromagnetic waves.	1-2
Waveguide propagation and optical fibers, introduction to waveguides, parallel, rectangular, cylindrical waveguides	3-5
Dielectric waveguides, step and graded (exponential) index fiber	6-7
Dispersion and losses in fibers	8-9
Review of semiconductors and LED	10
Semiconductor lasers	11
Photodetectors	12
Optical amplifiers (EDFA and Raman), optical receivers and noise considerations	13
System considerations, and WDM	14

Grading policy: Homework, quizzes class, participation: 5%
Project presentation: 10%
Two class examinations: 25%, 25%
Final examination: 35%

Homeworks and projects

Homeworks assigned in class weekly and a course project chosen by consultation with the instructor.

Office hours, recitations and group studies: Tuesday 16.00-18.00 PM and by appointment, 24/7 by e-mail.
Honor Code: The NJIT Honor Code will be upheld; any violations will be brought to the immediate attention of the Dean of Students.
Office: MIC Bldg., Room 403
Prepared by E. Niver