

Department of Electrical and Computer Engineering
New Jersey Institute of Technology

ECE 469: RF/Microwave and Fiber Optics System Laboratory (2 credits, 4 contact hours, required laboratory course)

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

Text books Experiment sheets were prepared by Dr. E. Niver for some experiments and are distributed prior the experiments to the students every semester. Application notes, catalogs and other relevant information is provided for the remaining experiments.

Reference: Robert A. Witte, Spectrum and Network Measurements, Prentice Hall, 1991 ISBN 0-13-826959-9

Course Description:

Laboratory work in characterization of rf/microwave transmission structures and optical fibers, sources and detectors, spectral and time domain (OTDR) measurements in microwave and optics Experimental investigations of microwave and fiber optic links, GPIB.and optical amplifiers. Usage of CAD software tools for rf/microwave simulations.

Prerequisite: ECE students - ECE 393; **Corequisite:** ECE 461, ECE 462 or instructor permission.

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

1. Hands on experience using state-of-the-art equipment in optical and rf/microwave characterization of components for fiber optic communication systems;
2. Understand major applications of optical and rf/microwave components used in the system environment;
3. Develop understanding of equipment used in GPIB environment for computer control
4. Develop understanding how measurement equipment is designed.

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 and other CAD tools

Tentative Course Schedule: Experiments	Weeks
Optical Time Domain Reflectometry (OTDR) measurements of fiber loss, and losses due to splices and connectors in the single mode fibers.	1
Familiarization with microwave components at X-Band. Frequency, wavelength and VSWR measurements. Response of a detector	2
Antenna measurements	3
Optical source to fiber coupling and far field pattern measurements of the multimode fiber. Numerical aperture (NA) measurements.	4
Spectral measurements using the vector network analyzer. Response of the wave meter, broad band attenuator , phase shifter, filter and other selected components	5
Spectral attenuation of a multi mode optical using the white light source and a monochromator	6
Microwave link simulation at X-Band to demonstrate modulation and demodulation concepts	7
Biasing characteristics of a Laser diode and spectral characterization using an Optical Spectrum Analyzer	8
Time domain measurements using a TDR sampling head and a wide band oscilloscope	9
Optical pulse dispersion using a Lightwave Component Analyzer	10
Scalar Characterization of optical and rf components using Amplitude Spectrum Analyzers	11
Design considerations of a fiber optic link and BER measurements.	12
Make-up laboratory sessions	13-14

Grading policy: Laboratory reports are graded on individual basis.

Updates and Assignments to be distributed via e-mail/printed form

Office hours, recitations and group studies: By appointment

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., Room406

Prepared by: E.Niver