

**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](mailto: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):**

- (1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics (CLO 1, 2, 3,4)
- (2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors. (CLO 3, 4)
- (4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts (CLO 3, 4)
- (6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions (CLO 1,2, 3)
- (7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies (CLO 3, 4)

**Computer assisted design and course specific software:**  
PSPICE and other CAD tools

<b>Tentative Course Schedule: Experiments</b>	<b>Weeks</b>
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