

COURSE OUTLINE

PHOT-205

Detection and Measurement

3 Semester Hours

HOWARD COMMUNITY COLLEGE

Description

This course will provide the student with a working knowledge of the various devices and techniques for evaluating optical systems. This course covers basic concepts of fiber optic measurement techniques. Measurement of power, spectrum analyzer, and wavelength meters will be used to measure optical spectral measurements. Topics include the applications and use of spectrometers, monochromators, spectrophotometers, and Michelson, Febry-Perot, Twyman-Green, Mach-Zender interferometers to measure wavelengths, absorption of wavelengths, defect in lenses, prisms, and flat plates. Hands-on lab will help the students to understand the concepts better. Prerequisite: ELEC-117 and PHOT-105. (2 hours lecture, 3 hours lab)

Overall Course Objectives

Upon completion of this course, the student will be able to:

1. Discuss the basic concepts of fiber optic systems and measurement techniques.
2. Describe the measurement techniques of power meters.
3. Describe and apply photon and thermal detectors.
4. Discuss the basic structure of photomultiplier, photomultiplier power supply and their applications.
5. Describe the use of power and energy meters and their applications.
6. Follow the lab safety procedures and practices.
7. Discuss the various types of Spectrum Analyzers.
8. Describe the basic concepts of Optical Spectrum Analyzer (OSA).
9. Calibrate and make measurements using monochromators.
10. Discuss spectral measurements on modulated signals.
11. Discuss the basic optical-amplifier test and its measurements.
12. Describe the functions and characteristics of Spectrometers.
13. Describe the concepts of wavelength meters and operations of Michelson Interferometers, Fabry-Perot Interferometers, and Twyman-Green Interferometers.

Major Topics

- I. Introduction to Fiber Optic Systems and Measurements
 - a. A digital fiber-optic communication link
 - b. Optical fibers and components
 - c. Optical measurement terminology
 - d. Optical transmitter and receiver measurements
 - e. Amplifier gain and Noise measurements

- II. Optical Power Measurement
 - a. Power meters and thermal detectors
 - b. Power meters with photo detectors
 - c. PIN diode operation
 - d. LED-Power Measurement
 - e. High-Power Measurement

- III. Optical Spectrum Analysis
 - a. Types of optical spectrum analyzers.
 - b. Operation of grating-based optical spectrum analysis
 - c. Monochromator and its measurement

- IV. Optical Spectrum Analysis-Wavelength Meters
 - a. Wavelength definition
 - b. Basic operation and calibration
 - c. Methods of accurate wavelength measurements
 - d. Operation of Michelson Interferometer
 - e. Fabry-Perot Interferometers
 - f. Twyman-Green Interferometers.

Course Requirements

Grading/exams: Grading procedures will be determined by the individual faculty member, but will be calculated on the basis of exams, quizzes, and lab reports. This course includes a final exam.

Writing: Specific writing assignments will be determined by the individual faculty member, but will include lab reports.

Other Course Information

This course is required for the Photonics Technology Program.