

# **COURSE OUTLINE**

## **PHOT-210 Fiber Optics Communications 4 Semester Hours**

### **HOWARD COMMUNITY COLLEGE**

#### **Description**

This course provides the student with a theoretical and hands-on background in fiber optics communications. Topics will include a basic overview of light and optics, total internal reflection, basic waveguide propagation, singlemode, and multimode fiber, fiber optics loss mechanisms, splicing and termination, loss testing, OTDR usage, lasers and DWDM, and optical network design. Hands-on lab experience will help the students to understand the concepts better. Prerequisite: PHOT-105. (3 hours lecture, 3 hours lab)

#### **Overall Course Objectives**

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

1. Discuss the fundamentals of light and lasers.
2. Describe the basic structure of a fiber optics cable.
3. Discuss light propagation in an optical fiber.
4. Identify the various types of optical fibers.
5. Determine the dispersion characteristics for various types of optical fibers.
6. Discuss fiber losses and loss mechanism.
7. Discuss the safe handling of fiber optics cable.
8. Describe the various stages of the fiber fabrication process.
9. Discuss various fiber testing procedures.
10. Perform fiber splicing using mechanical splicing and fusion splicing methods.
11. Describe the operation and applications of the various types of fiber optics couplers.
12. Discuss the differences between various types of optical sources with respect to performance characteristics (LED, Injection Laser Diode, Fabry-Perot Lasers).
13. Discuss the operation of optical detectors – PIN photodiode, avalanche photodiode.
14. Discuss the various types of digital and analog modulation.
15. Evaluate a typical fiber optics transmitter and receiver.
16. Describe various fiber optics test equipment.
17. Identify and discuss fiber optics networks and architectures.

## **Major Topics**

1. Fundamentals of Light and Lasers
2. Properties of Optical Fibers
  - a. Step-index multimode
  - b. Step-index singlemode
  - c. Safe handling fiber optics cable
  - d. Fiber losses and loss mechanism
3. Fiber Fabrication and Cable Design
4. Fiber Connectors, Splices and Couplers
  - a. Intrinsic losses
  - b. Extrinsic losses
  - c. Splices
  - d. Connectors (SMA, ST, FC and PC, D4 and Epoxyless)
  - e. Couplers (Passive, Star, T-Couplers)
5. Fiber Sources and Optical Detectors
  - a. Light Emitting Diode (LED)
  - b. Injection Laser Diode (ILD)
  - c. Fabry-Perot Lasers
  - d. Characteristics of LED vs. Laser Diode
  - e. PIN diode
  - f. Bit error rate detectors, detector noise characteristics
6. Optical Transmitters and Receivers and Fiber Optics Test and Measurement
  - a. Evaluate a typical fiber optics transmitter and receiver
  - b. Measure fiber output power
  - c. Perform decibel and dBm Power measurement
  - d. Use of OTDR
7. Future Fiber Optics Communication
  - a. Fiber optics network and architectures
  - b. Fiber optics modulation and multiplexing

## **Course Requirements**

**Grading/exams:** Grading procedures will be determined by the individual faculty member, but will be calculated on the basis of exams, quizzes, homework problems 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 and a few short answer and essay questions on quizzes and exams.

## **Other Course Information**

This course is required for the Photonics Technology Program.