



MERCER
COUNTY COMMUNITY COLLEGE

COURSE OUTLINE

Course Number EET 145	Course Title Fiber Optics	Credits 3
Hours: Lecture/Lab/Other 2 Lecture/3 Lab	Pre-requisites EET 130 or EET 138; MAT 038	Implementation Semester & Year Spring 2022

Catalog description:

A study of fiber optics as it pertains to the communications process. Topics include the physics and behavior of light in a fiber. Skills learned include connectorization of fiber and the use of the special tools and test equipment required. Successful completion of this course can lead to FOA certification.

General Education Category:
Not GenEd

Course coordinator:
Harry Bittner, 609-570-3751, bittnerh@mccc.edu

Required texts & Other materials:

FOA Reference Guide to Fiber Optics, ISBN 1-4392-5387-0

Course Student Learning Outcomes (SLO):

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

1. Describe why and how a fiber optic system allows for the transmission of light. [ILG # 1, 3; PLO # 1]
2. Properly terminate a fiber optic cable. [ILG # 4; PLO # 5]
3. Identify the parts of a fiber optic system and describe their function. [ILG # 1, 10; PLO # 1, 4]
4. Identify types of cable, both fiber optic and electrical. [ILG # 3; PLO # 1]
5. Assess and test a fiber optic cable, connection, or system. [ILG # 2, 3, 4, 10, 11; PLO # 4, 5, 8]
6. Design a basic fiber optic network. [ILG # 2, 4, 10, 11; PLO # 2, 5]
7. Describe conditions that limit the operation of a fiber optic system. [ILG # 1, 2, 3, 11; PLO # 1, 4]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 1. Written and Oral Communication in English. Students will communicate effectively in both speech and writing.

Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Institutional Learning Goal 3. Science. Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 10. Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for Electronics Engineering Technology (PLO)

1. Communicate effectively in English, both orally and in written form.
4. Demonstrate mastery of college algebra and trigonometry.
5. Demonstrate mastery of job skills such as soldering, metalworking, and PC board repair.
8. Set up and operate modern electronic equipment such as DMM, oscilloscope, and signal generators.

Units of study in detail – Unit Student Learning Outcomes:

Unit I **Basic Principles of Fiber Optics [Supports Course SLO # 1, 5, 3, 7]**

Learning Objectives

The student will be able to:

1. List the two major advantages of fiber over copper.
2. List the three main components of a communication system.
3. Set up an experiment and determine the index of refraction (N) of a Lucite block.
4. Calculate the speed of light through a material of given index of refraction.
5. Given the upper and lower cutoff frequencies, calculate the bandwidth (BW).
6. With regard to constructive and destructive interference, explain why not all light rays are reflected from a surface.
7. Calculate numerical aperture, mode volume number, and number of modes.
8. Identify single mode, multimode step index and multimode graded index fiber from a cross sectional drawing and refractive index profile.

Unit II **System Measurements, Physical Qualities of Optical Fiber [Supports Course SLOs # 3, 4, 5, 7]**

Learning Objectives

The student will be able to:

1. Calculate A_v numerical power gain.
2. Calculate gain G in decibels (dB).
3. Convert A_v to dB and dB to A_v
4. Convert power in mw to dBm and dBm to mw.
5. Given any 2 of power out, power in and gain (loss); calculate the unknown.
6. Use a microscope to observe quality of a fiber end.
7. Be able to set up a light source and power meter to determine the loss of a fiber system.
8. Identify the principal connectors used in the fiber industry.
9. Describe what causes dispersion in a fiber.
10. Describe what causes loss in a fiber.
11. Calculate the dispersion given the critical angle, core index, and length of cable.
12. Identify the 3 primary transmission wavelength windows.
13. Identify the following cables: telephone twisted pair, Cat 5, coax, and fiber.
14. Describe the difference between metallic, non-metallic and composite cables.

Unit III **Fiber Optic Systems** [Supports Course SLOs # 2, 3, 5, 6, 7]

Learning Objectives

The student will be able to:

1. Describe the difference between PIN diodes and APDs as detectors.
2. Describe the difference between LEDs and lasers as sources.
3. Calculate system bandwidth given the source, detector and link information.
4. Prepare a multimode fiber for adding an ST or SM connector.
5. Install, cleave and polish ST and SM connectors.
6. Determine the losses of a fiber cable or link using appropriate equipment.
7. Perform a link loss budget analysis for a given system.
8. Review the loss analysis and determine if an amplifier or attenuator is needed.
9. Given a fiber specification sheet and operating conditions, determine the loss and BW.

Evaluation of student learning: [Evaluates SLOs # 1 - 7]

Students' achievement of the course objectives will be evaluated through the use of the following:

- Active participation in class.
- Three unit tests assessing students' comprehension of terminology, calculations and practices related to the unit objectives.
- Three lab reports.

Evaluation Tools	Percentage Of Grade
3 Unit Tests	80%
3 Reports	10%
Class Participation	10%
Total	100%