Mercer County Community College

COURSE OUTLINE

EET215	Fiber Optics	
Course Number	**Course Title**	**Credits**

3	2			15
Class or Lecture Hours	**Laboratory Work Hours**	**Clinical or Studio Hours**	**Practicum, Co-op, Internship**	**Course Length (15 week, 10 week, etc.)**

Required Materials:

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

Catalog Description:

This course is a study of fiber optics as it pertains to the communication 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. EET215 can lead to FOA certification.

Prerequisites: **Corequisites:**

MAT135, and EET138 or EET130

Latest Review: Spring 2010

Course Coordinator (name, email, phone extension):
D.T.DeFino defino@mccc.edu Ext. 3456

Attendance Policy:

Mercer County Community College does not have a "cut system." Students are expected to attend all classes of every course on their schedules. Only illness or serious personal matters may be considered adequate reasons for absence.

It is the prerogative of the instructor to excuse absences for valid reasons, provided the student will be able to fulfill all course requirements.

Approved by Curriculum Committee, 10/16/2003

Student performance in classes is formally verified at the middle of each full semester. If a student's attendance has been infrequent or performance unsatisfactory, he or she may receive notification in the mail. At any time, the instructor may withdraw the student from class for insufficient attendance.

Academic Integrity:

Students are required to perform all the work specified by the faculty and are responsible for the content and integrity of all academic work submitted, such as papers, reports, and examinations.

A student will be guilty of violating the Rule of Academic Integrity if he or she:

- Knowingly represents the work of others as his or her own;
- Uses or obtains unauthorized assistance in any academic work;
- Gives fraudulent assistance to another student.
- Intentionally damages any contents of the classroom or lab.
- Is found to have stolen anything from the classroom or lab.

Penalty:

First violation for stealing or damaging is F in the course.

Other Violations:

First violation will result in an F for the test or project involved.

Second violation will be an F in the course.

Temporary Grade Policy:

If you do not complete the course requirements by the end of the semester, and you have a prior agreement with the instructor, you may be given an INC (incomplete). INC indicates that the instructor is affording extra time to earn a grade in the course. The amount of extra time is determined by the instructor, up to a maximum of 16 calendar weeks after grades are submitted. A INC grade which has not been resolved within 16 calendar weeks is changed to an F or NC (no credit) grade, as appropriate to the course.

Letter Grades:

Letter grades have the following quality point values:

A = 93 - 100 4.0
A^- = 90 - 92 3.7
B^+ = 87 - 89 3.4
B = 83 - 86 3.0
B^- = 80 - 82 2.7
C^+ = 77 - 79 2.4
C = 70 - 76 2.0
D = 60 - 69 1.0
F = 0 – 59 0.0

Audit:

If you audit the course, you will receive an "AU" grade—this cannot be changed to a letter grade.

Withdrawal Course Requirements:

To receive a W grade for any course, a student must consult with the course instructor or an appropriate division representative and then withdraw officially before two-thirds of the course has been completed by submitting a withdrawal form to the Office of Student Records. Withdrawal after this point results in a grade other than W (usually F). At any time before two-thirds of the course has been completed, the instructor may also withdraw with a W grade any student who has been absent excessively. A student thus withdrawn will not be entitled to any refund of tuition or fees. The student may appeal this action.

General Objectives.

The student will be able to:

- •Determine the losses of a jumper cable.
- •Take data, normalize the data, and plot dB vs angle for numerical aperture.
- •Plot dB vs microns for axial misalignment, and also for air gap.
- •Install, cleave, polish and test: ST and SM style connectors on multimode fiber.
- •Describe the four key characteristics of an OTDR display.
- •Measure the light power exiting a cable or port.
- •Complete a link loss budget analysis on a system.
- •Use Snell's Law to determine the index of refraction or angle of refraction.
- •Calculate critical angle, numerical aperture and acceptance angle for a given fiber.
- •Calculate Mode Volume Number and the number of modes for a given fiber.

Examinations and Required Work.

There will be three tests, one at the end of each unit. Each test will focus on the material from the unit just completed. However the material in this course is all connected so knowledge from previous units is required on each test.

Unit I

Learning Objectives: (The student will be able to…)

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

Unit II

Learning Objectives: (The student will be able to…)

- •Calculate A_v numerical power gain.
- •Calculate gain G in dB.
- •Convert A_v to dB and dB to A_v
- •Convert power in mw to dB_m and dB_m to mw.
- •Given any 2 of power out, power in and gain (loss); calculate the unknown.
- •Use a microscope to observe quality of a fiber end.
- •Be able to set up a light source and power meter to determine the loss of a fiber system.

•Identify all the principle connectors used in the fiber industry.
•Describe what causes dispersion in a fiber.
•Describe what causes loss in a fiber.
•Calculate the dispersion given the critical angle, core index, and length of cable.
•Identify the 3 primary transmission wavelength windows.
•Identify the following cables: telephone twisted pair, Cat5, coax, and fiber.
•Describe the difference between metallic, non metallic and composite cables.

Unit III

Learning Objectives: (The student will be able to…)

•Describe the difference between PIN diodes and APDs as detectors.
• Describe the difference between LEDs and Lasers as sources.
•Calculate system BW given the source, detector and link information.
•Be able to prepare a multimode fiber for adding an ST or SM connector.
•Be able to install, cleave and polish ST and SM connectors.
•Be able to set up equipment and determine the losses of a fiber cable or link.
•Perform a link loss budget analysis for a given system.
•Review the loss analysis and determine if an amplifier or attenuator is needed.
•Given a fiber specification sheet and operating conditions, determine the loss and BW.

Student Evaluation

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%