

College of Micronesia – FSM
P.O. Box 159
Kolonia, Pohnpei

Course Outline Cover Page

Fiber Optics
 Course Title

VTE 265
 Department and Number

Course Description: This course explores the development of fiber optic technology, explains the theory of light propagation and discusses the advantages and limitations of fiber optic technology. In addition fiber optic components, signal transmission, connections and fiber optic system trouble shooting will also be studied.

Prepared by: Brent Villiers

State: National Campus

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	4/8	8/4	32	3
Laboratory				
Total Semester Credits:				3

Purpose of Course

Degree Requirement _____
 Degree Elective _____
 Advanced Certificate _____
 Certificate _____
 Remedial _____
 Other (Workshop) _____

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Prerequisite Course(s): VEE 240

 Signature, Chairman, Curriculum Committee

 Date Approved by Committee

 Signature, President, COM-FSM

 Date Approved by the President

General Objective:

This course will introduce telecommunications students to the concept of using light to transmit and receive information via a fiber optic system. The principles and components of fiber optic communications technology and the theories of light as they relate to the types and uses of lasers are described. The practical aspects of fiber optic splicing, connections and fiber optic system troubleshooting are also presented

Learning Outcomes:

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

1. Explain how a fiber optic system uses light, the construction of fiber optic cables and the advantages and disadvantages of the fiber optic system.
2. Describe fiber optic components, their characteristics and factors that affect their performance.
3. Describe methods of modulation, Signal to Noise Ratio and BER.
4. Construct a fiber optic system and demonstrate the characteristics of Time Division Multiplexing.
5. Correctly terminate fiber optic cable.
6. Troubleshoot a fiber optic system.

STUDENTS SHOULD BE MADE AWARE OF OCCUPATIONAL HEALTH AND SAFETY ISSUES IN ALL SITUATIONS AND BE EXPECTED TO DEMONSTRATE SAFE WORKING PRACTICES AT ALL TIMES.

Outline of Content:

The course content is as follows:

1. Introduction to fiber optics including the visible and optical spectrum, law of reflection and Snell's law. Optical light sources, optical detectors and the operation of the fiber optic system
2. Attenuation, bandwidth and fiber optic components such as:
 - LED's
 - Lasers
 - PIN photodiode
 - APD's

3. Signal transmission and modulation techniques including AM, FM and PCM. Multiplexing techniques, SNR and BER.
4. Fiber optic connections, losses and splicing.
5. Troubleshooting fiber optic systems.

Learning Outcomes: On completion of this course the learner will be able to:

Learning Outcome 1 **Explain how a fiber optic system uses light, the construction of fiber optic cables and the advantages and disadvantages of the fiber optic system.**

Assessment Criteria

- a. Explain what light is and how is it produced.
- b. Identify the components of the visible spectrum and the optical spectrum.
- c. Describe the difference between reflection and refraction.
- d. Identify the law of reflection and Snell's law.
- e. Explain total internal reflection.
- f. Explain the operation of a fiber optic system.
- g. Describe the three sections of a fiber optic system.
- h. Identify optical light sources and optical detectors.
- i. Describe the construction of a fiber optic cable.
- j. Identify the advantages and disadvantages of fiber.
- k. Compare fiber optic cables.
- l. Observe the operation of a fiber optic system.

Assessment Method

Multiple choice questions
Short answer questions
Practical exercises

Learning Outcome 2 **Describe fiber optic components, their characteristics and factors that affect their performance.**

Assessment Criteria

- a. Define attenuation and bandwidth.
- b. Identify the primary causes of attenuation.
- c. Describe singlemode and multimode waveguides.
- d. Recall the numerical aperture rating.
- e. Identify the characteristics of optical light sources.
- f. Describe the difference between homojunction and heterojunction LEDs.
- g. Describe the difference between LEDs and lasers.
- h. Identify the characteristics for optical detectors.

	<ul style="list-style-type: none"> i. Describe the difference between PIN photodiode and APDs.
Assessment Method	Multiple choice questions Short answer questions
Learning Outcome 3	Describe methods of modulation, Signal to Noise Ratio and BER.
Assessment Criteria	<ul style="list-style-type: none"> a. Describe the five areas of signal processing. b. Explain AM, FM, PCM, and intensity modulation. c. Explain TDM, FDM and WDM. d. Define SNR and BER.
Assessment Method	Multiple choice questions Short answer questions
Learning Outcome 4	Construct a fiber optic system and demonstrate the characteristics of Time Division Multiplexing.
Assessment Criteria	<ul style="list-style-type: none"> a. Construct and setup a fiber optic system utilizing time division multiplexing. b. Demonstrate the operational characteristics of time division multiplexing.
Assessment Method	Multiple choice questions Short answer questions Practical exercises/tests
Learning Outcome 5	Correctly terminate fiber optic cable.
Assessment Criteria	<ul style="list-style-type: none"> a. Explain losses due to the different types of misalignment and waveguide geometry. b. Describe the basic steps to properly splice waveguides. c. Identify the six requirements for a good connector. d. Correctly terminate a fiber optic cable. e. Determine the losses of adding a non-mechanical splice to a fiber optic cable.
Assessment Method	Multiple choice questions Short answer questions Practical exercises/tests

Learning Outcome 6**Troubleshoot a fiber optic system.**

Assessment Criteria

- a. Identify a faulted optic system.
- b. Develop an organized troubleshooting strategy.
- c. Isolate a faulted section of a fiber optic system.
- d. Demonstrate the steps involved in properly troubleshooting a fiber optic system using a troubleshooting flowchart.
- e. Examine the characteristics of a faulty; transmission circuit, transmission medium, and receiver circuit.

Assessment Method

Multiple choice questions
 Short answer questions
 Practical exercises/tests

Required Course Materials:**1. Instructor:**

- a. CAI Classroom with whiteboard or chalkboard
- b. Practical laboratory equipped with tools of the trade

2. Student:

- a. Text(s), handouts provided by instructor
- b. Ring binder
- c. College ruled note sheet, pencil or pen

Reference Materials:

Modern Electronic Communication, *Seventh Edition*
 Gary M. Miller, Jeffrey S. Beasley, 2002

Method of Instruction:

1. Computer Aided Instruction
2. Practical/Experimentation

Evaluation:

Final Grade for this course will be based on meeting the course requirements at the following percentage rates:

90% - 100%	A – Superior
80% - 89%	B – Above Average
70% - 79%	C – Average
60% - 69%	D – Below Average
0 % - 59%	F – Failure

Attendance:

The COM-FSM attendance policy will apply