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

Course Outline Cover Page

Microwave	**VTE 260**
Course Title	Department and Number

Course Description: This course introduces the student to Microwaves and Microwave systems. The student will analyze Microwave Transmitters, Receivers, Waveguide Theory, Antennas, Cavity Resonators and Tube Microwave devices and semiconductor microwave devices.

Prepared by: Brent Villiers **State:** National Campus

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	2/4	8/4	32	2
Laboratory				
		Total Semester Credits:		2

Purpose of Course

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

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 the telecommunication student to the principles and major components of a microwave system.

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

1. Describe the basic concept of microwaves.
2. Explain the basic principles of microwave systems.
3. Describe the operation of microwave transmitters.
4. Describe the operation of microwave receivers.
5. Compare waveguides with other methods of energy transfer.
6. Describe the theory and operation of horn antennas, microwave reflectors and lenses.
7. Describe cavity resonators and tube microwave devices.
8. Describe the theory of semiconductor microwave devices.

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: This course contains:

1. Introduction to Microwaves
   - History and inception of microwave communications
   - Microwave principles and Radio Frequency Spectrum
   - Microwave frequencies
   - Metric prefixes

2. Introduction to Microwave Systems
   - Stages of a microwave systems
   - Multiplexing
   - Components and devices
   - Effects of misalignment

3. Microwave Transmitters
   - Operation and signal tracing

4. Microwave Receivers
   - Operation and signal tracing

5. Waveguide Theory
   - Advantages and disadvantages of waveguides.
   - Waveguide development and plumbing.

6. Antennas
   - Construction and theory

7. Cavity resonators and tube microwave devices
   - Theory of operation of cavity resonators, klystrons and magnetrons

8. Semiconductor Microwave Devices
   - Discuss the limitations of BJTs and FETs and the operation of Varacter, Tunnel and Gunn diodes, and DROs.

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

Learning Outcome 1 **Describe the basic concept of microwaves.**

Assessment Criteria
a. Describe the history of microwave inception and explain how microwave communications were initiated.
b. Identify basic microwave principles and recognize the Radio Frequency Spectrum.
c. Identify microwave frequencies and factors affecting communications.
d. Identify metric prefixes.
e. Perform conversions between different metric prefixes.

Assessment Method
Multiple choice questions
Short answer questions

Learning Outcome 2 **Explain the basic principles of microwave systems.**

Assessment Criteria
a. Identify various stages in a basic microwave communication system.
b. Describe the basic principle of multiplexing.
c. Describe the purpose of microwave repeater stations.
d. Identify basic microwave components and devices.
e. Observe the effects of blocked microwave transmission signals and misaligned microwave antennas.

Assessment Method
Multiple choice questions
Short answer questions
Practical experiment/test

Learning Outcome 3	**Describe the operation of microwave transmitters.**	
Assessment Criteria	a.	Describe the operation of typical microwave transmitters.
	b.	Observe and trace signals through a basic microwave transmitter.
Assessment Method		Multiple choice questions Short answer questions Practical/Test
Learning Outcome 4	**Describe the operation of microwave receivers.**	
Assessment Criteria	a.	Describe the operation of typical microwave receiver.
	b.	Observe and trace signals through a basic microwave receiver.
Assessment Method		Multiple choice questions Short answer questions Practical exercises/test
Learning Outcome 5	**Compare waveguides with other methods of energy transfer.**	
Assessment Criteria	a.	Describe a waveguide and explain the advantages and disadvantages over other means of transferring RF energy.
	b.	Explain how waveguides are developed from parallel to wire transmission lines.
	c.	Describe waveguide plumbing.
Assessment Method		Multiple choice questions Short answer questions Practical exercises/tests
Learning Outcome 6	**Describe the theory and operation of horn antennas, microwave reflectors and lenses.**	
Assessment Criteria	a.	Describe the basic construction and theory of operation of horn antennas.
	b.	Describe the basic construction and theory of operation of microwave reflectors.
	c.	Describe the basic construction and theory of operation of microwave lenses.
	d.	Verify that microwave signals can be reflected.

Assessment Method	Multiple choice questions Short answer questions Practical Exercises/tests

Learning Outcome 7 **Describe cavity resonators and tube microwave devices.**

Assessment Criteria	a. Describe the purpose of cavity resonators. b. Describe the basic theory and operation of cavity resonators. c. Describe the basic principle of microwave tubes and their limitations. d. Describe the basic theory and operation of klystrons and Magnetrons.
Assessment Method	Multiple choice questions Short answer questions

Learning Outcome 8 **Describe the theory of semiconductor microwave devices.**

Assessment Criteria	a. Describe the limitations of Bipolar and field effect transistors at microwave frequencies. b. Describe methods to minimize the limitations in Bipolar and field effect transistors at microwave frequencies. c. Describe the basic theory of operation of Varactor Diodes, Tunnel Diodes, Gunn Diodes and DROs.
Assessment Methods	Multiple Choice Questions Short Answer Questions

Required Course Materials:

1. Instructor:

a. CAI Classroom with whiteboard or chalkboard
b. Laboratory equipment with tools of the trade
c. Text, Teacher's Resource Guide, workbook
d. Overhead projector, transparencies

2. Student:

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

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