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

Course Outline Cover Page

Electronic Fundamentals I — Course Title
VEE 103 — Department and Number

Course Description: This course introduces the student to the theory of electricity and magnetism, basic components such as resistors, switches, fuses and circuit breakers, and the relationship of voltage, current, resistance and power and their measurements in basic electrical circuits. Basic direct current circuits are analyzed using Ohm's Law, Kirchoff's Laws and various network theorems.

Prepared by: Gardner Edgar **State:** Pohnpei Campus

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3/6	16/8	48	3
Laboratory				

Total Semester Credits:

Purpose of Course

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

Prerequisite Course(s): Admission and VSP 121

_____ _____
Signature, Chairman, Curriculum Committee **Date Approved by Committee**

_____ _____
Signature, President, COM-FSM **Date Approved by the President**

General Objective:

This course will introduce the students to the basic fundamentals of electricity, magnetism, and basic components. Students will analyze direct current circuits using Ohm's Law; Kirchoff's Law, and various Network Theorems. It also introduces students to the theoretical and practical aspects of series, parallel and series-parallel circuit construction using the Breadboarding method.

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

1. Describe the basic concept of voltage and current and the behavior of these parameters in simple electrical circuits.
2. Explain the purpose and identify the various types of resistors and their symbols. Identify the value, power rating and tolerance of resistors using various types of industry codes.
3. Describe the purpose and types of switches, fuses and circuit breakers and identify their schematic symbols.
4. Define magnetism and electromagnetism and their characteristics; describe how these characteristics are utilized in the operation of the relay, magnetic circuit breaker and meter.
5. Describe the function of the multimeter and its controls. Safely and accurately use a multimeter to measure the circuit quantities of resistance, voltage, and current.
6. Using Ohm's Law to define the relationship between resistance, voltage, current, and power in an electrical circuit. By experimentation prove Ohm's Law.
7. Identify the following circuits, calculate and measure the circuit parameters of voltage, resistance, and current. Troubleshoot the series, parallel and series-parallel circuits.
    a. Series Circuit
    b. Parallel Circuit
    c. Series and Parallel Circuit
    d. Voltage Divider Circuit
    e. Bridge Circuit
8. Simplify and analyze complex circuits using the following methods:
    a. Kirchoff's Laws
    b. Thevenin's Theorem
    c. Norton's Theorem

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. Voltage and Current
   - Atomic Structure
   - Voltage and volt
   - Voltage and Potential Difference
   - Six methods of producing electricity
   - Current and amperage
   - Conductor and Insulator
   - Three basic elements of an electrical circuit
   - Circuit load and Current flow

2. Resistors
   - Purpose of the resistor
   - Unit of resistance as the ohms
   - Resistor coding and schematic symbol
   - Fixed and Variable Resistor types
   - Resistor power rating and tolerance

3. Switches, Fuses, and Circuit Breakers
   - Purpose of a switch and its schematic symbol
   - Single & double pole switch/ Single & double throw switch
   - Four types of switches and their schematic diagrams
   - Purpose of a circuit protection device
   - Fuses and circuit breakers and their schematic diagrams

4. Magnetism Relays and Meters
   - Magnetism and the characteristics of magnet
   - The laws of magnetic attraction & repulsion
   - The properties of magnetic lines of force
   - Magnetic materials and Non-magnetic materials
   - Electromagnetism and their characteristics
   - Operation of a relay, magnetic circuit breaker and a meter

5. Multimeter and Multimeter Use
   - Procedures and precautions in measuring voltage, current, and resistance.
   - Performing actual voltage, current, and resistance measurements with a multimeter.

6. Ohm's Law & Power
    - Ohm's Law
    - Power in an electrical circuit
    - Experimentation on Ohm's Law

7. Series Circuit & Troubleshooting Theory
    - Series Circuit
    - Calculating and measuring total resistance, current, voltage drops, and power in a series circuit
    - Troubleshooting procedures on series circuit
    - Experimentation -Fault finding: open circuits, short circuit, and faulty component

8. Parallel Circuit & Troubleshooting Theory
    - Parallel Circuit
    - Calculating and measuring total equivalent resistance, total and individual branch currents, voltage drops, and power in a parallel circuit
    - Troubleshooting procedures
    - Experimentation - Fault finding: open circuit, short circuit, and faulty component

9. Series-Parallel Circuit and Troubleshooting Theory
    - Series-Parallel Circuit
    - Calculating and measuring total resistance, total and individual branch currents, voltage drops, and power
    - Troubleshooting procedures
    - Experimentation – Fault finding: open circuit, short circuit, and faulty component

10. Voltage Divider Circuit
    - Voltage Divider Circuit
    - Unloaded & Loaded
    - Calculating and measuring voltage and current in an unloaded & a loaded voltage divider circuit
    - Calculating percent regulation

11. Bridge Circuits
    - Purpose of a bridge circuit
    - Identifying a bridge circuit
    - Solving for voltage output and unknown resistance
    - Experimentation – Making voltage measurement in an operating bridge circuit and calculating resistance

12. Kirchoff's Law, Thevenin's Theorem, and Norton's Theorem
    - Complex circuits
    - Analyzing voltage and current of a complex circuit using Kirchoff's Current and Voltage Laws
    - Thevenizing a complex circuit
    - Nortonizing a complex circuit

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

Learning Outcome 1 **Describe the basic concept of voltage and current and the behavior of these parameters in simple electrical circuits.**

Assessment Criteria

a. Describe atomic structure and how electric charge relates to electrons and protons.
b. Describe the law of electrostatic force.
c. Define voltage and the volt as the unit of measure.
d. Describe the relationship between voltage and potential difference.
e. Identify the six methods of producing electricity.
f. Define current and the ampere as the unit of measure.
g. Describe a conductor and an insulator and the behavior of electrons in an insulator.
h. Identify the three elements of an electrical circuit.
i. Describe an electrical circuit load and resulting current flow.

Assessment Method

Multiple choice questions
Short answer questions

Learning Outcome 2 **Explain the purpose and identify the various types of resistors and their symbols. Identify the value, power rating and tolerance of resistors using various types of industry codes.**

Assessment Criteria

a. Identify the purpose of a resistor and its schematic symbol.
b. Identify the unit of resistance as ohm and resistor reference designator code.
c. Identify fixed and variable resistor types.
d. Define a resistor's power rating and tolerance.
e. Identify a resistor's number and letter codes.

Assessment Method

Multiple choice questions
Short answer questions

Learning Outcome 3	**Describe the purpose and types of switches, fuses and circuit breakers and identify their schematic symbols.**
Assessment Criteria	a. Identify the purpose of a switch and its schematic diagram. b. Describe a single pole & single throw switch and a single pole and double throw switch. c. Describe four types of switches and their schematic diagrams. d. Identify the purpose a circuit protection device. e. Identify a fuse and circuit breaker and their schematic diagram.
Assessment Method	Multiple choice questions Short answer questions
Learning Outcome 4	**Define magnetism and electromagnetism and their characteristics; describe how these characteristics are utilized in the operation of the relay, magnetic circuit breaker and meter.**
Assessment Criteria	a. Define magnetism and the characteristics of a magnet. b. Define the laws of magnetic attraction and repulsion. c. Observe magnetic poles and flux lines. d. Describe the properties of magnetic lines of force. e. Identify magnetic and non-magnetic materials. f. Define electromagnetism and their characteristics. g. Observe electromagnetic strength and polarity. h. Describe the operation of a relay, magnetic circuit breaker, and a meter.
Assessment Method	Multiple choice questions Short answer questions Experiments
Learning Outcome 5	**Describe the function of the multimeter and its controls. Safely and accurately use a multimeter to measure the circuit quantities of resistance, voltage, and current.**

Assessment Criteria	a. Describe the purpose of a multimeter. b. Identify the electrical quantities measured by multimeters. c. Identify analog and digital multimeter displays. d. Describe and state the purpose of functional sections of multimeters. f. Make circuit measurements and read an analog meter scale. g. Compare meter voltage measurements to actual voltages. h. Describe how to set up a multimeter to measure voltage, resistance, and current. i. Describe how to read a multimeter display when measuring resistance, voltage, and current. j. Describe how to connect a multimeter to a circuit to make measurement. k. State the precautions to observe when making resistance, voltage, and current measurements. l. Make resistance, voltage, and current measurements with an analog and digital multimeter.
Assessment Method	Multiple choice questions Short answer questions Practical exercises/tests
Learning Outcome 6	**Using Ohm's Law to define the relationship between resistance, voltage, current, and power in an electrical circuit. By experimentation prove Ohm's Law.**
Assessment Criteria	a. Define Ohm's Law and how voltage, current, and resistance are related. b. Define Power and how voltage, current, and resistance and Ohm's Law are related to power. c. Prove, by experimentation, the Ohm's Law relationship of voltage, current, and resistance.
Assessment Method	Multiple choice questions Short answer questions Practical exercises/tests
Learning Outcome 7	**Identify the following circuits, calculate and measure the circuit parameters of voltage, resistance, and current in**

each. Troubleshoot the series, parallel and series-parallel circuits.

a. Series Circuit
b. Parallel Circuit
c. Series and Parallel Circuit
d. Voltage Divider Circuit
e. Bridge Circuit

Assessment Criteria

a. Identify a Series Circuit, a Parallel Circuit, a Series-Parallel Circuit, a Voltage Divider Circuit, and a Bridge Circuit.
b. Calculate total resistance, current, and voltage drops in a series circuit.
c. Measure current and voltage drops in a series circuit.
d. Calculate the total resistance, total current & individual branch current, and voltage drop across each branch in a parallel circuit.
e. Calculate and measure total resistance, current, and voltage drop in a series-parallel circuit.
f. Calculate voltage, current, and resistance in an unloaded and loaded voltage divider circuit.
g. Measure voltage and current in a loaded and unloaded voltage divider circuit.
h. Explain the purpose of a bridge circuit.
i. Solve for voltage output and unknown resistance in a bridge circuit.
j. Measure voltage in an operating bridge circuit and calculate resistances.
k. Determine if an operating series circuit, parallel circuit, or series-parallel circuit is faulty.
l. Identify shorted, open, and changed value resistor in a series, parallel, or series-parallel circuit.
m. Troubleshoot a series, parallel, or series-parallel circuit if it is faulty.
n. Identify a faulty circuit as being open, shorted, or changed valued.

Assessment Method

Multiple choice questions
Short answer questions
Practical Exercises/Test

Learning Outcome 8 **Simplify and analyze complex circuits using the following methods:**

a. Kirchoff's Laws
b. Thevenin's Theorem
c. Norton's Theorem

Assessment Criteria

a. Identify a complex circuit.
b. Explain Kirchoff's Current Law (KCL) and Kirchoff's Voltage Law (KVL).
c. Given a complex circuit, calculate voltage and current using KCL and KVL.
d. State the purpose of the Norton's Theorem and Thevenin's Theorem.
e. Nortonize a series-parallel circuit.
f. Thevenize a series-parallel circuit.

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:

Principles of Electric Circuits, *Sixth Edition*
Thomas L. Floyd.

Method of Instruction:

1. Computer Aided Instruction
2. Practical/Experimentation
3. Lecture/Demonstration

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