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

Course Outline Cover Page

Building Maintenance II — Course Title
VBM 102 — Department and Number

Course Description: This course is designed to provide the students with the basic skills necessary to properly install individual Electrical circuits in a building will cover the use of essential hand and power tools. This course is also designed to provide the students with the basic knowledge required for properly using a meter for testing faulty devices and troubleshoot electrical circuit.

Prepared by: Grilly Jack **State:** Pohnpei Campus

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	3/6	16/8	48	3
Laboratory	3/6	16/8	48	1
		Total Semester Credits:		4

Purpose of Course

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

Prerequisite Course(s): VSP 153a Industrial Safety

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

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

General Objective: This course introduces the student to the theory of electricity and basic components used in the electrical industry and the relationship of voltage, current, resistance and power. This course will also enable the students to perform basic measurements by using a measuring device and analyzing electrical Direct Current and Alternating Current circuits using Ohm's Law and various network theorems. Students will compare different types of direct and alternating current circuits. The course emphasizes electrical components, relationships and power factors. Students will apply formula to analyze AC and DC circuits. This course also includes the theoretical and practical aspects of series, parallel, and series-parallel circuit construction using experimental board's 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. Describe the purpose and types of switches, fuses and circuit breakers and identify their schematic symbols.
3. Define magnetism and electromagnetism and their characteristics; describe how these characteristics are utilized in the operation of the relay, magnetic circuit breaker and meter.
4. 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.
5. Using Ohm's Law to define the relationship between resistance, voltage, current, and power in an electrical circuit. By experimentation prove Ohm's Law.
6. 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
7. Use experimental boards to construct and analyze series and parallel circuits.
8. Explain the operation of an AC generator and motor their characteristics.
9. Use Ohm's Law to calculate voltage, resistance, and current in an AC circuit and to discuss the relationship between the three quantities
10. The students need basic drawing skills as a mean communication.
11. Develop the skills to read basic circuit diagrams and explain the operation of a circuit.
12. The student will be able to identify the major tools that are used in the electrical industry.
13. Develop a methodical approach to completing a task.

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.

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.

All work practices must ensure that safe practices are adopted.

Conditions **Working in groups given:**

- **Resources**
- **Verbal presentation to the group of learners**

Assessment Method **Assessment may involve any of the following methods**

- **Oral questioning**
- **Written tests**
- **Computer managed testing**
- **Individual written assignments**
- **Active participation in group activity**

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.

All work practices must ensure that safe practices are adopted.

Conditions **Working in groups given:**

- **Resources**
- **Verbal presentation to the group of learners**

Assessment Method **Assessment may involve any of the following methods**

- **Oral questioning**
- **Written tests**
- **Computer managed testing**
- **Individual written assignments**
- **Active participation in group activity**

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.

All work practices must ensure that safe practices are adopted.

Conditions **Working in groups given:**

- **Resources**
- **Verbal presentation to the group of learners**

Assessment Method **Assessment may involve any of the following methods**

- **Oral questioning**
- **Written tests**
- **Computer managed testing**
- **Individual written assignments**
- **Active participation in group activity**

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.

All work practices must ensure that safe practices are adopted.

Conditions

Working in groups given:

- **Resources**
- **Verbal presentation to the group of learners**

Assessment Method

Assessment may involve any of the following methods

- **Oral questioning**
- **Experiments**
- **Computer managed testing**
- **Drawing Exercise**
- **Computer drawing program**

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.

All work practices must ensure that safe practices are adopted.

Conditions **Working in groups given:**

- **Resources**
- **Verbal presentation to the group of learners**

Assessment Method **Assessment may involve any of the following methods**

- **Oral questioning**
- **Written tests**
- **Computer managed testing**
- **Individual written assignments**
- **Active participation in group activity**

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. **All work practices must ensure that safe practices are adopted.**
Conditions	**Working in groups given:** • **Resources** • **Verbal presentation to the group of learners**
Assessment Method	**Assessment may involve any of the following methods** • **Oral questioning** • **Written tests** • **Computer managed testing** • **Practical exercisers** • **Active participation in group activity**

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.**

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.
j. Determine if an operating series circuit, parallel circuit, or series-parallel circuit is faulty.
k. Identify shorted, open, and changed value resistor in a series, parallel, or series-parallel circuit.
l. Troubleshoot a series, parallel, or series-parallel circuit if it is faulty.
m. Identify a faulty circuit as being open, shorted, or changed valued.

All work practices must ensure that safe practices are adopted.

Conditions **Working in groups given:**

- **Resources**
- **Verbal presentation to the group of learners**

Assessment Method **Assessment may involve any of the following methods**

- **Oral questioning**
- **Written tests**
- **Computer managed testing**
- **Exercisers**
- **Active participation in group activity**

Learning Outcome 8: **Describe the basic principles of alternating current and analyze various ac waveforms (such as sine-wave, square-wave, saw tooth-wave, etc…) by determining their frequency/cycle in Hertz, period (Time), and other parameters, such as voltage & current values (as in peak, peak-to-peak, average, and RMS), phase relationships, magnitude, and degree (angle).**

Assessment Criteria:

a. Define alternating current.
b. Define and determine frequency, wavelength, and period of a sine wave.
c. Define the characteristics of induction.
d. Calculate peak, peak-to-peak, average, and RMS.

All work practices must ensure that safe practices are adopted.

Conditions **Working in groups given:**

- **Resources**
- **Verbal presentation to the group of learners**

Assessment Method **Assessment may involve any of the following methods**

- **Oral questioning**
- **Written tests**
- **Computer managed testing**
- **Individual written assignments**
- **Active participation in group activity**

Learning Outcome 9:	**Explain the operation of an AC generator and its characteristics.**
Assessment Criteria:	a. Determine the magnitude and polarity of voltage produced in a magnetic field. b. Describe the operation of an AC generator. c. Identify in & out of phase and magnitude & degree of AC waveform. **All work practices must ensure that safe practices are adopted.**
Conditions	**Working in groups given:** • **Resources** • **Verbal presentation to the group of learners**
Assessment Method	**Assessment may involve any of the following methods** • **Oral questioning** • **Written tests** • **Computer managed testing** • **Individual written assignments** • **Active participation in group activity**

Learning Outcome 10: **The students need basic drawing skills as a mean of communication.**

Assessment Criteria:

a. Use the correct lettering, drawing sketching techniques.

b. Identify the various methods of drawing from block diagram to wiring diagram.

All work practices must ensure that safe practices are adopted.

Conditions **Working in groups given:**

- **Resources**
- **Verbal presentation to the group of learners**

Assessment Method **Assessment may involve any of the following methods**

- **Oral questioning**
- **Written tests**
- **Computer managed testing**
- **Exercisers**
- **Active participation in group activity**

Learning Outcome 11 **Develop the skills to read basic circuit diagrams and Explain the operation of a circuit.**

Assessment Criteria:

a. Produce an electrical drawing/ sketch to convey a Pictorial message.

b. Recognize basic electrical symbols.

All work practices must ensure that safe practices are adopted.

Conditions **Working in groups given:**

- **Resources**
- **Verbal presentation to the group of learners**

Assessment Method **Assessment may involve any of the following methods**

- **Computer managed testing**
- **Complete drawing exercisers**
- **Computer Drawing program**
- **Active participation in group activity**

Learning Outcome12	**The students will be able to identify the major tools that are used in the electrical industry.**
Assessment Criteria	a. Identify a range of tools and the range of tools safely. b. Satisfactorily demonstrate these skills in the manufacture of small projects. **All work practices must ensure that safe practices are adopted.**
Conditions	**Working in groups given:** • **Resources** • **Verbal presentation to the group of learners**
Assessment Method	**Assessment may involve any of the following methods** • **Oral questioning** • **Computer managed testing** • **Individual written assignments** • **Active participation in group activity**
Learning Outcome13	**Develop a methodical approach to completing a task.**
Assessment Criteria	a. Develop a systematic approach to completing a task. b. Use applied Mathematics. c. Develop a work team approach and give and receive instruction. **All work practices must ensure that safe practices are adopted.**
Conditions	**Working in groups given:** • **Resources** • **Verbal presentation to the group of learners**
Assessment Method	**Assessment may involve any of the following methods** • **Oral questioning** • **Computer managed testing** • **Active participation in group activity**

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

Evaluation:

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

96% - 100%	A – Superior
90% - 95%	B – Above Average
80% - 89%	C – Average
69% - 79%	D – Below Average
0 % - 69%	F – Failure

Attendance:

The COM-FSM vocational educational attendance policy will apply.