**College of Micronesia – FSM**
**Course Modification Request**

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| VEM 103 Basic Electricity 1<br>Course Number and Title | Technology and Trade<br>Department |
| Same as above<br>Recommended Course Number and Title | Same as above<br>Department |

New Course Objectives:
No change

New Course Description:
No change

Revision/s Requested:

**Request 1** is to make the correction on page 1 of the course VEM 103 Basic Electricity 1. It was incorrectly typed as VEE 103 and approved.
Electronic Fundamentals I is the correct VEE 103.

Justification for Revising the Course:
The revision is to have the correct name/number for VEM Basic Electricity 1

**Request 2** is for book change for VEM 103 to Electrical Level One NCCER, Trainee Guide 2002 Revision, Prentice Hall, Inc Upper Saddle River New Jersey

Justification for Changing the Textbook:
Since Electrical Level One is used for another electricity course VEM 102 we recommend to use the same for VEM 103.

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| Signed by Bernando Dimaliwat<br>Division Chairperson | 02-03-05<br>Date |
| _____<br>Chairperson, Curriculum Committee | _____<br>Date |
| _____<br>President, COM-FSM | _____<br>Date |

| **Official Use Only** |
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| **New Course Number and Title:** |

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

# Course Outline Cover Page

**Basic Electricity 1** — Course Title
**VEM 103** — Department and Number

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

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

| | Hours per Week | No. Of Weeks | Total Hours | Sem. Credits |
|---|---|---|---|---|
| Lecture | 4/8 | 16/8 | 64 | 4 |
| Laboratory | | | | |

Total Semester Credits: 4

**Purpose of the Course**

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| Degree Requirement | _____ |
| Degree Elective | _____ |
| Advance 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 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 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 if 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 if 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
9. Use Breadboarding techniques to construct and analyze series and parallel circuits.

***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.***

**Outlines 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 and 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 measurement with multimeter.
6. Ohm's Law and 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 procedure
   - 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 and Loaded
    - Calculating and measuring voltage and current in an unloaded and 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 Kirchof's Current and Voltage Laws
    - Thevenizing a complex circuit
    - Nortorizing a complex circuit

13. Circuit Construction
    - ♦ Breadboarding methods for DC Circuit Construction: Series Circuit & Parallel 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 if 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.**

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| Assessment Criteria | a. Identify the purpose of a switch and its schematic Diagram.<br>b. Describe a single pole & single throw switch and a single pole and double throw switch.<br>c. Describe four types of switches and their schematic diagrams.<br>d. Identify the purpose of a circuit protection device.<br>e. Identify a fuse and circuit breaker and their schematic diagram. |
| Assessment Method | Multiple choice questions<br>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.<br>b. Define the laws of magnetic attraction and repulsion.<br>c. observe magnetic poles and flux lines.<br>d. Describe the properties of magnetic lines of force.<br>e. Identify magnetic and non-magnetic materials.<br>f. Define electromagnetism and their characteristics.<br>g. Observe electromagnetic strength and polarity.<br>h. Describe the operation of a relay, magnetic circuit breaker and a meter. |
| Assessment Method | Multiple choice questions<br>Short answer questions<br>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.<br>b. Identify the electrical quantities measured by multimeters.<br>c. Identify analog and digital multimeter displays.<br>d. Describe and state the purpose of functional sections of multimeters.<br>f. Make circuit measurements and read an analog meter scale.<br>g. Compare meter voltage measurements to actual voltages. |

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| | h. Describe how to set up a multimeter to measure voltage, resistance and current.<br>i. Describe how to read a multimeter display when measuring resistance, voltage and current.<br>j. Describe how to connect a multimeter to a circuit to make measurement.<br>k. State the precautions to observe when making resistance, voltage and current measurements.<br>l. Make resistance, voltage and current measurements with an analog and digital multimeter. |
| Assessment Method | Multiple choice questions<br>Short answer questions<br>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 the Ohm's Law and how voltage, current and resistance are related.<br>Define Power and how voltage, current and resistance and Ohm's Law are related to power.<br>Prove, by experimentation, the Ohm's Law relationship of voltage, current and resistance. |
| Assessment Method | Multiple choice questions<br>Short answer questions<br>Practical exercises/tests |
| **Learning Outcome 7** | **Identify the following circuits, calculate and measure the circuit parameters of voltage, resistance and current in each. Troubleshooting the series, parallel and series-parallel circuits.**<br>**a. Series Circuit**<br>**b. Parallel Circuit**<br>**c. Series and Parallel Circuit**<br>**d. Voltage Divider Circuit**<br>**e. Bridge Circuit.** |
| Assessment Criteria | a. Identify a Series Circuit, a Parallel Circuit, a Series Parallel Circuit, a Voltage Divider Circuit and Bridge Circuit.<br>b. Calculate total resistance, current and voltage drops in a series circuit.<br>c. Measure current and voltage drops in a series circuit. |

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| | d. Calculate the total resistance, total current & individual branch current and voltage drop across each branch in a parallel circuit.<br><br>e. Calculate and measure total resistance, current and voltage drop in a series-parallel circuit.<br>f. Calculate voltage, current and resistance in an unloaded and loaded voltage divider circuit.<br>g. Measure voltage and current in a loaded and unloaded voltage divider circuit.<br>h. Explain the purpose of a bridge circuit.<br>i. Solve for voltage output and unknown resistance in a bridge circuit.<br>j. Measure voltage in an operating bridge circuit and calculate resistances.<br>k. Determine if an operating series circuit, parallel circuit, or series-parallel circuits is faulty.<br>l. Identify shorted, open and changed value resistor in a series, parallel or series-parallel circuit.<br>m. Troubleshoot a series, parallel or series-parallel circuit if it is faulty.<br>n. Identify a faulty circuit as being open, shorted or changed valued. |
| Assessment Method | Multiple choice questions<br>Short answer questions<br>Practical Exercises/Tests |
| **Learning Outcome 8** | **Simplify and analyze complex circuits using the following methods:**<br>**a. Kirchoff's Laws**<br>**b. Thevenin's Theorem**<br>**c. Norton's Theorem** |
| Assessment Criteria | a. Identify a complex circuit.<br>b. Explain Kirchoff's Current Law (KCL) and Kirchoff's Voltage Law (KVL).<br>c. Given a complex circuit, calculate voltage and current using KCL and KVL.<br>d. State the purpose of the Norton's Theorem and Thevenin's Theorem.<br>e. Nortorize a series-parallel circuit.<br>f. Thevenize a series-parallel circuit. |
| Assessment Methods | Multiple choice questions<br>Short answer questions |

*** Learning Outcome 9 can be incorporated into Learning Outcome 7 or completed separately.**

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| **Learning Outcome 9** | **Use Breadboarding techniques to construct and analyze series and parallel circuits.** |
| Assessment Criteria | a. Describe the Breadboarding method of circuit construction.<br>b. Describe how to construct a simple series circuit<br>c. Insert and remove a components from circuits<br>d. Construct & verify a series circuit.<br>e. Construct & verify a parallel circuit<br>f. Construct & verify a series-parallel circuit. |
| Assessment Methods | Multiple Choice Questions<br>Short Answer Questions<br>Practical Exercises/Tests |

**Required Course Materials:**

1. **Instructor:**
    a. Text: Electrical Level One NCCER, Annotated Instructor's Guide 2002 Revision, Prentice Hall, Inc Upper Saddle River New Jersey
    b. CAI Classroom with whiteboard or chalkboard
    c. Laboratory equipment with tools of the trade
    d. Teacher's Resource Guide, workbook
    e. Overhead projector, transparencies
2. **Student:**
    a. Electrical Level One NCCER, Trainee Guide 2002 Revision, Prentice Hall, Inc Upper Saddle River New Jersey
    b. Ring binder
    c. College ruled note sheet, pencil or pen
    d. Scientific calculator

**Reference Materials:**

Principles of Electric Circuits, Six 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:

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

**Attendance:**

The COM – FSM attendance policy will apply.