College of Micronesia

PO Box 159

Pohnpei FM 96941

Course Title: Industrial wiring Department and number: VEM 240

Course Description: This course is designed to introduce students to the fundamental concepts, principles, and devices involved in industrial control of motors. Students will also develop the skills necessary for wiring basic motor control and selecting the required pilot devices and safety components. Also includes troubleshooting motor circuitry and understanding Article 430 of NEC. To advance to the next level, the student must demonstrate proficiency to at least “C” grade level.

Prepared by: Cirilo B. Recana State: Pohnpei, Pohnpei Campus

 Hours/Week No. Of Weeks Total Hours Semester Credits

Lecture 3/6 x 16 = 48 3

Laboratory 3/6 x 16 = 48 1\_

 Total Semester Credits 4

Purpose of Course Degree Requirement √

 Degree Elective

Advanced Certificate

 Certificate

 Remedial

 Other

* This course also meet PLO#(S): NA

Prerequisite Course: VEM 104 and VEE 266

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Signature, Chairperson Date Approved

Curriculum & Assessment Committee

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Signature, VPIA, COM-FSM Date Approved

# PROGRAM LEARNING OUTCOMES (PLOs):

# The student will be able to:

# Practice safety and occupational health procedures in the workplace.

1. Use electricity hand and power tools competently.
2. Test electrical equipment.
3. Interpret schematic wiring diagrams and waveforms.
4. Determine the amount of load per circuit.
5. Install residential wiring circuits according to given specification and plan.
6. Identify and interpret basic solid state (electronics) symbols and circuit schematics commonly found in the electrical industry.
7. Analyze circuit operations on basic motors.
8. Perform basic troubleshooting on basic motors.
9. Install and perform maintenance on air-conditioning units.
10. Interpret and install circuits according to rules and regulations of the National Electrical Codebook.
11. Install and analyze basic motor control circuits.

# STUDENT LEARNING OUTCOMES (SLOs) – GENERAL

# The student will be able to:

1. State the purpose and general principles of control components and circuits.
2. Identify pilot devices both physically and schematically and describe their operating principles.
3. Interpret motor control wiring, connection, and ladder diagrams.
4. Select and size contactors, relays and timing relays and overload relays both physically and schematically and describe their operating principles.
5. Connect motor controllers for specific applications with emphasis on safety practices and in accordance with National Electrical Code (NEC) requirements.
6. Troubleshoot control and motor control circuit for basic to intermediate level faults.

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| SLO | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 | PLO10 | PLO11 | PLO12 |
| 1 |  |  |  |  |  |  |  | D | D |  |  |  |
| 2 |  |  |  | ID |  |  |  | ID | ID |  |  |  |
| 3 |  |  |  | ID |  |  |  | I | D |  |  |  |
| 4 |  |  |  | D |  |  |  | D | M |  |  |  |
| 5 |  |  |  |  |  |  |  |  | DM |  | DM |  |
| 6 |  |  |  |  |  |  |  |  |  |  | M | M |

I = Introduced

D = Demonstrated

M= Mastered

# STUDENT LEARNING OUTCOMES (SLOs) – SPECIFIC

#  The student will be able to:

General SLO 1. State the purpose and general principles of control components and circuits.

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| Student Learning Outcomes | Assessment Strategies |
| 1.1 Describe control circuit components. | Competence will be demonstrated through oral questioning, written tests, individual written assignments and active participation in group activity. |
| * 1. Differentiate manual to automatic control operation.
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General SLO 2. Identify pilot devices both physically and schematically and describe their operating

principles.

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| Student Learning Outcomes | Assessment Strategies |
| 2.1 Identify and describe the function of contacts. | Competence will be demonstrated through oral questioning, written tests, individual written assignments and active participation in group activity. |
| 2.2 Familiarize with the construction and function of switches used in control components. |
| 2.3 Familiarize with pushbutton control station. |
| 2.4 Identify types of magnetic coils used in control circuit. |
| 2.5 Familiarize with physical and schematic overload  contact relays. |
| 2.6 Familiarize with other pilot devices used in control circuit components of a motor. |

General SLO 3. Interpret motor control wirings, connections, and ladder diagrams.

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| Student Learning Outcomes | Assessment Strategies |
| 3.1 Identify from diagram the power circuit and control  circuit. | Competence will be demonstrated through oral questioning, written tests, individual written assignments and active participation in group activity. |
| 3.2 Differentiate control circuit from power circuit in the  diagram. |
| 3.3 Differentiate two-wire to three-wire circuit. |
| 3.4 Read and interpret variations on motor control circuits. |

General SLO 4. Select and size contactors, relays and timing relays and overload relays both physically and schematically and describe their operating principles.

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| Student Learning Outcomes | Assessment Strategies |
| 4.1 Describe the operating principle of contactors, relays,  timing relays and magnetic starters. | Competence will be demonstrated through oral questioning, written tests, and active participation in group activity.  |
| 4.2 Describe function of magnetic starter, contactor,  relays, timing relays and overload relays in motor  control circuits. |
| 4.3 Identify magnetic starter, contactor, relays, timing  relays and their schematic symbols and physical  construction. |
| 4.4 Differentiate ratings of magnetic starters and  contactors according to application. |

General SLO 5. Connect motor controllers for specific applications with emphasis on safety practices and in accordance with National Electrical Code (NEC) requirements.

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| Student Learning Outcomes | Assessment Strategies |
| 5.1 Identify control components to use for motor control circuit. | Competence will be demonstrated through oral questioning, and practical or hands-on activities. |
| 5.2 Design and analyze motor control circuit based on the  given application. |
| 5.3 Wire a motor control circuit based on given ladder diagram. |
| 5.4 Size motor disconnecting and branch circuit devices  raceways and raceways. |

General SLO 6. Troubleshoot control and motor control circuit for basic to intermediate level faults.

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| Student Learning Outcomes | Assessment Strategies |
| 5.1 Troubleshoot motor control circuit for basic level  faults. | Competence will be demonstrated through active participation in group and individual activities using Simutech troubleshooting skills series.  |
| 5.2 Troubleshoot motor control circuit for intermediate  level faults. |

# COURSE CONTENTS

1. Introduction to motor control components and circuits.

2. Pilot devices and symbols.

3. Line/Ladder Diagram.

4. Magnetic contactors, starters, control relays timing relays and overload protection.

5. Industrial control of motors.

6. Troubleshoot motor control circuit using Simutech.

7. Troubleshooting Skills Series.

# METHOD OF INSTRUCTION

Lectures, group work/discussion, hand-out readings, assignments/class work and experiments.

# TEXT(S) AND COURSE MATERIALS

Burke, T., Shannon, G., Brown, N., & Rogers, C. (2008). *NCCER Electrical Level 2* *NEC*

*revision*. Gainesville, FL: Pearson Education, Inc (or most recent edition).

Binder

Scientific calculator

# REFERENCE MATERIALS

NIDA, (2002). *NIDA Lab Text Manual****.*** Melbourne, Florida, USA: NIDA Corporation (or most recent edition).

# INSTRUCTIONAL COST

None

# EVALUATION

Students must achieve 70% mastery or a “C” to pass this course.

# CREDIT BY EXAMINATION

None