Course Title: Basic Electricity for Manufacturing, Process and Power Operation

Course Prefix & No: PROT - 1250

LEC: 5.0 LAB: 3.0 Credit Hours: 6.0

COURSE DESCRIPTION:

Through lectures, discussions, demonstrations, coaching and problem solving, students learn and apply general electrical theory used in manufacturing, process, and power industries. Students study electron theory as it relates to ac and dc circuits. Students study various circuits, resistance, capacitance, inductance, symbols, and wiring diagrams. Lab assignments allow students to demonstrate an understanding of electrical theory, measuring, and control devices. The course emphasizes safety, as students are working with actual controls and voltages.

COURSE PREREQUISITE (S):

None

RATIONALE:

This course provides the knowledge of electrical theory and practice required for students in the Process Operation Technology program. This course is a component of all degrees and diplomas in this area.

REQUIRED TEXTBOOK (S) and/or MATERIALS:

Title: Basic Electricity for Process and Power
Edition: Current
Author: NCCER Contren Learning Series
Publisher: Pearson Custom Library
Materials:

Attached course outline written by: Bob Boyer Date: October 2011
Reviewed/Revised by: Bob Boyer Date: October 2018
Effective quarter of course outline: 19/FA Date: 
Academic Dean Scott Broady Date: October 31, 2018

Course Objectives, Topical Unit Outlines, and Unit Objectives must be attached to this form.

AAO Revised 3-13-01
COURSE OBJECTIVES:

1. Students will define terms used in basic electric circuits.
2. Students will demonstrate safety procedures in working with electrical circuits.
3. Students will explain and apply direct current (DC) concepts, laws, and perform calculations and measurements on live circuits.
4. Students will explain and apply alternating current (AC) concepts, laws, and perform calculations and measurements on live circuits.
5. Students will demonstrate the proper use of measuring devices used to check electric circuits.
6. Students will identify electrical components and devices.
7. Students will calculate wire size and loads for electric circuits.
8. Students will understand transformer theory, types and operation.
9. Students will demonstrate an understanding of various types of wiring diagrams.
10. Students will demonstrate the ability to wire and connect electric circuits following wiring diagrams.
11. Students will demonstrate processes and procedures used to troubleshoot electric circuits.
12. Students will demonstrate a basic understanding of electronic theory including semiconductors, diodes and transistors.

TOPICAL UNIT OUTLINE/UNIT OBJECTIVES:

**Week One – Objective #1, Objective #2**

Students will be welcomed and introduced to the course syllabus and expected outcomes. Students will be introduced to the terms used in basic electric circuits. Students will be introduced to safe work practices required when working on electrical circuits and systems.

Students will be introduced to electricity theory and troubleshooting using circuit calculations involving the application of Ohm’s and Kirchhoff’s Laws. Topics will include but are not limited to: Atomic theory, Electrical power and generation, Electric charge and current, Ohm’s law, Schematic representation of circuit elements, Resistors, Electrical circuits, Electrical measuring instruments, Electrical power and DC circuit calculations.
TOPICAL UNIT OUTLINE/UNIT OBJECTIVES (Cont’d):

**Week Two – Objective #5**  
Students will be introduced to various test instruments for testing and performing troubleshooting on electrical equipment. Students will learn how to convert from one scale to another on the test instruments. Students will understand electrical category ratings and electrical safety. Topics included but not limited to:

- Voltmeters, Ohmmeters, Ammeters, Multimeters, Megohmmeters, Motor and Phase Rotation Testers, Recording instruments, Electrical Category Ratings, Electrical Safety, Calibration and Instrumentation Test Equipment.

Students will start on series circuits on 4810 Trainer

**Week Three – Objective #3, Objective #5**  
Students will continue with lecture and assignments from week two.

Students will continue working with the lab trainers.

**Week Four – Objective #4,**  
Students will be introduced to the principals of alternating current. Topics will include but not be limited to:
- Sine Wave Generation, Sine wave terminology, AC Phase relationships, Nonsinusoidal waveforms,
- Resistance in AC Circuits, Inductance in AC Circuits, Capacitance, LC and RLC Circuits, Power in AC Circuits, and Transformers.

Students will continue working on various lab projects.

**Week Five – Objective #4, Objective #8**  
Students will continue with lecture and assignments from week four.

Students will continue working in the lab on series and parallel circuits

**Week Six – Objective #4, Objective #8**  
Students will continue with lecture and assignments from week five.

Students will continue working in the lab on series, parallel, and combination series parallel circuits
TOPICAL UNIT OUTLINE/UNIT OBJECTIVES (Cont’d):

**Week Seven – Objective #6, Objective #10**
The student will be able to identify electrical components and devices. The student will demonstrate the ability to wire and connect electric circuits following wiring diagrams.

Students will work on the lab trainers to demonstrate an understanding of circuit drawings.

**Week Eight - Objective #6, Objective #10**
Students will continue the assignments given in week seven.

Students will continue work on the lab trainers, identifying components and wiring and testing electrical circuits with relays and timers.

Instructors will wire up components and circuits for the student to test and identify problems.

(Problem Based Learning)

**Week Nine – Objective #9  Objective #10**
The students will demonstrate an understanding of various types of wiring diagrams. The student will demonstrate the ability to wire and connect electric circuits following wiring diagrams.

Students will be introduced to electrical prints, drawings and symbols. Students will learn about the information found on schematics, one-line drawings and wiring diagrams. Students will work on wiring trainers in the lab with relays and timers.

**Week Ten – Objective #10**
Students will work on wiring trainers in the lab.

Students will be given a scenario to draw and wire in the lab. (Problem solving/critical thinking)

Students will be given an incorrectly wired trainer and a wiring diagram to use for problem solving. (Problem Based Learning)

**Week Eleven – Objective #12**
The student will demonstrate a basic understanding of electronic theory including semiconductors, diodes and transistors.

Students will learn the function and operation of basic electronic devices, including semiconductors, diodes, rectifiers, and transistors.

Students will complete any missed lab assignments.

AAO Revised 3-13-01
**COURSE REQUIREMENTS/EVALUATION:**

**COURSE OBJECTIVES/ASSESSMENT MEASURES**

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<td>1. Students will define terms used in basic electric circuits.</td>
<td>Observation, Self-evaluation, Ability to understand and complete hands-on and virtual lab projects and assignments. Students are given weekly quizzes and tests containing questions relating to terms.</td>
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<td>2. Students will demonstrate safety procedures in working with electrical circuits.</td>
<td>Observation, Self-evaluation, Ability to properly apply safety procedures in working with electrical circuits. Students must successfully complete a written safety test before working with live electrical circuits.</td>
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<td>3. Students will explain and apply direct current (DC) concepts, laws, and perform calculations and measurements on live circuits.</td>
<td>Observation, Self-evaluation, Ability to properly apply safety procedures in working with electrical circuits. Graded hands-on lab projects and assignments. Graded weekly tests and assignments.</td>
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<td>4. Students will explain and apply alternating current (AC) concepts, laws, and perform calculations and measurements on live circuits.</td>
<td>Observation, Self-evaluation, Ability to properly apply safety procedures in working with electrical circuits. Graded hands-on projects and assignments. Graded weekly tests and assignments.</td>
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<td>5. Students will demonstrate the proper use of measuring devices used to check electric circuits.</td>
<td>Observation, Self-evaluation, Ability to properly apply safety procedures in working with electrical circuits. Graded hands-on projects and assignments. Graded weekly tests and assignments.</td>
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<td>6. Students will identify electrical components and devices.</td>
<td>Observation, Self-evaluation, Ability to properly apply safety procedures in working with electrical circuits. Graded hands-on lab projects and assignments. Graded weekly tests and assignments.</td>
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