Northwest State Community College  
Course Information Sheet

# Course Information

Title: Industrial Electricity 1A

Course Number: PLC 120

Credit Hours: 1

Pre-requisite: None

# Description

This is the first course in a sequence of 3 one credit hour courses.  These three courses together are equivalent to IND 120 Industrial Electricity.  This is an introductory course on the study of basic electrical concepts and circuits.   The course will be based on Direct Current (DC) and Alternating Current (AC) concepts, terminology, components, and basic series/parallel circuits.  Students will learn how to calculate and measure voltage, current, and resistance in basic series and parallel circuits.  Students will learn how to utilize a Digital Multi-meter (DMM) to troubleshoot components in an electrical circuit, and test stand-alone components.  The students will be introduced to DC and AC relay circuits, as well as electrical symbols that will be used on electrical prints.  The course will have a heavy focus on troubleshooting concepts and techniques when working with electrical circuits.

# Learning Outcomes

Upon completion of this course the students will be able to:

1. Explain basic electrical concepts and terminology
2. Apply various types of electrical test equipment
3. Explain the operation and application of electrical switches
4. Demonstrate Proper wiring DC Circuits (series & parallel)

# Required Material

**Text:**

DC Circuit Fundamentals Author: Lab-Volt; - ISBN: 978555000084

AC Circuit Fundamentals Author: Lab-Volt; ISBN: 978000088

**Supplies:**

Calculator

Safety Eyewear

DMM

Wire Strippers

Wiring Kit

# Industrial Electricty 1A Module 1 - Basic Electrical Concepts, Terminology, and Multi-meters

This module will overview basic electrical concepts, electrical terminology and the application of a Digital Multi-Meter.  Students will learn the basic differences between AC & DC electricity, where this power comes from, and will be introduced to a basic electrical circuit.

Upon completion of this module the student will be able to:

1. Identify and explain two sources of direct current
2. Measure basic resistance and voltage with a digital multi-meter
3. Wire a basic DC series circuit of P/S, switch and pilot light
4. Measure the voltage across each component with a DVM
5. Measure the resistance of a resistor and a solenoid coil
6. Measure the resistance of a switch when out of a circuit
7. Check and explain the continuity of a coil or contact

### Module 1 Activities

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 Read DC Circuit Fundamentals, pages 1-7 - Basic Concepts of Electricity

Text Book

 Read DC Circuit Fundamentals, pages 60-67 - Voltage, Current, and Measuring Instruments

Text Book

 Review PowerPoint: Electrical Basics 1

<https://slideplayer.com/slide/6193325/>

 Watch video: An Overview of the Labvolt AC/DC Training Unit (3:47)

<https://www.youtube.com/watch?v=1PZGFIo5PFk>

 Watch video: Using the EXTECH Digital Multi-Meter Part 1 (3:27)

<https://www.youtube.com/watch?v=u8c1_cfH-sQ>

 Watch video: Using the EXTECH Digital Multi-Meter Part 2 (1:46)

<https://www.youtube.com/watch?v=RRwRtVPpouU>

 Review the EXTECH MN47 Digital Multi-Meter Users Guide

<https://www.instrumart.com/assets/Extech-MN47-Manual.pdf>

 Complete Quiz 120-1

See Quiz INT120-1 Content Packaging files to upload into an LMS System

 Review Hands-on Lab 120-1.1, Lab 120-1.2, and Lab 120-1.3.

See Lab Documents

 Schedule and complete Hands-on Lab 120-1.1

Complete Hands-on Lab 120-1.1

 Schedule and complete Hands-on Lab 120-1.2

Complete Hands-on Lab 120-1.2

 Schedule and complete Hands-on Lab 120-1.3

Complete Hands-on Lab 120-1.3

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# Industrial Electricity 1A Module 2 - Basic Electrical Concepts, Switches, and Circuits

This module will focus on various types of electrical switches and how they will be wired to control basic electrical devices.  Series and parallel switching circuits will be discussed, as well as basic troubleshooting techniques on switches and loads in an electrical circuit.

Upon completion of this module the student will be able to:

1. Identify the various types of switches (SPST, SPDT, DPDT, DPST)
2. Measure the continuity on each switch type
3. Identify the symbols of each type of switch on an electrical diagram
4. Explain the current flow through each switch when in a circuit
5. Wire and test a circuit with a DPDT switch with two different loads
6. Wire and test a circuit with 2 switches in series driving a pilot light
7. Wire and test a circuit with 2 switches in parallel driving a pilot light

### Module 2 Activities

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 Read DC Circuit Fundamentals, pages 25-45 - Exercise 2 (Switches)

Text Book

 Read DC Circuit Fundamentals, pages 49-59 - Exercise 3 (Series and Parallel Circuits)

Text Book

 Review "Switches Demystified" handout

<https://musicfromouterspace.com/analogsynth_new/ELECTRONICS/pdf/switches_demystified_assembly.pdf>

 Complete Quiz 120-2

See Quiz INT120-2 Content Packaging files to upload into an LMS System

 Review Hands-on Lab 120-2.1, Lab 120-2.2, and Lab 120-2.3

See Lab Documents

 Schedule and complete Hands-on Lab 120-2.1

Complete Hands-on Lab 120-2.1

 Schedule and complete Hands-on Lab 120-2.2

Complete Hands-on Lab 120-2.2

 Schedule and complete Hands-on Lab 120-2.3

Complete Hands-on Lab 120-2.3

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# Industrial Electricity 1A Module 3: Direct Current Circuits, Series & Parallel

This module will introduce the student to Ohm’s Law and the Power Law in electrical circuits, as well as resistors, potentiometers and rheostats.  Conductors and insulators will also be discussed, as well as open circuits and short circuit concepts.  Students will calculate current, voltage and resistance; then measure these variables to validate the calculations.

Upon completion of this module the student will be able to:

1. Wire a series circuit with a switch and two resistors
2. Before applying power, open circuit, calculate, the total resistance.
3. Measure the total resistance with a DMM.
4. Calculate the current flowing in the series circuit
5. Measure the current flowing in the series circuit with a DMM.
6. Calculate the voltage drop across each resistor, then measure with a DMM
7. Wire a parallel circuit with a switch and two resistors
8. Calculate the current through each resistor
9. Measure the current in each resistor with a DMM.

### Module 3 Activities

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 Read DC Circuit Fundamentals, Pages 81-106 - Exercise 5 (Resistance and Ohm's Law)

Text Book

 Read DC Circuit Fundamentals, Pages 111-116 - Exercise 6 (Solving Series Circuits)

Text Book

 Read DC Circuit Fundamentals, Pages 141-146 - Exercise 7 (Solving Parallel Circuits)

Text Book

 Watch video: Greek Letters & Scientific Notation Basics I (11:10)

<https://www.youtube.com/watch?v=E5EefarKqAc>

 Watch video: Ohm's Law Basics and Series Circuits (5:24)

<https://www.youtube.com/watch?v=mO9FjIrePWk>

 Watch video: Basic Parallel Circuits (5:29)

<https://www.youtube.com/watch?v=yfsE2C30Puc>

 Watch video: Calculating Parallel Resistors with the Reciprocal Method (7:04)

<https://www.youtube.com/watch?v=Riu2ngYpDWU>

 Watch video: Calculating Power (9:16)

<https://www.youtube.com/watch?v=WvHxmP8q71w>

 Complete Quiz 120-3

See Quiz INT120-3 Content Packaging files to upload into an LMS System

 Review Hands-on Lab 120-3.1, Lab 120-3.2, and Lab 120-3.3

See Lab Documents

 Schedule and complete Hands-on Lab 120-3.1

Complete Hands-on Lab 120-3.1

 Schedule and complete Hands-on Lab 120-3.2

Complete Hands-on Lab 120-3.2

 Schedule and complete Hands-on Lab 120-3.3

Complete Hands-on Lab 120-3.3

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