

# EMERGING TECHNICIAN

## Electrical Trainer Package



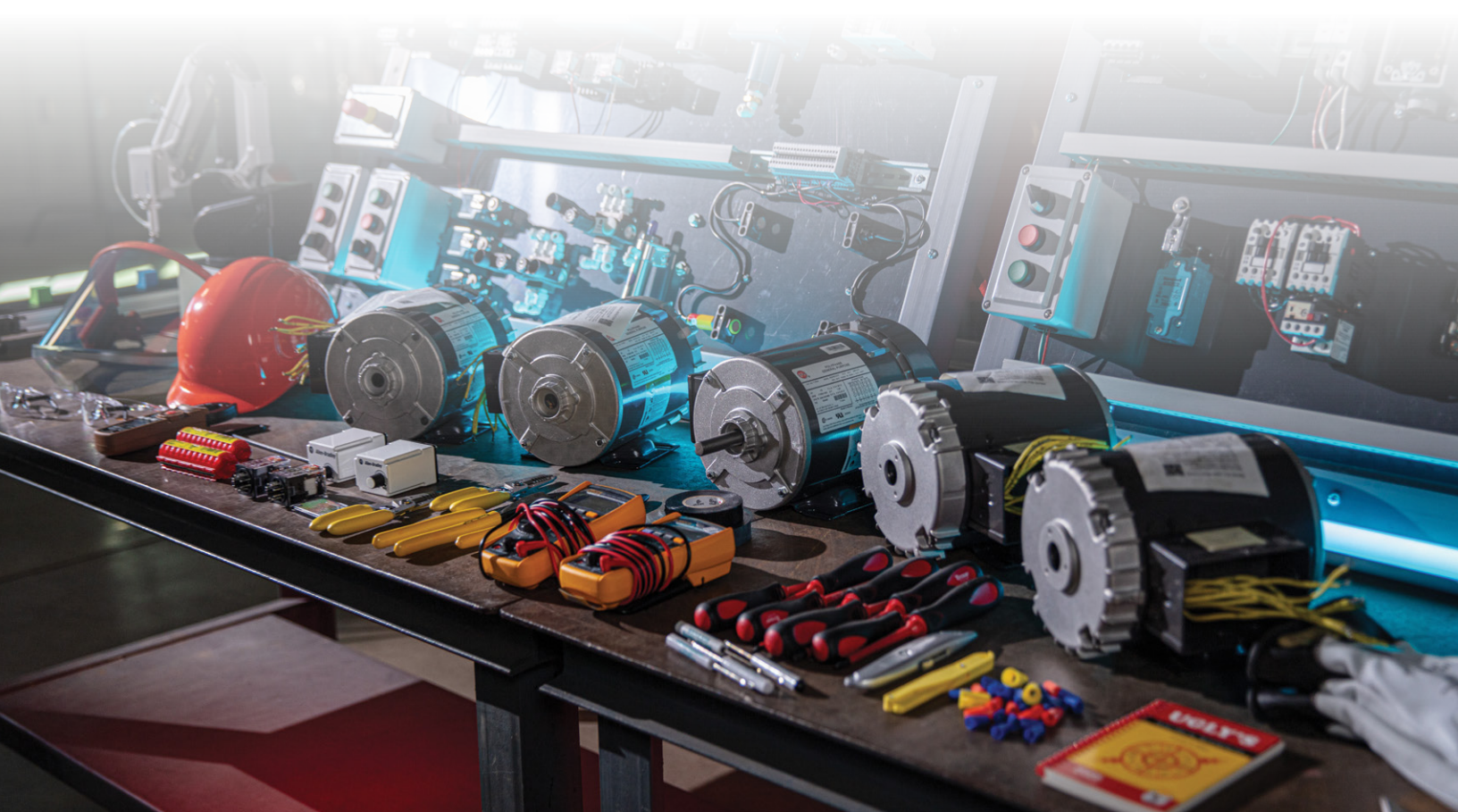
# AMTEC

*ADVANCED MANUFACTURING TECHNICAL EDUCATION COLLABORATIVE*

AMTECWORKFORCE.ORG

# TABLE OF CONTENTS

|   |     |
|---|-----|
| Table of Contents .....                               | 1   |
| About Us .....  | 2   |
| Contacts .....  | 2   |
| Emerging Technician - Electrical Trainer Package..... | 3-4 |
| Electrical Power.....                                 | 5   |
| Electrical Controls.....                              | 5   |
| Robotics.....   | 5   |
| Specific Competencies.....                            | 7   |



# ABOUT US

Multi-Skill Academy, a division of Multi-Skill Training services, has partnered with AMTEC to provide custom training solutions for educational institutions to help merge the gap between technical education and industry. We supply instructors and students with the necessary tools and equipment for success. Multi-Skill Academy's trainers have been used to teach in manufacturing facilities for over 30 years, which ensures your students will be taught the correct skills in the most effective way.

## What Sets Us Apart:

- Competitively priced (less than our competitors)
- 30-60 day delivery time
- Turnkey training solutions for educators (packages include everything an instructor needs to conduct an effective course)
- Real world hands-on exercises (exercises that relate directly to the plant environment)
- No banana plugs on electrical wires (students will strip wire and make actual terminations on components)
- Includes all tools and consumables
- Detailed course curriculum (includes instructor guide, lab guide, and student books)
- Industrial components (components on trainers are what you will see in industry)

## Providing Training Throughout the US



# CONTACT US



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## Emerging Technician - Electrical Trainer Package

Our trainer package provides technical education with essential instruction regarding the wide variety of concepts that relate to today's industrial manufacturing environment. The curriculum for this trainer package provides crucial supplements to ensure consistent and successful training.

Multi-Skill Academy provides the equipment necessary to deliver cognitive and hands-on training for the Emerging Technician - Electrical Trainer Package. The hands-on training utilizes the various components through exercises designed for use on our trainer package. Also included, are instructor step-by-step hands-on demonstrations for each hands-on lesson.

### Key Features of Industrial Trainers

- All necessary tools and equipment included
- Training packages include real world plant components designed to administer hands-on activities effectively
- Portable workstations with industrial components
- Sets on benchtop

### Requirements:

- 120/208 VAC
- For Electrical Controls: Compressed Air {Above 60psi}  
(Air Compressor sold as add-on option)

### General Information:

- Dimensions: 48" x 20" x 24"
- Non-Skid Rubber Feet
- Trainers fold up for easy storage

### Online Content

#### 1 Instructor Guide

- Includes lesson plans, training content, hands-on exercises, and quizzes

#### 2 Student Books

(subscription sold separately)

- Includes training content for self-study

#### 1 Lab Manual

- Includes step-by-step instructor directions for using the industrial maintenance training to support hands-on exercises



# LESSON PLAN EXAMPLES

## TABLE of CONTENTS

### ELECTRICAL POWER

|  |      |
|--|------|
| <b>1. INTRODUCTION TO ELECTRICITY</b> .....                      | 1-18 |
| Understanding Electricity.....                                   | 3    |
| Voltage.....   | 4    |
| Common Voltage Levels.....                                       | 4    |
| Current.....   | 6    |
| Resistance.....  | 7    |
| Power.....   | 8    |
| Conductors and Insulators.....                                   | 8    |
| Heat.....  | 9    |
| Ohm's Law.....   | 9    |
| Voltage/Current Relationship.....                                | 11   |
| Current/Resistance Relationship.....                             | 11   |
| Applications of Ohm's Law.....                                   | 13   |
| Using Ohm's Law when Troubleshooting.....                        | 14   |
| Calculating Power, Voltage, and Current Using Power Formula..... | 15   |
| Power/Current Relationship.....                                  | 16   |
| Applications Using Power Formula.....                            | 16   |
| Combining Ohm's Law and Power Formula.....                       | 18   |
| <b>2. ELECTRICAL POWER SAFETY</b> .....                          | 1-13 |
| Electrical Shock.....  | 2    |
| Electrical Codes and Standards and Enforcement Agencies.....     | 2    |
| Classes of Fire Extinguishers.....                               | 4    |
| Personal Protective Equipment.....                               | 4    |
| Grounding.....   | 7    |
| Lockout/Tagout.....  | 8    |
| Lockout Devices.....   | 10   |
| Electrical Enclosures.....                                       | 10   |
| Electrical Motor Safety.....                                     | 11   |

## SESSION PLAN

**TITLE:** INTRODUCTION TO ELECTRICITY

**INTRODUCTION:** In this session, students will work with the basic quantities that define electricity. The instructor will introduce fundamental electrical terminology and relationships. The instructor will also provide a definition and explanation of Ohm's law, and power equations will be given to demonstrate the relationship between current, voltage, and resistance.

**OBJECTIVE:** After an introduction to the fundamentals of electricity, its origination, and properties, students will identify parameters for current, resistance, and voltage, apply Ohm's law in calculations, and use the power formula when troubleshooting.

### PRESENTATION

|   |   |
|---|---|
| 1. Understanding electricity              | 7. Voltage/current relationship             |
| 2. Voltage and types of voltage           | 8. Current/resistance relationship          |
| A. AC voltage                             | 9. Applications using Ohm's law             |
| B. Types of voltage                       | 10. Using Ohm's law when troubleshooting    |
| C. DC voltage                             | 11. Power                                   |
| 3. Current                                | 12. Calculating power using power formula   |
| A. Current levels                         | 13. Calculating voltage using power formula |
| B. Current flow                           | 14. Calculating current using power formula |
| 4. Resistance                             | 15. Power/current relationship              |
| 5. Conductors and insulators              | 16. Heat                                    |
| 6. Ohm's and Ohm's law                    | 17. Application using Power Formula         |
| A. Calculating current using Ohm's law    | 18. Combining Ohm's Law and Power Formula   |
| C. Calculating resistance using Ohm's law |   |

### EVALUATION

Quiz / Hands-On Application

## SESSION QUIZ

### INTRODUCTION TO ELECTRICITY

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**DIRECTIONS:** Circle the best answer.

- The units of measurement for resistance in an electrical circuit is \_\_\_\_\_.
  - volts
  - amps
  - ohms
  - watts
- The amount of electrical pressure in a circuit is \_\_\_\_\_.
  - power
  - current
  - resistance
  - voltage
- A material that has little resistance and permits electrons to move through it easily is a(n) \_\_\_\_\_.
  - insulator
  - atom
  - conductor
  - track
- A common power source that directly produces DC voltage is a \_\_\_\_\_.
  - battery
  - generator
  - hydro-electrical power plant
  - motor
- The opposition to the flow of electrons is \_\_\_\_\_.
  - power
  - current
  - resistance
  - voltage

## HANDS-ON EXERCISES

### BASIC ELECTRICAL MEASUREMENTS

**MATERIALS:**

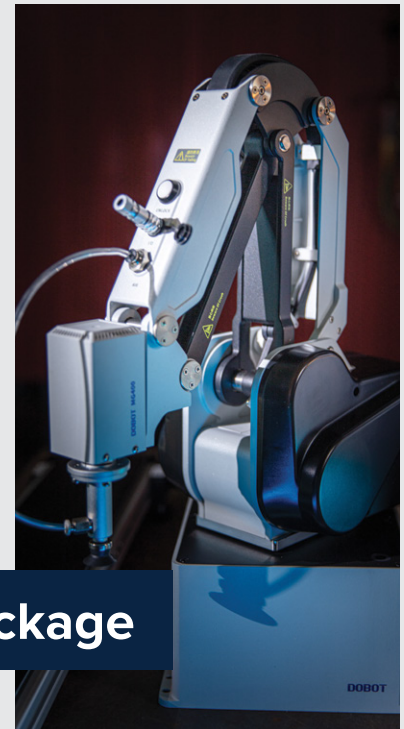
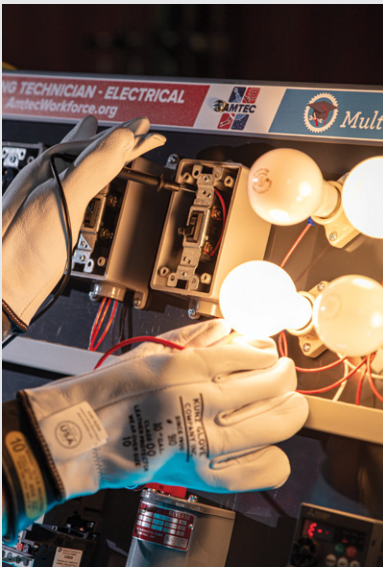
- 1 - Electrical Power simulator
- 1 - digital multi-meter
- 1 - digital amp probe



**PURPOSE:** During these hands-on exercises, students will use basic electrical tests and measurement equipment safely. Students will select the correct meters and settings to perform voltage, current, and resistance measurements on known sources. Students will also interpret readings on digital meter displays.

**PROCEDURE:**

- Using a digital multimeter, perform continuity checks on various fuses, both good and bad.
- Using a digital multimeter, take resistance measurements on various resistance values and compare to known values.



## Emerging Technician - Electrical Trainer Package

### Electrical Power

The Electrical Power class is the starting point for working with industrial electricity. The training sessions include electrical safety, electrical meters, series & parallel circuits, conductors & OCPDs, and magnetism, transformers, & power distribution systems. The class then expands to cover 3-phase electricity and the proper use and troubleshooting of industrial motors and motor starters.

### Sample Course Outline

1. Introduction to Electricity
2. Electrical Power Safety
3. Basic Electrical Measurements
4. Series & Parallel Circuits
5. Conductors & Overcurrent Protection Devices
6. Basic Circuit Connections
7. Magnetism Transformers
8. Power Distribution Systems
9. Three-Phase Motors & Diagnostics
10. Motor Starters & Motor Protections
11. Final Assessment

### Electrical Controls

The Electrical Controls class builds upon the electrical knowledge learned in the Electrical Power class. This basic knowledge is used to expand the technician's electrical knowledge to include troubleshooting of industrial electrical schematics and electrical components typically found in an industrial environment. The training sessions include pushbuttons, selector switches, relays, timers, and photoelectrical & proximity switches.

### Sample Course Outline

1. Electrical Diagrams & Control Logic
2. Control Devices I
3. Electromechanical Relays
4. Control Devices II
5. Photoelectric Switches
6. Proximity Switches
7. PLCs
8. Troubleshooting Switches & Relays
9. Control Circuits
10. Troubleshooting Controls
11. Final Assessment

### Robotics

This entry level robotics course introduces the basic concepts and components relating to robots in manufacturing. Hands-on exercises will allow students to become familiar with robotics and their many functions. Students will program the robot by using DobotStudio software. This robot software allows you to program the robot similar to what you see in industry. Training in this area includes the sessions listed below.

### Sample Course Outline

1. Robot Axis and Movement
2. Pick and Place Routines
3. Using Jumps and Loops
4. Using Inputs
5. Palletizing and Roll Angles
6. Handshaking – Dobot to Dobot
7. Handshaking – Dobot to Microcontroller
8. Workcell Design

# SPECIFIC COMPETENCIES INCLUDED ARE:

## Industrial Maintenance Electrical Principles

- Demonstrate knowledge of basic electrical safety principles
- Demonstrate basic knowledge of electricity
- Analyze and install electrical components and circuits
- Install/replace wire
- Operate electrical/electronic test equipment

## Industrial Maintenance Electrical Motor Controls

- Install/maintain/troubleshoot limit and proximity switches
- Troubleshoot/calibrate/adjust and replace sensors and input devices
- Troubleshoot/repair/replace motors (AC and DC)
- Install/maintain/troubleshoot servo motors
- Install/maintain/troubleshoot VFD drives (Variable Frequency Drive)
- Install/repair/replace motor starters
- Interpret electrical schematics and relay logic

## Industrial Maintenance of PLC

- Demonstrate knowledge of basic PLC systems
- Describe and connect PLC hardware
- Manipulate PLC software
- Interpret ladder logic programs
- Use sequential function chart programming
- Use PLC communication tools

## Robotics and Automation

- Describe robot hardware and operation
- Describe Cartesian axes and coordinate system
- Set up, repair, and maintain robots and automated equipment
- Program robots
- Perform robot maintenance and PM
- Troubleshoot robots using error codes





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