Western Technical College

10660124 Electronic Component Applications

Course Outcome Summary

Course Information

Description	Solid state theory and troubleshooting is applied through the construction of a power supply project.
Career Cluster	Manufacturing
Instructional Level	Associate Degree Courses
Total Credits	2.00
Total Hours	60.00

Types of Instruction

Instruction Type	Credits/Hours
Lecture	0.67 CR / 12 HR
Lab	1.33 CR / 48 HR

Course History

Last Approval Date	1/11/2016

Pre/Corequisites

Pre/Corequisite	10660105 Soldering Fundamentals

Textbooks

Electricity Basic and Intro to Industrial Controls (Custom Book). Petruzella, Frank. Publisher: McGraw-Hill Publishing Company. **ISBN-13**: 978-1-3081-1020-2. Required.

Learner Supplies

Safety glasses with side eye protection that meet Z87 OSHA guidelines. **Vendor:** Campus Shop. Required.

Scientific calculator - T1-30XIIS. **Vendor:** Campus Shop. Required.

Core Abilities

1. **Apply mathematical concepts.**
   Status *Active*

2. **Demonstrate ability to think critically.**
   Status *Active*

3. **Demonstrate ability to value self and work ethically with others in a diverse population.**
   Status *Active*

4. **Transfer social and natural science theories into practical applications.**
   Status *Active*

5. **Use effective communication skills.**
   Status *Active*

6. **Use technology effectively.**
   Status *Active*

Program Outcomes

1. **Adhere to proper safety practices and procedures.**
   Type *Local* ***Code*** * * ***Status*** *Active*

2. **Exhibit professionalism.**
   Type *Local* ***Code*** * * ***Status*** *Active*

3. **Perform preventative maintenance.**
   Type *Local* ***Code*** * * ***Status*** *Active*

4. **Maintain parts and equipment inventory including service documentation.**
   Type *Local* ***Code*** * * ***Status*** *Active*

5. **Maintain electrical and electronic devices and systems.**
   Type *Local* ***Code*** * * ***Status*** *Active*

6. **Build or assemble electrical, electronic and mechanical hardware under the guidance of a journeyman electrician or electromechanical technician.**
   Type *Local* ***Code*** * * ***Status*** *Active*

Course Competencies

1. **Discuss the two types of semiconductor material.**
   Domain *Cognitive* ***Level*** *Understanding* ***Status*** *Active*

   Assessment Strategies
   1.1. Written Objective Test

   Criteria
   1.1. you can explain the difference between P and N type semiconductor material.
   1.2. you can draw the schematic symbol of a diode listing the Anode and Cathode connection.
   1.3. you can describe current flow through a diode that is forward biased and reverse biased.

   Learning Objectives

1.a. Discuss the basic structure of atoms.
1.b. Discuss valence electrons and how they determine if a material is a conductor, insulator or semiconductor.
1.c. Describe how doping is used to make P and N type semiconductors.

2. Analyze diode construction and operation.

Domain *Cognitive* ***Level*** *Analyzing* ***Status*** *Active*

Assessment Strategies

2.1. Written Objective Test
2.2. Skill Demonstration

Criteria

Performance will meet expectations when:

2.1. you can draw the current/voltage curve of a diode based on lab measurements.
2.2. you can describe the three diode approximations and when to use each.
2.3. you can predict the current flow through a diode based on the physical installation in a circuit.
2.4. you can demonstrate how the application of heat to a semiconductor alters its operational characteristics.

Learning Objectives

2.a. Construct a basic circuit to test diode operation when forward and reverse biased.
2.b. Determine which diode approximation to used based on circuit operational conditions.
2.c. Test a diode with a DMM to determine if it is defective.
2.d. Measure the voltage drop across a diode and determine if it is forward or reverse biased.

3. Analyze diode circuit operation with DC and AC voltages.

Domain *Cognitive* ***Level*** *Analyzing* ***Status*** *Active*

Assessment Strategies

3.1. Written Objective Test
3.2. Skill Demonstration

Criteria

You will know you are successful when:

3.1. you can calculate the voltages from a full wave and half wave rectifier circuits.
3.2. you can graph the voltage curve for both a half wave and full wave rectifier circuit.
3.3. you can explain the advantages and disadvantages of the different type of rectifier circuits.

Learning Objectives

3.a. Construct a half wave and full wave rectifier circuit.
3.b. Determine the operating frequency of either a half wave or a full wave rectifier circuit.
3.c. Calculate the output voltage from a rectifier circuit based on the schematic drawing of the circuit.
3.d. Measure the peak output voltage of a rectifier circuit using an oscilloscope.
3.e. Measure the operating frequency of a rectifier circuit using an oscilloscope.

4. Troubleshoot diodes in rectifier circuits.

Domain *Cognitive* ***Level*** *Analyzing* ***Status*** *Active*

Assessment Strategies

4.1. Written Objective Test
4.2. Skill Demonstration

Criteria

You will know you are successful when:

4.1. you can determine which component in a rectifier circuit is defective.
4.2. you can determine what affect a changing load will have on a rectifier circuit.
4.3. you can determine how much current can be supplied by a rectifier without damaging any components.

Learning Objectives

4.a. Isolate the problem component in a rectifier circuit based on measurements.
4.b. Measure the effects of a changing load on a rectifier circuit.

4.c. Calculate the effects of a changing load resistance on a rectifier circuit.

5. Explore the operation of a diode in a clipper circuit.

Domain *Cognitive* ***Level*** *Applying* ***Status*** *Active*

Assessment Strategies

5.1. Written Objective Test
5.2. Skill Demonstration

Criteria

You will know you are successful when:

5.1. you can predict the voltages of a positive or negative diode clipper circuit.
5.2. you can predict and graph the voltage waveform of a diode clipper circuit.
5.3. you can construct a diode clipper circuit.

Learning Objectives

5.a. Construct a diode clipper circuit.
5.b. Measure the output voltage from a diode clipper circuit.
5.c. Determine if a diode clipper circuit is a positive or negative circuit based on the schematic diagram.

6. Test the operation of zener diodes and apply them as a voltage regulator.

Domain *Cognitive* ***Level*** *Analyzing* ***Status*** *Active*

Assessment Strategies

6.1. Written Objective Test
6.2. Skill Demonstration

Criteria

Performance will meet expectations when:

6.1. you can construct a circuit to demonstrate the operation of a zener diode as a voltage regulator.
6.2. you can demonstrate how to measure the zener voltage drop when forward and reverse biased.
6.3. you can graph the operating curve of a zener diode.
6.4. you can calculate the load resistance range that will allow a zener to operate within its specifications.

Learning Objectives

6.a. Explain the operating characteristics of a zener diode and how it differs from a regular diode.
6.b. Construct a zener voltage regulator circuit.
6.c. Measure the output voltage of a zener regulated power supply with a varying load resistance.
6.d. Determine the operating range of the load for a zener regulated power supply.
6.e. Calculate currents in a zener regulated supply with varying load resistances.
6.f. Calculate power dissipation of a zener diode in a voltage regulator circuit.

7. Determine the operational characteristics of a light emitting diode (LED)

Domain *Cognitive* ***Level*** *Evaluating* ***Status*** *Active*

Assessment Strategies

7.1. Written Objective Test
7.2. Skill Demonstration

Criteria

You will know you are successful when:

7.1. you can describe the operation of a light emitting diode.
7.2. you can construct a circuit to test the operation of a light emitting diode.
7.3. you can describe the operation of a opto-isolator.

Learning Objectives

7.a. Describe the operation of a light emitting diode.
7.b. Construct a circuit to demonstrate the operation of a light emitting diode.
7.c. Assemble a circuit using an opto-isolator to demonstrate optical isolation.

8. Construct a linear power supply.

Domain *Cognitive* ***Level*** *Creating* ***Status*** *Active*

Assessment Strategies

8.1. Skill Demonstration

Criteria

8.1. you can construct a linear power supply.
8.2. you can test the operation of a linear power supply.

Learning Objectives

8.a. Solder the components of a linear power supply to a printed circuit board.
8.b. Wire the circuit board and related components to complete a linear power supply.
8.c. Test the operation of a linear power supply.

9. Explore the operation of a bipolar junction transistor (BJT).

Domain *Cognitive* ***Level*** *Applying* ***Status*** *Active*

Assessment Strategies

9.1. Skill Demonstration
9.2. Written Objective Test

Criteria

You will know you are successful when:

9.1. you can the construction of a NPN and PNP transistor.
9.2. you can draw the schematic symbols for either a NPN or PNP transistor.
9.3. you can test a transistor to determine the collector, base and emitter leads.
9.4. you can calculate the beta of a transistor.
9.5. you can measure any of the three currents in a transistor.

Learning Objectives

9.a. Describe the construction of a bipolar junction transistor.
9.b. Demonstrate the proper circuit construction to bias it properly.
9.c. Demonstrate how a transistor is used as a current amplifier.
9.d. Demonstrate how heat changes the operational characteristics of a transistor.
9.e. Explain how a transistor can be used as a amplifier or a switch.

10. Design and test transistor bias circuits.

Domain *Cognitive* ***Level*** *Creating* ***Status*** *Active*

Assessment Strategies

10.1. Skill Demonstration
10.2. Written Objective Test

Criteria

You will know you are successful when:

10.1. you can calculate the DC voltages and currents in a variety different transistor bias circuits.
10.2. you can measure the voltages and currents in a variety of transistor bias circuits.
10.3. you can determine from the collector to emitter voltage if a transistor is in the active, cutoff or saturation mode of operation.

Learning Objectives

10.a. Analyze the different transistor bias circuits.
10.b. Describe how a transistor can be used when operating in saturation mode.
10.c. Explain the differences in the three operating modes of a transistor.
10.d. Analyze a voltage divider bias circuit.
10.e. Discuss the effects of beta a various transistor bias circuits.
10.f. Examine the effects of heat on a transistors beta.