



Mitchell Technical Institute

IC-102 IC-102 Electronics Theory

Course Outcome Summary

Course Information

Description	This course will start with the analysis of P-N junction diodes and their use as three different rectifier configurations in power supplies. Specialty diodes like Zener, LED, and opto-couplers will be included in student studies. Bipolar transistors used as a switch and in three configurations will be studied. Hi-powered industrial devices from the thyristor family (SCR's, Diac's, Triac's) will be examined. Open-loop and closed-loop designs will be introduced in operational amplifiers. Skills in solid state troubleshooting will be emphasized.
Career Cluster	Construction and Manufacturing
Instructional Level	Certificate
Total Credits	2.00

Types of Instruction

Instruction Type

On-line

Credits/Hours

Textbooks

Free On-line Textbook - www.ibiblio.org/kuphaldt/electricCircuits

Industrial Control Electronics: Devices, Systems and Applications 3rd Edition - Bartelet, Terry

Electrical Motor Controls for Integrated Systems 4th Edition - Rockis, Gary and Mazur, Glen

Course Competencies

1. Analyze basic structure of a semiconductor and how they conduct current

Assessment Strategies

- 1.1. Worksheet
- 1.2. Written Objective Test

Learning Objectives

- 1.a. Describe atomic bonding in a crystal structure
- 1.b. Generalize minority and majority carriers in a N material
- 1.c. Generalize minority and majority carries in a P material
- 1.d. Explain how a depletion region is formed

2. Describe diode biasing

Assessment Strategies

- 2.1. Simulation (lab project)
- 2.2. Written Objective Test

Learning Objectives

- 2.a. Discuss forward bias
- 2.b. Discuss reverse bias

3. Determine condition of a diode by ohmmeter test method

Assessment Strategies

- 3.1. Written Objective Test

Learning Objectives

- 3.a. Analyze ohmmeter reading of a working diode
- 3.b. Analyze ohmmeter reading of a shorted diode
- 3.c. Analyze ohmmeter reading of an open diode

4. Differentiate rectifier circuits

Assessment Strategies

- 4.1. Simulation (lab project)
- 4.2. Written Objective Test

Learning Objectives

- 4.a. Recognize half-wave rectifier configuration
- 4.b. Recognize full-wave rectifier configuration
- 4.c. Recognize full-wave bridge rectifier configuration

5. Summarize operation of half-wave and full-wave power supplies

Assessment Strategies

- 5.1. Simulation (lab project)
- 5.2. Simulation (circuit challenge)
- 5.3. Written Objective Test

Learning Objectives

- 5.a. Explain the process of a basic half-wave power supply
- 5.b. Explain the process of a basic full-wave power supply
- 5.c. Explain the process of a basic full-wave bridge power supply

6. Outline basic operation of four special-purpose diodes

Assessment Strategies

- 6.1. Worksheet
- 6.2. Simulation (lab project)
- 6.3. Written Objective Test

Learning Objectives

- 6.a. Discuss operation of a zener diode
- 6.b. Express proper biasing of a zener diode
- 6.c. Discuss operation of an LED
- 6.d. Express proper biasing of an LED
- 6.e. Discuss operation of a photodiode
- 6.f. Express proper biasing of a photodiode
- 6.g. Discuss operation of a varactor diode
- 6.h. Express proper biasing of a varactor diode

7. Explain basic structure and operation of BJT

Assessment Strategies

- 7.1. Worksheet
- 7.2. Simulation (lab project)
- 7.3. Written Objective Test

Learning Objectives

- 7.a. Evaluate the Emitter, Base, and Collector regions

- 7.b. Explain difference between NPN and PNP transistor
- 7.c. Summarize the junction biasing
- 7.d. Discuss transistor currents

8. Analyze transistor as a switching circuit

Assessment Strategies

- 8.1. Written Objective Test

Learning Objectives

- 8.a. Describe condition in cutoff
- 8.b. Describe condition in saturation

9. Outline ohmmeter test for a transistor

Assessment Strategies

- 9.1. Simulation (circuit challenge)
- 9.2. Written Objective Test

Learning Objectives

- 9.a. Explain test procedure for an NPN
- 9.b. Explain test procedure for a PNP
- 9.c. Express ohmmeter reading of a shorted junction
- 9.d. Express ohmmeter reading of an open junction

10. Determine transistor biasing methods

Assessment Strategies

- 10.1. Worksheet
- 10.2. Simulation (lab project)
- 10.3. Written Objective Test

Learning Objectives

- 10.a. Solve base bias calculations
- 10.b. Solve voltage-divider bias calculations

11. Identify transistor biasing techniques

Assessment Strategies

- 11.1. Simulation (circuit challenge)
- 11.2. Written Objective Test

Learning Objectives

- 11.a. Summarize Class A operation
- 11.b. Summarize Class B operation
- 11.c. Summarize Class C operation

12. Compare different transistor configurations

Assessment Strategies

- 12.1. Written Objective Test

Learning Objectives

- 12.a. Generalize common-emitter's voltage, current, and power gains
- 12.b. Generalize common-collector's voltage, current, and power gains
- 12.c. Generalize common-base's voltage, current, and power gains

13. Study basic construction and operation of FET's

Assessment Strategies

- 13.1. Written Product (report)
- 13.2. Written Objective Test

Learning Objectives

- 13.a. Write a report about FET construction
- 13.b. Write a report about FET operation

14. Discuss basic construction and operation of Thyristor family components

Assessment Strategies

- 14.1. Simulation (lab project)
- 14.2. Written Objective Test

Learning Objectives

- 14.a. Describe the basic construction of an SCR
- 14.b. Discuss the operation of an SCR
- 14.c. Describe the basic construction of a DIAC
- 14.d. Discuss the operation of a DIAC
- 14.e. Describe the basic construction of a TRIAC
- 14.f. Discuss the operation of a TRIAC

15. Outline ohmmeter testing procedure for Thyristor family

Assessment Strategies

- 15.1. Simulation (circuit challenge)
- 15.2. Written Objective Test

Learning Objectives

- 15.a. Explain test procedure for an SCR
- 15.b. Explain the test procedure for a DIAC
- 15.c. Explain the test procedure for a TRIAC

16. Discuss the basic op-amp

Assessment Strategies

- 16.1. Worksheet
- 16.2. Simulation (lab project)
- 16.3. Written Objective Test

Learning Objectives

- 16.a. Recognize the op-amp symbol
- 16.b. Identify the terminals

17. Explain basic operation of a differential amplifier

Assessment Strategies

- 17.1. Worksheet
- 17.2. Written Objective Test

Learning Objectives

- 17.a. Describe inverting input function
- 17.b. Describe non-inverting input function

18. Summarize negative feedback in op-amp circuits

Assessment Strategies

- 18.1. Worksheet
- 18.2. Simulation (lab project)
- 18.3. Simulation (circuit challenge)
- 18.4. Written Objective Test

Learning Objectives

- 18.a. Describe the effects of negative feedback
- 18.b. Discuss why negative feedback is used

19. List basic op-amp circuits

Assessment Strategies

- 19.1. Simulation (lab project)
- 19.2. Written Objective Test

Learning Objectives

- 19.a. Discuss basic operation of comparator circuits
- 19.b. Generalize basic operation of a summing a amplifier
- 19.c. Generalize the operation of Integrator and Differentiator circuits

Grading Information

100% - 90% A
89% - 80% B
79% - 70% C
69% - 60% D
59% - Below F

Online - Attendance

In an online course, you are not required to show-up in at a particular location and at a particular time. However, you are expected to show-up online.

This course is designed to be an active and interactive course in which you contribute and respond to the contributions of others. You should plan to log on and participate in the course at least 3-5 times each week. I will measure this by recording the date of each entry you make to the system--a response to an assignment, an entry into the threaded discussion, submission of an assignment, or participation in group work. (Though you are welcome to participate in the CyberCafe as frequently as you would like, this does not qualify as "attending and participating" in the course.)

Please do not "drop out" for a period of time and then expect to "drop back in." If your business/personal obligations or illness require you to be absent for a week, please contact me and arrange to make up the work you will miss. Since you can access this online course from anywhere in the world, there should be little likelihood "absence."

ADA Statement 1

I wish to fully include persons with disabilities in this course. Please let me know if you need any special accommodations in the curriculum, instruction, or assessments of this course to enable you to fully participate. I will maintain the confidentiality of the information you share with me.

Online - Communication

In a cyber community, you present yourself and learn about others through written words. You don't need to be a prize-winning author or poet to successfully communicate in an online community, however you do want to present yourself in a positive light and to communicate your thoughts and ideas effectively.

The following guidelines will help you ensure that you are properly understood, get your points across effectively, avoid getting anybody annoyed, and avoid looking like a "beginner" on the net.

1. Format your posting so that it is easy to read. Use short paragraphs separated by blank lines. Don't write everything in uppercase (capital) letters. It is more difficult to read and, even worse, in an online environment it means you are SHOUTING.
2. Be brief. Plan your messages ahead so that you don't ramble.
3. Be clear. Don't use abbreviations or acronyms that others may not understand. Read your messages over before sending them.
4. Check your spelling. People will not take you seriously, no matter how brilliant your ideas, if your writing is full of misspellings. Use your computer's Spell Check features; then read over what you have written to catch errors that Spell Check misses.

5. When you are interacting with others online, remember that things may "sound" harsh or less friendly when the reader cannot see your smile or the twinkle in your eye. Read your messages over to be sure they are diplomatic and polite.

Online - Learner Role and Responsibilities

You are an adult learner and as such you are responsible for your own learning. No one else can be a "stand in" for you in the learning process. You will be held accountable for all assigned activities. You matter and what you do does make a difference. You will have an opportunity to share your unique ideas and experiences with your student peers and instructor. The form and content of your participation will determine the level of achievement, satisfaction, and enjoyment that you experience. Because others are depending on you to keep the course moving, you have an obligation to meet deadlines for completing assignments and postings.

Online - Instructor Role and Responsibilities

As your instructor, I am responsible for providing an environment in which an opportunity for learning exists. I will work with you and assist you in your quest for understanding. I cannot make you learn anything. As a resource person and facilitator, I will organize the course, schedule learning activities, and evaluate the short-run "products" of your learning process. Recognizing that even asynchronous online communication is time sensitive, I will monitor threaded discussions and respond to queries within 48 hours of the time they were posted. Since the Writing and Thinking Skills and Individual Reflections are significant pieces of writing, it may take a little longer to assess them. I will be giving your work, as well as that of your fellow learners, careful consideration.