Western Technical College

10662157 Integrated Circuits Applications

Course Outcome Summary

Course Information

Description	This course will concentrate on the use of integrated circuits and their applications. The student will use operational amplifiers (op amps) to construct basic amplifiers, active filters, comparators, Schmitt triggers, integrators and differentiators. Special function ICs, such as instrumentation amplifiers and monolithic switching regulators will be used to construct typical circuits used in modern electronic equipment. The use of data and specification sheets, along with internet searches and electronic simulation software, will be emphasized throughout the course.
Career Cluster	Science, Technology, Engineering and Mathematics
Instructional Level	Associate Degree Courses
Total Credits	3

Textbooks

Electronic Principles - with CD. 8th Edition. Copyright 2016. Malvino, Albert Paul and David J. Bates. Publisher: McGraw-Hill Publishing Company. **ISBN-13**: 978-0-07-337388-1. Required.

Success Abilities

1. **Apply mathematical concepts.**
2. **Demonstrate ability to think critically.**
3. **Demonstrate ability to value self and work ethically with others in a diverse population.**
4. **Use effective communication skills.**
5. **Use technology effectively.**

Course Competencies

1. Verify the operation of first-order low-pass and high-pass active filters.

Learning Objectives

1.a. Construct low-pass and high-pass active filters using Multisim and actual circuit components.
1.b. Measure the output frequency response of first-order low-pass and high-pass filters.
1.c. Modify filter circuit components to meet design specifications.

2. Design second-order and higher-order op amp active filters.

Learning Objectives

2.a. Design higher-order active filters.
2.b. Construct higher-order active filters using Multisim and actual components.
2.c. Evaluate the circuit performance of higher-order active filters to meet given specifications.

3. Analyze the operation of active filters using electronics design software.

Learning Objectives

3.a. Construct active filter circuits using electronic design software.
3.b. Test active filter circuits using electronic design software.
3.c. Evaluate active filter circuit performance to specified performance levels.

4. Document the performance of an active filter circuit.

Learning Objectives

4.a. Write lab reports using an engineering notebook format.

5. Verify the operation of differential amplifiers.

Learning Objectives

5.a. Calculate the output voltage of a differential amplifier with given input voltages.
5.b. Construct a differential amplifer using Multisim and actual components.
5.c. Test a differential amplifier for proper operation.

6. Design a Wheatstone bridge differential amplifier circuit.

Learning Objectives

6.a. Design a Wheatstone bridge circuit used to measure an output temperature level.
6.b. Construct a Wheatstone bridge circuit using actual components.
6.c. Evaluate the Wheatstome bridge circuit for proper output voltage range.

7. Verify the operation of an instrumentation amplifier.

Learning Objectives

7.a. Construct an integrated circuit instrumentation amplifier circuit.
7.b. Test an instrumentation amplifier circuit for proper output voltage levels.
7.c. Combine a Wheatstone bridge circuit and an instrumentation amplier to operate as a temperature-to-voltage converter.

8. Design a wideband variable gain amplifier using electronic design software.

Learning Objectives

8.a. Design a wideband variable gain amplifier using design software.
8.b. Evaluate the output performance of an instrumentation amplifier using design software.

9. Verify the operation of basic op amp comparator circuits.

Learning Objectives

9.a. Design a basic op amp comparator.
9.b. Construct an open collector op amp comparator circuit.
9.c. Design an op amp window comparator.

10. Generate low-frequency linear and nonlinear waveforms with op amp circuits.

Learning Objectives

10.a. Evaluate the operation of low frequency RC oscillator circuits.
10.b. Modify critical RC components to set an oscillator frequency to a specified value.

11. Design integrator and differentiator op amp circuits using electronic design software.

Learning Objectives

11.a. Design an IC integrator circuit to meet stated specifiecations.
11.b. Design an IC differentiator circuit to meet stated specifications.
11.c. Evaluated the operation of integrator and differentiator circuits.

12. Design linear voltage regulator circuits with monolithic integrated circuits.

Learning Objectives

12.a. Design IC voltage regulator circuits to meet specified output voltage levels.
12.b. Construct IC voltage regulator circuits.
12.c. Evaluate the output voltage and current levels of IC voltage regulators.

13. Verify the operation of DC-to-DC converters.

Learning Objectives

13.a. Construct an unregulated DC-to-DC voltage regulator circuit.
13.b. Measure the output voltage levels of a DC-to-DC voltage regulator circuit.
13.c. Evaluate the operation of a DC-to-DC voltage regulator circuit.

14. Verify the operation of buck/boost switching voltage regulators.

Learning Objectives

14.a. Construct a buck/boost switching voltage regulator.
14.b. Measure the output voltage levels of a buck/boost switching voltage regulator.
14.c. Describe the circuit operatiion of a buck/boost switching voltage regulator.

15. Evaluate the circuit performance of industry built switching power supply circuits.

Learning Objectives

15.a. Measure the output voltage of an industrial switching power supply circuit.
15.b. Determine if a prebuild switching power supply meets listed specifications.