

**ELEC 54A Course Outline as of Summer 2019****CATALOG INFORMATION**

Dept and Nbr: ELEC 54A Title: DC AND AC THEORY

Full Title: Direct and Alternating Current Theory

Last Reviewed: 5/8/2023

Units	Course Hours per Week		Nbr of Weeks		Course Hours Total	
Maximum	3.00	Lecture Scheduled	2.00	17.5	Lecture Scheduled	35.00
Minimum	3.00	Lab Scheduled	3.00	8	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	5.00		Contact Total	87.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 70.00

Total Student Learning Hours: 157.50

Title 5 Category: AA Degree Applicable

Grading: Grade Only

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly:

**Catalog Description:**

Introduction to electronic components and underlying physics concepts, electrical units, direct current (DC), DC circuit analysis, batteries, magnetism, meters, alternating current (AC), capacitance, inductance, transformers, and AC circuit analysis.

**Prerequisites/Corequisites:**

Completion of ELEC 51A or

Completion of an algebra-based Math course (MATH 150B, MATH 150, MATH 151, OR MATH 154 or higher (MATH));

See Student Success &amp; Assessment Services for more information about the assessment process

**Recommended Preparation:**

Eligibility for ENGL 100 or ESL 100

**Limits on Enrollment:****Schedule of Classes Information:**

Description: Introduction to electronic components and underlying physics concepts, electrical units, direct current (DC), DC circuit analysis, batteries, magnetism, meters, alternating current (AC), capacitance, inductance, transformers, and AC circuit analysis. (Grade Only)

Prerequisites/Corequisites: Completion of ELEC 51A or  
 Completion of an algebra-based Math course (MATH 150B, MATH 150, MATH 151, OR  
 MATH 154 or higher (MATH));  
 See Student Success & Assessment Services for more information about the assessment process  
 Recommended: Eligibility for ENGL 100 or ESL 100  
 Limits on Enrollment:  
 Transfer Credit: CSU;  
 Repeatability: Two Repeats if Grade was D, F, NC, or NP

### **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

<b>AS Degree:</b>	<b>Area</b>	Effective:	Inactive:
<b>CSU GE:</b>	<b>Transfer Area</b>	Effective:	Inactive:
<b>IGETC:</b>	<b>Transfer Area</b>	Effective:	Inactive:
<b>CSU Transfer:</b>	Transferable	Effective: Fall 2016	Inactive:
<b>UC Transfer:</b>		Effective:	Inactive:

### **CID:**

### **Certificate/Major Applicable:**

Both Certificate and Major Applicable

### **COURSE CONTENT**

#### **Student Learning Outcomes:**

At the conclusion of this course, the student should be able to:

1. Identify and describe the characteristics of common electronic components.
2. Analyze and measure the characteristics of typical DC and AC circuits.
3. Use algebra and right angle trigonometry to solve electronic circuit calculations.

#### **Objectives:**

During this course students will:

1. Use algebraic functions, signed numbers and metric notations, make circuit calculations using Ohm's Law, Watt's Law and Kirchoff's Laws.
2. Use algebraic expressions and numerical representations to analyze and evaluate series, parallel, and series-parallel circuits.
3. Summarize the basic characteristics of magnetism.
4. Identify alternating current (AC) units.
5. Use signed numbers to calculate values in an AC resistive circuit.
6. Identify and describe the characteristics of capacitors, inductors and transformers using trigonometric functions.
7. Analyze and evaluate resistor-capacitor (RC), resistor-inductor (RL) and resistor-inductor-capacitor (RLC) circuits through the application of right angle trigonometry and geometry.

#### **Topics and Scope:**

- I. Atoms
  - A. Bohr model structure

- B. Quantum mechanical model structure
- II. Review of Elementary Algebra
- III. Basic Laws of Physics
  - A. Ohm's law
  - B. Watt's law
  - C. Kirchoff's laws
- IV. Direct Current (DC) Circuits
  - A. Digital volt meters
  - B. Series circuits
  - C. Parallel circuits
  - D. Series-parallel circuits
- V. Unloaded voltage dividers
- VI. Conductors and insulators
- VII. Control components
  - A. Switches
  - B. Fuses
  - C. Circuit breakers
- VIII. Resistors, Fixed and Variable
- IX. Batteries
- X. Magnetism
- XI. Right Angle Trigonometry
- XII. Alternating Current (AC)
  - A. Oscilloscope operation
  - B. Frequency
  - C. Sine wave values
- XIII. Capacitors and Capacitance
  - A. Resistor-capacitor (RC) time constant
  - B. Capacitive reactance
  - C. RC circuit impedance
    - 1. series
    - 2. parallel
    - 3. series-parallel
- XIV. Inductors and Inductance
  - A. Resistor-inductor (RL) time constant
  - B. Inductive reactance
  - C. RL circuit impedance
    - 1. series
    - 2. parallel
    - 3. series-parallel
- XV. Resistor, Inductor, Capacitor (RLC) Circuits
  - A. Series
  - B. Parallel
  - C. Admittance, conductance and susceptance
  - D. Transformers

All subjects are covered in both lecture and lab portions of the course.

#### LABORATORY MATERIAL

- I. Ohm's Law simple circuits
- II. Series Circuits - Kirchoff's Laws, Watt's Law, & Ohm's Law. Voltage dividers
- III. Parallel Circuits - Kirchoff's Laws, Watt's Law, & Ohm's Law. Current dividers
- IV. Complex Circuits - Kirchoff's Laws, Watt's Law, & Ohm's Law. Maximum Power

Transfer.

V. Basic oscilloscope and multimeter operation and measurements

VI. Resistor - Capacitor (RC) circuits, impedance measurements & calculations including RC time constant

VII. Resistor - Inductor (RL) circuits, impedance measurements & calculations

VIII. RLC circuits - impedance measurements & calculations

### Assignment:

#### Lecture-Related Assignments:

1. Textbook readings, 20 - 30 pages per week.

2. Homework assignments (10-15)

3. Lab reports (8-14)

4. Quizzes (4-8)

5. Final exam: objective examination including multiple choice, true/false, matching items, completion, and objective/essay questions

6. Lab skills test

#### Lab-Related Assignments:

1. Lab assignments (8-14)

### Methods of Evaluation/Basis of Grade:

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Lab reports

Writing  
20 - 30%

**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems, lab assignments

Problem solving  
30 - 40%

**Skill Demonstrations:** All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Lab skills test

Skill Demonstrations  
10 - 20%

**Exams:** All forms of formal testing, other than skill performance exams.

Quizzes and final exam

Exams  
30 - 40%

**Other:** Includes any assessment tools that do not logically fit into the above categories.

None

Other Category  
0 - 0%

**Representative Textbooks and Materials:**

Contemporary Electronics: Fundamentals, Devices, Circuits, and Systems. Frenzel, Louis.  
McGraw-Hill Education. 2013 (classic)