

Course Number and Title: ELC 125 Electrical Circuits I

Campus Location:

Georgetown, Dover, Stanton

Effective Date:

2021-52

Prerequisite:

SSC 100 or concurrent

Co-Requisites:

none

Course Credits and Hours:

4.00 credits

3.00 lecture hours/week

3.00 lab hours/week

Course Description:

This course introduces applied electronic circuit analysis with the study of fundamentals, including Ohm's law, Watt's law, and Kirchhoff's laws. Topics include measuring instruments, oscilloscope, switches, circuit breakers, resistance, capacitance, inductance, series, parallel, and series-parallel circuits, transformers, alternating and direct power sources, and magnetism.

Required Text(s):

Obtain current textbook information by viewing the [campus bookstore - https://www.dtcc.edu/bookstores](https://www.dtcc.edu/bookstores) online or visit a campus bookstore. Check your course schedule for the course number and section.

Additional Materials:

Electronics Parts Kit, Digital Multimeter, TI-84+ or TI-89 Calculator.

Schedule Type:

Classroom Course

Disclaimer:

None

Core Course Performance Objectives (CCPOs):

1. Explain the fundamental elements of electric circuits. (CCC 1, 2, 5; PGC 1, 2, 3)
2. Assess direct current series circuits. (CCC 2, 6; PGC 1, 2, 3, 4)
3. Assess direct current parallel circuits. (CCC 2, 6; PGC 1, 2, 3, 4)
4. Assess direct current series-parallel circuits. (CCC 2, 6; PGC 1, 2, 3, 4)
5. Explain the principles of magnetism, electromagnetism, and alternating current. (CCC 1, 2, 5, 6; PGC 1, 2, 3)
6. Assess simple circuits containing resistors and capacitors. (CCC 2, 6; PGC 1, 2, 3, 4)
7. Assess simple circuits containing resistors and inductors. (CCC 2, 6; PGC 1, 2, 3, 4)
8. Assess series circuits with resistors, inductors, and capacitors. (CCC 2, 6; PGC 1, 2, 3, 4)
9. Describe the principles and operating characteristics of transformers. (CCC 1, 2, 5; PGC 1, 2, 3)
10. Follow procedural directions in laboratory assignments and reporting. (CCC 1, 2, 5; PGC 1, 6)

See Core Curriculum Competencies and Program Graduate Competencies at the end of the syllabus. CCPOs are linked to every competency they develop.

Measurable Performance Objectives (MPOs):

Upon completion of this course, the student will:

1. Explain the fundamental elements of electric circuits.
 1. Use powers of ten and engineering notation.
 2. Describe the basic structure of atoms.
 3. Explain the concept of electrical charge.
 4. Define *voltage*, *current*, and *resistance*, and discuss their characteristics.
 5. Describe the electrical characteristics of resistors.
 6. Translate a resistor value from the color code.
 7. Identify and explain the different types of resistors.
 8. Explain Ohm's Law and describe its function.
 9. Define *energy* and *power*.
2. Assess direct current series circuits.
 1. Identify a series circuit.
 2. Compute the total resistance of resistors in a series configuration.
 3. Solve series direct current (DC) linear circuits in terms of voltage, resistance, current, and power.
 4. Apply Kirchoff's Voltage Law in a series circuit.
 5. Use the voltage divider formula to calculate voltages in a series circuit.

6. Assemble and collect current and voltage data in series circuits using acceptable industry standards.
7. Assemble and collect current and voltage data in series circuits using circuit analysis software simulation tools.
3. Assess direct current parallel circuits.
 1. Identify a parallel circuit.
 2. Compute the total resistance of resistors in a parallel configuration.
 3. Solve parallel DC linear circuits in terms of voltage, resistance, current, and power.
 4. Apply Kirchoff's Current Law in a parallel circuit.
 5. Use the current divider rule to calculate current in a parallel circuit.
 6. Assemble and collect current and voltage data in parallel circuits using acceptable industry standards.
 7. Assemble and collect current and voltage data in parallel circuits using circuit analysis software simulation tools.
4. Assess direct current series-parallel circuits.
 1. Identify series-parallel circuits.
 2. Compute the total resistance of resistors in a series-parallel configuration.
 3. Solve a series-parallel DC linear circuit in terms of voltage, resistance, current, and power.
 4. Identify differences between series, parallel, and series-parallel circuits.
 5. Solve a ladder network in terms of current, voltage, resistance, and power.
 6. Solve a balanced and unbalanced Wheatstone bridge circuit in terms of current, voltage, resistance, and power.
 7. Identify short and open circuits.
 8. Apply Thevenin's theorem to simplify a circuit for analysis.
 9. Apply the maximum power transfer theorem to determine when the maximum power is transferred from a given circuit.
 10. Assemble and collect current and voltage data in series-parallel circuits using acceptable industry standards.
 11. Assemble and collect current and voltage data in series-parallel circuits using circuit analysis software simulation tools.
5. Explain the principles of magnetism, electromagnetism, and alternating current.
 1. Define and explain magnetism and electromagnetism.
 2. Interpret a sine wave based on frequency, and write equations for sine waves, both shifted and not, with respect to time.
 3. Compute the peak voltage, peak to peak voltage, root-mean-square (rms) voltage, and average value of a sine wave.
 4. Use a graph, multi-meter, and/or oscilloscope to read alternating voltage values.
6. Assess simple circuits containing resistors and capacitors.
 1. Explain the factors determining capacitance.
 2. Describe the characteristics of the basic types of capacitors.
 3. Translate a capacitor's value based on the coding labeled on the device.
 4. Describe fields, energy, storage, and transient behavior in capacitive DC circuits.
 5. Compute total capacitance of capacitors in a series, parallel, or series-parallel configuration.
 6. Compute currents and voltages in DC switching circuits containing resistors and capacitors.
 7. Compute capacitive reactance, currents, and voltages in alternating current (AC) series circuits containing resistors and capacitors.
 8. Compute capacitive reactance, currents, and voltages in AC parallel circuits containing resistors and capacitors.
 9. Compute phase shift in AC circuits containing resistors and capacitors.
 10. Assemble and collect current and voltage data in circuits containing resistors and capacitors using acceptable industry standards.
 11. Assemble and collect current and voltage data in circuits containing resistors and capacitors using circuit analysis software simulation tools.
7. Assess simple circuits containing resistors and inductors.
 1. Explain the factors determining inductance.
 2. Describe fields, energy, storage, and transient behavior in inductive DC circuits.
 3. Compute total inductance of inductors in a series, parallel, or series-parallel configuration.
 4. Compute currents and voltages in DC switching circuits containing resistors and inductors.
 5. Compute inductive reactance, currents, and voltages in AC series circuits containing resistors and inductors.
 6. Compute inductive reactance, currents, and voltages in AC parallel circuits containing resistors and inductors.
 7. Compute phase shift in AC circuits containing resistors and inductors.
 8. Assemble and collect current and voltage data in circuits containing resistors and inductors using acceptable industry standards.
 9. Assemble and collect current and voltage data in circuits containing resistors and inductors using circuit analysis software simulation tools.
8. Assess series circuits with resistors, inductors, and capacitors.
 1. Compute total reactance, impedance, and phase angle of a series resistive-inductive-capacitive (RLC) circuit.
 2. Compute component currents and voltages in a series RLC circuit.
 3. Solve resonant frequency of a series RLC circuit.
 4. Solve currents, voltages, and impedance at resonant frequency of a series RLC circuit.
 5. Assemble and collect current and voltage data in circuits containing resistors, inductors, and capacitors using acceptable industry standards.
 6. Assemble and collect current and voltage data in circuits containing resistors, inductors, and capacitors using circuit analysis software simulation tools.
9. Describe the principles and operating characteristics of transformers.
 1. Define various types of transformers.
 2. Predict, given the turns ratio or the winding values, the voltage and current to a load from a given input to a transformer.
 3. Compute turns ratio using the input and output voltage of a transformer.
10. Follow procedural directions in laboratory assignments and reporting.
 1. Use instructional material of the laboratory to assemble the circuits as designed in the experiment.
 2. Demonstrate the proper use of all tools and equipment required in the work environment.
 3. Compute the outcomes for each component.
 4. Collect data for each of the components of the circuit.
 5. Appraise, both orally and written, the comparisons and discrepancies of one or more laboratory assignments.
 6. Write laboratory reports using Microsoft Word or similar word processing software to describe the process and conclusions.
 7. Use Microsoft Word, Microsoft Excel or similar software to produce data tables.

Evaluation Criteria/Policies:

The grade will be determined using the Delaware Tech grading system:

90	-	100	=	A
80	-	89	=	B
70	-	79	=	C
0	-	69	=	F

Students should refer to the [Student Handbook - https://www.dtcc.edu/handbook](https://www.dtcc.edu/handbook) for information on the Academic Standing Policy, the Academic Integrity Policy, Student Rights and Responsibilities, and other policies relevant to their academic progress.

Final Course Grade:

Calculated using the following weighted average

Evaluation Measure	Percentage of final grade
Summative: 3-4 Exams (equally weighted)	50%
Summative: 10-15 Laboratory Experiments (equally weighted)	30%
Formative: Homework/ Quizzes (equally weighted)	10%
Formative: Quizzes (equally weighted)	10%
TOTAL	100%

Core Curriculum Competencies (CCCs are the competencies every graduate will develop):

1. Apply clear and effective communication skills.
2. Use critical thinking to solve problems.
3. Collaborate to achieve a common goal.
4. Demonstrate professional and ethical conduct.
5. Use information literacy for effective vocational and/or academic research.
6. Apply quantitative reasoning and/or scientific inquiry to solve practical problems.

Program Graduate Competencies (PGCs are the competencies every graduate will develop specific to his or her major):

1. Perform the duties of an entry-level technician using the skills, modern tools, theory, and techniques of the electronics engineering technology.
2. Apply a knowledge of mathematics, science, engineering, and technology to electronics engineering technology problems that require limited application of principles but extensive practical knowledge.
3. Conduct, analyze, and interpret experiments using analysis tools and troubleshooting methods.
4. Identify, analyze and solve narrowly defined electronics engineering technology problems.
5. Explain the importance of engaging in self-directed continuing professional development.
6. Demonstrate basic management, organizational, and leadership skills which commit to quality, timeliness and continuous improvement.

Disabilities Support Statement:

The College is committed to providing reasonable accommodations for students with disabilities. Students are encouraged to schedule an appointment with the campus Disabilities Support Counselor to request an accommodation needed due to a disability. A listing of campus Disabilities Support Counselors and contact information can be found at the [disabilities services - https://www.dtcc.edu/disabilitysupport](https://www.dtcc.edu/disabilitysupport) web page or visit the campus Advising Center.