

TITLE: LATI ON-LINE ELECTRONICS FOR HIGH SCHOOL STUDENTS

COURSE TITLE: CT00121 –DC Circuits- .5 CREDIT HOUR

TIME: TBD through cooperation with the Corona Learning Center

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Mission Statement

Lake Area Technical Institute offers superior, comprehensive technical education, creating a foundation for success in an every-changing world.

Vision Statement

Lake Area Technical Institute will be the leader in technical education working in partnership with business and industry and all levels of education. Lake Area Tech staff will integrate the latest technology and methods of delivering quality education to meet merging global workforce demands. Lake Area Tech will continue to develop marketing strategies to promote technical education and will maintain excellence in all programs.

COURSE DESCRIPTION:

This is a hands-on (the student uses laboratory equipment) entry-level course that provides an understanding of direct current electricity. The student will be exposed to electrical quantities and measurement systems. Students will also be exposed to schematic and pictorial diagrams, component familiarization, wiring and soldering techniques, and the use of the multimeter.

Topics Covered – The following topics will be covered:

1. Introduction to Electricity
2. Magnetism
3. Using the Multimeter
4. Basic DC Circuits
5. Wiring and Connectors
6. The Complex DC Circuit
7. Circuit Construction

Laboratory Exercises– each student will perform the following labs:

1. Equipment Familiarization
2. Resistors
3. Multimeter Use
4. Ohms Law
5. Series Circuit
6. Series Circuit Troubleshooting
7. Parallel Circuit
8. Parallel Circuit Troubleshooting
9. Series/Parallel Circuit Troubleshooting

10. Voltage Dividers
11. Meter Loading
12. The Balanced Bridge

PROGRAM OF STUDY:

This is the first of four-courses offered by CATE. The courses in this series are DC Circuits, AC Circuits, Analog Circuits and Digital Circuits.

COURSE LENGTH:

All CATE courses are self paced; however, students enrolled in AC Circuits should be able to complete the coursework meeting one hour per day for one standard semester.

COURSE PREREQUISITES:

This course requires skills in Algebra. It is recommended that the student has passed Algebra I with a C or above prior to enrolling in this course.

Basic foundation skills in the areas of reading, writing, speaking, listening, problem solving, and reasoning are also important.

Responsibility, self-discipline and integrity are vital.

COURSE POLICIES:

1. This is an on-line course, taught primarily using Computer Aided Instruction (CAI), which has been developed by the NIDA Corporation. It also provides exposure to interactive video, hands-on circuit construction, field trips, and regional competition.
2. Students are expected to complete each lesson in the NIDA curriculum. It is required that all students take each of the Block Tests and the Final Test. Lessons must be completed with a minimum score of 70%. All students will complete the pre- and post-tests.
3. Students will work independently; however, they may work in pairs on projects and on the CATE competition.
4. Student evaluation is based on average lesson scores, average Block Tests, the Final Test, pre- and post-test differences, and teacher discretion.
5. **Any form of dishonesty is unacceptable. There is no excuse for cheating and any student caught doing so may be expelled from the course.**

See attached sheets for Integrated Course Goals – Both Technical and Academic

Integrated Course Goals – Technical Skills

Students will demonstrate:

- 1) Technical Literacy skills, which include written and oral communication, reading and comprehension skills and proficiency in numerical relations. **Indicator A**
- 2) Good safety practices, soldering, bread boarding, data analysis, troubleshooting and component recognition. **Indicator B**
- 3) Appropriate use of the analog and the digital multimeter in taking electrical measurements. **Indicator C**
- 4) The ability to mathematically analyze simple and complex DC Circuits.
- 5) The ability to troubleshoot failures in electronic circuitry, connectors, and cables.
- 6) The ability to construct an electronic kit.

Integrated Course Goals – Academic skills

By completing this course students will demonstrate ability in the following academic skills

Listening and Viewing –

- 1) Standard 10.L.1.2: Students are able to summarize what has been presented for clarification and understanding. (Example – instruction interpretation)
- 2) Standard 9.L.2.1: Students are able to evaluate evidence in informational text. (Example – instrument interpretation to ascertain nature of circuit failure).
- 3) Standard 9.L.2.2: Students are able to use note-taking techniques to record, synthesize, and retrieve information. (Example – student designs and builds a data table using test instruments in order to configure a hypothesis relating to circuit failure).

Reading –

- 1) *Standard 11.R.1.1: Students are able to use various reading and study strategies to increase comprehension. (Example – student reads technical manual to understand best method for approaching circuit failure).*

Nature of Science –

- 1) Standard 9-12.N.1.1: Students are able to evaluate a scientific discovery to determine and describe how societal, cultural, and personal beliefs influence scientific investigation and interpretation. (Example – student examines information about electrical discoveries and their positive and negative impacts on our society).
- 2) Standard 9-12.N.1.2: Students are able to describe the role of observation and evidence in the development and modification of hypotheses, theories, and laws. (Example – student examines malfunctioning electronic system, forms a hypothesis concerning the fault and proposes a solution to the problem – she/he builds a scientific argument).

- 3) Standard 9-12.N.2.1: Students are able to apply science process skills to design and conduct student investigation. (Example – student examines circuit information, formulates a hypothesis and then, using test equipment, tests accuracy of the hypothesis, revising and modifying the hypothesis as necessary, eventually formalizing a circuit solution).
- 4) Standard 9-12.N.2.2: Students are able to practice safe and effective laboratory techniques. (Example—student utilize test circuits and test equipment according to appropriate lab standards).

Physical Science –

- 1) Standard 9-12.P.1.2: Students are able to describe ways that atoms combine. (Example – students describe the nature of electron flow in a resistor)
- 2) Standard 9-12.P.2.3: Students are able to relate concepts of course, distance, and time to their quantitative relationships or work, energy, and power. (Example – student describes how voltage, electromotive force, relates to electron flow, current, to create power, watts, to do work).
- 3) Standard 9-12.P.3.1: Students are able to describe the relationships among potential energy, kinetic energy, and work as applied to the Law of Conservation of Energy. (Example – student describes how voltage, and current produce power, which is translated fully into heat in a resistor).
- 4) Standard 9-12.P.3.3: Students are able to describe electrical effects in terms of motion and concentrations of charged particles. (Example – student describes how voltage created current flow in a resistive material).

Math Algebra –

- 1) Standard 9-12.A.1.1: Students are able to write equivalent forms of algebraic expressions using properties of the set of real numbers.(Example – student converts the Ohm’s Law equation for voltage into the Ohm’s Law equation for current, or the Watt’s Law equation for voltage into the equation for power).
- 2) Standard 9-12.A.2.1: Students are able to use algebraic properties to solve multi step, single variable, first-degree equation. (Example – student will solve for the equivalent resistance of a parallel DC circuit).
- 3) Standard 9-12.A.3.1: Students are able to create linear models to represent problem situation. Use algebraic properties to solve multi step, single variable, first degree equations. (Example – student will draw a graph of current as a function of voltage)

Math Geometry –

- 1) Standard 9-12.G.2.1: Students are able to recognize the relationship between a 3-D figure and its 2-D representation. (Example – student will convert a schematic drawing of a simple electrical circuit to a physical circuit).
- 2) Standard 9-12.G.2.3: Students are able to use proportions to solve problems. (Example – student will use the voltage divider rule to estimate series circuit voltage drops relating voltage value to resistance size)

Math Measurement –

- 1) Standard 9-12.G.2.1: Students are able to choose appropriate unit label, scales and precision. (Example – after Ohm’s Law to compute current, the student will select the appropriate unit, milli amps, micro amps, or amps).

Math Number Sense –

- 1) Standard 9-12.N.1.1: Students are able to identify multiple representations of a real number. (Example—students will recognize that 210 micro amps equal .210ma, students will recognize that 746 volts-amperes is equivalent to one horse power in a resistive circuit).
- 2) Standard 9-12.N.3.1: Students are able to apply the concept of place value, magnitude, and relative magnitude or real number. (Example – students will apply scientific notation in solving electronic circuits).
- 3) Standard 9-12.N.3.1: Students are able to use estimation strategies in problem solving situation to predict results and to check the reasonableness of results. (Example – students will estimate total equivalent resistance in a series and in a parallel circuit and then test their estimates using measurement techniques).