

**Career-Technical Credit Transfer (CT)<sup>2</sup>  
Electrical Engineering Technology Career-Technical Assurance Guide (CTAG)  
June 22, 2015**

The following courses, indicated by a Career-Technical Articulation Number (CTAN), are eligible for post-secondary credit and transfer among Ohio's public secondary career-technical institutions and state institutions of higher education. The SCTAI alignment document with ODE competencies and post-secondary learning outcomes are available on the ODHE website at <https://www.ohiohighered.org/sctai/ctags>.

CTEET001 - DC Circuits / OAN - OET001	Credits: 3 Semester Hours
<p><b>Advising Notes:</b></p> <ul style="list-style-type: none"> <li>• Students must matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program or within currency of certificate</li> <li>• Students must successfully complete the <b>ODE course [DC and AC Electronic Circuits (175011)]</b> with a "C" or better and receive a <b>qualifying cut score of 61 or higher</b> on the End-of-Course examination <b>OR ODE course [Engineering Principles (175002)]</b> with an End of Course qualifying score of 48 or higher, and in some cases, <b>[Robotics<sup>1</sup> (175004)]</b> with an End-of-Course <b>qualifying cut score of 64 or higher</b> from an approved high school program</li> <li>• Students must include proof of laboratory component with their submission</li> <li>• Students must complete the <b>pre-requisite requirement for College Algebra</b> at the matriculating institution <ul style="list-style-type: none"> <li>○ Students will not receive post-secondary credit for DC Circuits until this pre-requisite is satisfied</li> </ul> </li> </ul> <p>In order to access college credit for this CTAN, <b>adult career-technical students</b> from Ohio Technical Centers must:</p> <ul style="list-style-type: none"> <li>• Successfully complete an approved Electronics (CT)<sup>2</sup> program at an Ohio Technical Center</li> <li>• Complete the <b>pre-requisite requirement for College Algebra</b> at the matriculating institution <ul style="list-style-type: none"> <li>○ Students will not receive credit for DC Circuits until this pre-requisite is satisfied</li> </ul> </li> </ul> <p><b>For CTAG credit, please consult the <a href="#">CTAG Rubric</a> for DC Circuits developed by the OETEA. This document will help both instructors and students understand the level to which the CTAG learning outcomes should be taught and understood.</b></p>	<p><b>CERTIFICATE OF AFFIRMATION FORM</b> required for course submission through CEMS. <a href="https://www.ohiohighered.org/transfer/ct2/affirmation">https://www.ohiohighered.org/transfer/ct2/affirmation</a></p>

<b>CTEET002 - Digital Electronics / OAN - OET002</b>	<b>Credits: 4 Semester Hours</b>
<p><b>Advising Notes:</b> Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program</p> <ul style="list-style-type: none"> <li>• Students must successfully complete the <b>ODE course [Digital Electronics (175007)]</b> with a “C” or better and receive a <b>score of 56 or higher</b> on the End-of-Course examination</li> <li>• Students must include proof of laboratory component with their submission</li> </ul> <p><b>For CTAG credit, please consult the <a href="#">CTAG Rubric</a> for Digital Electronics developed by the OETEA. This document will help both instructors and students understand the level to which the CTAG learning outcomes should be taught and understood.</b></p>	<p><b>CERTIFICATE OF AFFIRMATION FORM</b> required for course submission through CEMS.  <a href="https://www.ohiohighered.org/transfer/ct2/affirmation">https://www.ohiohighered.org/transfer/ct2/affirmation</a></p>
<b>CTEET003 - Programmable Logic Controls</b>	<b>Credits: 3 Semester Hours</b>
<p><b>Advising Notes :</b> In order to access post-secondary college credit for this CTAN, <b>secondary students</b> must:</p> <ul style="list-style-type: none"> <li>• Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program</li> <li>• Successfully complete <b>ODE Course [Robotics (175004)]</b> with a “C” or better and receive a <b>qualifying cut score of 64 or higher</b> on the End-of-Course examination</li> <li>• Submitted course work must include proof of laboratory component</li> </ul> <p>In order to access college credit for this CTAN, <b>adult career-technical students</b> from Ohio Technical Centers must fulfill the following conditions:</p> <ul style="list-style-type: none"> <li>• Successfully complete an approved (CT)<sup>2</sup> program at an Ohio Technical Center</li> </ul> <p><b>For CTAG credit, please consult the <a href="#">CTAG Rubric</a> for Programmable Logic Controls developed by the OETEA. This document will help both instructors and students understand the level to which the CTAG learning outcomes should be taught and understood.</b></p>	<p><b>CERTIFICATE OF AFFIRMATION FORM</b> required for course submission through CEMS.  <a href="https://www.ohiohighered.org/transfer/ct2/affirmation">https://www.ohiohighered.org/transfer/ct2/affirmation</a></p>

Each CTAN identifies the learning outcomes equivalent or common to those taught in introductory technical courses. To receive credit under these agreements, the career-technical programs and the state institutions of higher education must document that their course content matches the learning outcomes in the CTANs.

## Requirements and Credit Conditions:

1. If a program selects Robotics (ODE Course 175004) for Programmable Logic Controls, a different course must be selected for DC Circuits; optimal alignment is to DC and AC Electronic Circuits (ODE Course 175011) or Engineering Principles (ODE course 175002). A program will not be approved for, nor will a receiving institution award credit for both the DC Circuits and Programmable Logic Controls CTANs if a secondary program completes only the ODE course in Robotics (ODE Course 175004).
2. If Robotics (ODE Course 175004) is utilized to satisfy the CTEET001 DC Circuits course, programs should reference the alignment document and be sure to include competency 2.4.1 "Identify resistor values from color codes or other marks"; 2.4.2 "Compare and contrast resistor compositions and their uses"; 2.4.3 Identify symbols for electronic components; 2.2.5. "Identify types of capacitors and common usages for each"; and 2.2.7. "Identify the function of inductors and capacitors in series and parallel circuits."

### General Notes and Student Guidance:

3. The receiving institution must have a comparable program, major, or courses for the CTANs listed in this document. [Approved programs can be found here.](#)
4. Credits apply to courses in the specified technical area at Ohio's public institutions of higher education, if the institution offers courses in the specific technical area. In the absence of an equivalent course, and when the institution offers the technical program, the receiving institution will guarantee to grant and apply an equivalent credit value of the Career-Technical Articulation Number (CTAN) toward the technical requirements of the specific degree/certificate program.
5. A career-technical student seeking credit under the terms of this CTAG must enroll in the college and submit the verification form within three years of completing a career-technical education course or within the currency of the industry certificate or license.
6. A career-technical student who meets all eligibility criteria will receive the credit hour value for the equivalent course(s) as offered at the receiving state institution of higher education.
7. The admission requirements of individual institutions and/or programs are unaffected by the implementation of (CT)<sup>2</sup> outcomes.
8. The transfer of credit through this CTAG will not exempt a student from the residency requirements at the receiving institution.

**General Course Description:** The course covers the analysis of networks with resistive loads, the transient response to capacitive and inductive networks, and an introduction to instruments. Laboratory activity will include verification of circuit analysis methods by circuit construction and electrical measurement. Lab report writing is emphasized.

**Credits: 3 Semester Hours**

**Learning Outcomes:**

1. \* Electrical components and quantities
2. \* Definitions of voltage, current, electrical resistance and power
3. \* Ohm's Law, electrical energy and power, Kirchhoff's Laws
4. \* Series circuit analysis
5. \* Parallel circuit analysis
6. \* Series-parallel circuit analysis
7. \* Circuit theorems (such as superposition, Thevenin's and Norton's theorems)
8. \* Mesh and/or nodal analysis techniques
9. \* Properties of capacitors and their behavior under DC conditions
10. \* Properties of inductors and their behavior under DC conditions

***\*Asterisk Indicates Essential Learning Outcomes***

**General Course Description:** Introduces students to computer based number systems, symbolic logic concepts, Boolean Algebra, logic devices, and basic logic circuits. Logic circuits are analyzed using truth tables and timing diagrams. Laboratory work will demonstrate and verify the principles studied in the classroom.

**Credits: 4 Semester Hours**

**Learning Outcomes:**

1. \* Number Systems, operations and codes
2. \* Logic Gates
3. \* Boolean algebra
4. \* DeMorgan's theorem and logic simplification
5. \* Combination logic circuits
6. \* Encoders / decoders
7. \* Multiplexers / demultiplexers
8. \* Adders, subtractors, and ALUs
9. \* Flip-flops and related devices
10. \* Counters
11. \* Shift registers
12. \* Memory and storage
13. \* Integrated circuit technologies
14. VHDL Topics
15. Introduction to microprocessors, computers and buses
16. Introduction to digital signal processing
17. Digital communications and transmission standards

***\*Asterisk Indicates Essential Learning Outcomes***

**General Course Description:** Introduces the field of programmable logic controllers (PLC). The student will use relay logic and ladder diagrams to control circuits with programmable controllers. The special aspects of the PLC, such as sequencers and timers, will also be utilized.

**Credits: 3 Semester Hours****Learning Outcomes:**

1. \* Recall the history of control systems and PLCs
2. \* Explain and describe the use of number systems
3. \* Demonstrate use of ladder logic programming devices
4. \* Employ ladder logic use in control circuit design
5. \* Use addressing to control I/O modules
6. \* Demonstrate the use of relays, contacts, coils, and timers
7. \* Demonstrate counters and sequencers
8. \* Demonstrate fundamental PLC programming (e.g. comparators, block transfers, I/O forcing)
9. \* Demonstrate data transfer in PLC networks

***\*Asterisk Indicates Essential Learning Outcomes***

**Electrical Engineering Technology Panel Participants  
Spring 2014**

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