

**Career-Technical Credit Transfer (CT)<sup>2</sup>  
Electrical Engineering Technology Career-Technical Assurance Guide (CTAG)  
July 15, 2015**

Secondary Submission Requirements:  
Full Review By Faculty Panel  
Student Demonstration:  
[Verification Form](#)

The following program(s)/course(s), indicated by a Career-Technical Articulation Number (CTAN), are eligible for transfer among (CT)<sup>2</sup> approved secondary programs/courses and state institutions of higher education.

<b>CTEET001 DC Circuits (Shared OAN Course OET001)</b>	<b>Credits: 3 Semester Hours</b>
<p><b>Advising Notes:</b> 1) Rubrics are available to help instructors and students understand the level to which the CTAG learning outcomes should be taught and understood, <a href="#">click here</a>. Alignment documents are available to assist secondary institutions with course selection, <a href="#">click here</a>. 2) Submitted course work or content must include proof of laboratory component.</p> <p>In order to access college credit for this CTAN, <b>secondary students</b> must fulfill the following conditions:</p> <ol style="list-style-type: none"> <li>1. Successfully complete DC and AC Electronic Circuits (ODE Course 175011) or Engineering Principles (ODE course 175002), and in some cases, Robotics<sup>i</sup> (ODE Course 175004) from an <a href="#">approved high school program</a>.</li> <li>2. Complete the requirement for Algebra at the matriculating institution. Students from (CT)<sup>2</sup> approved institutions may not receive credit for DC Circuits until this pre-requisite/or co-requisite is satisfied.</li> </ol> <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> <ol style="list-style-type: none"> <li>1. Successfully complete an <a href="#">approved</a> Electronics (CT)<sup>2</sup> program at an Ohio Technical Center.</li> <li>2. Complete the requirement for Algebra at the matriculating institution. Students from (CT)<sup>2</sup> approved institutions may not receive credit for DC Circuits until this pre-requisite is satisfied.</li> </ol>	<p>Secondary Submission requires a full review until the end-of-course exam has been endorsed by post-secondary faculty.</p>
<b>CTEET002 Digital Electronics (Shared OAN Course OET002)</b>	<b>Credits: 4 Semester Hours</b>
<p><b>Advising Notes:</b> 1) Rubrics are available to help instructors and students understand the level to which the CTAG learning outcomes should be taught and understood, <a href="#">click here</a>. Alignment documents are available to assist secondary institutions with course selection, <a href="#">click here</a>. 2) Submitted course work or content must include proof of laboratory component.</p> <p>In order to access college credit for this CTAN, <b>secondary students</b> must fulfill the following condition:</p> <ol style="list-style-type: none"> <li>1. Successfully complete Digital Electronics (ODE Course 175007) from an <a href="#">approved high school program</a>. See Requirements and Credit Conditions for details.</li> </ol>	<p>Secondary Submission requires a full review until the end-of-course exam has been endorsed by post-secondary faculty.</p>

CTEET003 Programmable Logic Controls	Credits: 3 Semester Hours
<p><b>Advising Notes:</b> 1) For CTAG credit, please consult the CTAG Rubric 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. 2) Submitted course work must include proof of laboratory component</p> <p>In order to access college credit for this CTAN, <b>secondary students</b> must fulfill the following condition:</p> <ol style="list-style-type: none"> <li>1. Successfully complete Robotics (ODE Course 175004) from an approved secondary career-technical institution. See Requirements and Credit Conditions for details.</li> </ol> <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> <ol style="list-style-type: none"> <li>1. Successfully complete an <a href="#">approved</a> (CT)<sup>2</sup> program at an Ohio Technical Center.</li> </ol>	<p>Secondary Submission requires a full review until the end-of-course exam has been endorsed by post-secondary faculty.</p>

Each CTAN identifies the learning outcomes that are equivalent or common in introductory technical courses. In order for students to be able to receive credit under these agreements, the career-technical programs and the state institutions of higher education must document that their course/program content matches the learning outcomes in the CTANs. In accordance with Ohio Revised Code 3333.162, industry standards and certifications provide documentation of student learning. Recognized industry standards are expectations established by business, industry, state agencies, or professional associations. These standards define training program curricular requirements, establish certification or licensure criteria, and often serve as the basis for program accreditation. Where there are not recognized industry standards that define curriculum, statewide faculty panels define the curricular requirements, then seek input and consensus from public institutions of higher education statewide.

## Requirements and Credit Conditions:

### *Notes for Programs Submitting from Secondary Career Technical High Schools/Districts/Compacts:*

- I. 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).
- II. 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."
- III. Only ODE courses coded as VT and taught between 120-280 hours will qualify for CTAN approval. While Engineering Principles (ODE course 175002) is offered as a first pathway (VM) course, the VM model is not acceptable for submission or eligible for award of credit.
- IV. Secondary programs submitting for Programmable Logic Controls, should carefully consider their capacity to offer the content and consult the [rubrics](#) for guidance on intended outcomes.

### *General Notes and Student Guidance:*

- V. Public/State-assisted institutions seeking participation in these statewide articulations, must document course equivalency (how learning outcomes are met and measured). Review will be conducted by the Electrical Engineering Technology CTAG and TAG Faculty Review Panels. All submissions for approval must be submitted electronically through the Course Equivalency Management System (CEMS).
- VI. The receiving institution must have a comparable program, major, or courses that have been approved through submission to the Ohio Department of Higher Education (CT)<sup>2</sup> approval process for the CTANs listed in this document. [Approved programs can be found here.](#)
- VII. Credits apply to courses in the specified technical area at Ohio's public/state-assisted institutions of higher education, provided that 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.
- VIII. The applicant must request the sending institution send a verification form to the receiving institution, which certifies completed course(s) or program(s) that has been approved through the (CT)<sup>2</sup> approval process and that the applicant has received an appropriate passing grade in the course(s)/program(s).
- IX. A career-technical student seeking credit under the terms of this CTAG must apply and be accepted to the college within three years of completing a career-technical education program/course or within the currency of the industry certificate or license.
- X. 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.
- XI. The admission requirements of individual institutions and/or programs are unaffected by the implementation of (CT)<sup>2</sup> outcomes.
- XII. The transfer of credit through this CTAG will not exempt a student from the residency requirements at the receiving institution.

**CTEET001 DC Circuits (Shared OAN Course OET001)**

**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***

**CTEET002 Digital Electronics (Shared OAN Course OET002)**

**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***

## **CTEET003 Programmable Logic Controls (PLC)**

**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***

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Spring 2014**

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