Career Technical Credit Transfer (CT²)
Electrical Engineering Technology Career Technical Assurance Guide (CTAG)
April 28, 2008

The following courses or Career-Technical Assurance Numbers (CTANs) are eligible for transfer between career-technical education, adult workforce education, and post-secondary education.

CTEET001 – DC Circuits	**3 Semester/4 Quarter Hours**
Advising Notes: Prerequisite: College Algebra. Career-technical students from CT² approved institutions would not receive credit or credit hour value for DC Circuits until he/she has completed the requirement for College Algebra at the matriculating institution.	
CTEET002 – Digital Electronics	**4 Semester/6 Quarter Hours**
Advising Notes: Prerequisites: None. Submitted course work must include proof of laboratory component.	
CTEET003 – Programmable Logic Controls (PLC)	**3 Semester/4 Quarter Hours**
Advising Notes: Prerequisites: None. Submitted course work must include proof of laboratory component.	
Note: Hours assigned to CTANs are "relative values," which are used to help determine the equivalency of submitted coursework or content. Once approved by a validation panel as a CT² course, students will be given what the receiving institution is offering as credit for its approved course.	

The CTAG illustrates the learning outcomes that are equivalent or common in introductory technical courses. These courses and their associated learning outcomes were adapted from the Electrical Engineering Transfer Assurance Guides (TAGs) and the Technical Competency Profile (TCP) for Engineering Technologies, and have been amended to satisfy the CT² transfer initiative mandated by H.B. 66. In some cases, completers must also hold certain licenses and/or credentials or have satisfied specific external validators. Pertinent to H. B. 66 legislation, industry standards and certifications provide documentation of student learning. Recognized industry standards are expectations established by business, industry, state agencies, or professional associations that defines training program curricular requirements, establishes certification or licensure criteria, and often serves as the basis for program accreditation.

Institutional Requirements and Credit Conditions:

1. Once colleges or universities courses have been approved as equivalent under CT², students from approved CT² Career-Technical Institutions will receive the credit hour value for course offered at the matriculating post-secondary institution.
2. Admission requirements of individual institutions and/or programs are unaffected by the implementation of CT² outcomes.
3. Institutional residency requirements may affect the amount of transfer credit.
4. Candidates for graduation from collegiate or university programs may have to satisfy additional degree requirements associated with the basic related or general education studies.
5. The institution must have a comparable program and/or offer comparable courses before students can matriculate.

In order to provide for seamless movement of students from career-technical institutions to two- and four-year colleges and universities the learning outcomes in each Electrical Engineering CTAN, as well as their associated credit hours, have been amended to match the learning outcomes in the Electrical Engineering Technology Transfer Assurance Guide (TAG). Thus, the learning outcomes for two of the three Electrical Engineering CTAG courses match the learning outcomes in two TAG courses (TAG courses are known as Ohio Articulation Numbers [OANs]). The two affected CT² CTANs are DC Circuits and the Digital Electronics.

CTEET001-DC CIRCUITS

Subject Codes-
Ohio Board of Regents Subject code valid at the T (technical) level

150303	ELECTRICAL, ELECTRONIC AND COMMUNICATIONS ENGINEERING TECHNOLOGY/TECHNICIAN	A PROGRAM THAT PREPARES INDIVIDUALS TO APPLY BASIC ENGINEERING PRINCIPLES AND TECHNICAL SKILLS IN SUPPORT OF ELECTRICAL, ELECTRONICS AND COMMUNICATION ENGINEERS. INCLUDES INSTRUCTION IN ELECTRICAL CIRCUITRY, PROTOTYPE DEVELOPMENT AND TESTING; SYSTEMS ANALYSIS AND TESTING, SYSTEMS MAINTENANCE, INSTRUMENT CALIBRATION, AND REPORT PREPARATION

Career-Technical Adult Education Subject code

171503	**Electronics** Classroom, laboratory, and practical learning experiences that include both electronic theory and practice.

Learning Outcomes

Outcomes that are bolded and mark by an asterisk are essential and must be taught. Submitted course work or content must include proof of laboratory component.

Prerequisite: College Algebra. Note: Career-technical students from CT² approved institutions would not receive credit for DC Circuits until they have completed the requirement for College Algebra.

	CTAN Clarifiers
1) Electrical components and quantities.*	**[Identify and describe . . .]**
2) Definitions of voltage, current, electrical resistance and power.*	**[Define voltage etc, . . a) solve equations and application problems for voltage, current, etc. b) determine the inverse function and relate the graph of the function to the graph of the inverse, and c) analyze the graph of the function].**
3) Ohm's Law, electrical energy and power, Kirchoff's Laws.*	**[Define and employ the use of the laws].**
4) Series circuit analysis.*	**[Analyze and solve systems of linear equations including 3x3 systems].**
5) Parallel circuit analysis.*	**[Analyze and solve systems of linear equations including 3x3 systems**
6) Series-parallel circuit analysis.*	**[Analyze and solve systems of linear equations including 3x3 systems**
7) Circuit theorems (such as superposition, Thevenin's and Norton's theorems).*	**[Analyze . . .]**
8) Mesh and/or nodal analysis techniques.*	**[Use . . .]**
9) Properties of capacitors and their behavior under DC conditions.*	**[Interpret and use exponential and logarithmic functions to explain behavior of capacitors under DC conditions].**
10) Properties of inductors and their behavior under DC conditions.*	**[Interpret and use exponential and logarithmic functions to explain behavior of inductors under DC condition**

CTEET002-DIGITAL ELECTRONICS

Subject Codes-
Ohio Board of Regents Subject code valid at the T (technical) level

None listed.

Career-Technical Adult Education Subject code

None listed.

Learning Outcomes

Outcomes that are bolded and mark by an asterisk are essential and must be taught. Submitted course work must include proof of laboratory component.

Prerequisite: None

	CTAN Clarifiers
1. Number systems, operations, and codes.*	**[Recognize . . .]**
2. Logic gates.*	**[Describe functions of . . .]**
3. Boolean algebra.*	**[Use to simplify problems to the smallest digital circuit needed . . .]**
4. DeMorgan's theorem and logic simplification.*	
5. Combination logic circuits.*	**[Implement derived from logic simplification techniques . . .]**
6. Encoders/decoders.*	**[Define . . .]**
7. Multiplexers/demultiplexers*	**[Utilize to convert between serial and parallel inputs and outputs . . .]**
8. Adders, subtractors, and ALUs.*	**[Identify and define . . .]**
9. Flip-flops and related devices.*	**[Distinguish between . . .]**
10. Counters.*	
11. Shift registers.*	
12. Memory and storage.*	**[Define memory addressing scheme . . .]**
13. Integrated circuit technologies*	
14. VHDL topics.	[Describe . . .]
15. Introduction to microprocessors, computers, and buses.	[Differentiate between those mentioned and microcontrollers. Describe buses.]
16. Introduction to digital signal processing (DSP).	[Define . . .]
17. Digital communications and transmission standards.	[Describe . . .]

CTEET003-PROGRAMMABLE LOGIC CONTROLS (PLC)

Subject Codes-
Ohio Board of Regents Subject code valid at the T (technical) level

None listed.

Career-Technical Adult Education Subject code

None listed.

Learning Outcomes

All outcomes essential (100% match). Submitted course work must include proof of laboratory component.

Prerequisites: None.

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 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.***

Engineering Technology Design/Writing Panel Members

Faculty and Teachers

• Ken Bentley	Collins Career Center
• Russell Crosthwaite	Great Oaks Institute of Technology
• Jeffrey Donbar	Sinclair Community College
• Jim Geralds	Ohio Hi Point Career Center
• Carl Hilgarth	Shawnee State University
• Carol Lamb	Youngstown State University
• Roger Newhouse	Rhodes State College
• Toby Prinsen	Apollo Career Center
• Robert Speckert	Miami University- Hamilton
• Vernon Sproat	Stark State College
• Surinder Jain	Sinclair Community College
• Jay Taylor	Owens Community College
• Dale Toukonen	Auburn Career Center

Contributors

• Robert Casto	Ohio Board of Regents
• Kathy Sommers	Ohio Department of Education

Engineering Technology Beta Test Group Panel Members

Faculty and Teachers

• Dennis Hance	Upper Valley JVS
• Tom Selis	Rhodes State College
• Roger Newhouse (Lead and Host)	Rhodes State College
• Janna Gallaher	Shawnee State University
• Brent Campbell	Wright State University – Lake Campus
• David Barth	Edison Community College
• David Clark	Edison Community College
• Rick Turner	Apollo Career Center
• Doug Bodey	Apollo Career Center
• Tonya Budkowski	Apollo Career Center