

**Career-Technical Credit Transfer (CT)²
Renewable Energy Career-Technical Assurance Guide (CTAG)
August 9, 2012**

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 can be found on the ODHE website at <https://www.ohiohighered.org/sctai/ctags>.

CTAE001/ORE001 – Introduction to Alternative and Renewable Energy	Credits: 3 Semester Hours
<p>Advising Notes: In order to access post-secondary college credit for this CTAN, the student must:</p> <ul style="list-style-type: none"> • Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program • Successfully complete the ODE course [Energy Systems Management (010715)] with a “C” or better from an approved secondary program and earn a qualifying score of 68 or higher on the corresponding End-of-Course examination 	<p>CERTIFICATE OF AFFIRMATION: Can be used for course submission through CEMS. https://www.ohiohighered.org/transfer/ct2/affirmation</p>
CTAE002/ORE005 – Wind Energy (Secondary institutions must choose to submit for either this CTAN or CTSP001 but not both)	Credits: 3 Semester Hours
<p>Advising Notes:</p> <p>In order to access post-secondary college credit for this CTAN, the student must:</p> <ul style="list-style-type: none"> • Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program • Successfully complete the ODE course [Solar and Wind Energy (010717)] with a “C” or better from an approved secondary program and earn a qualifying score of 52 or higher on the corresponding End-of-Course examination <p>To gain institutional approval for this CTAN, the secondary institution must:</p> <ul style="list-style-type: none"> • Choose to teach either Wind Energy or Solar Photovoltaic <ul style="list-style-type: none"> ○ A student may only earn credit for Wind Energy OR Solar Photovoltaic because both of these subject areas are included in the yearlong secondary course Solar and Wind Energy 	<p>CERTIFICATE OF AFFIRMATION: Can be used for course submission through CEMS. https://www.ohiohighered.org/transfer/ct2/affirmation</p>

CTSP001/ORE003 – Solar Photovoltaic
(Secondary institutions must choose to submit for either this CTAN or CTAE002 but not both)

Credits: 3 Semester Hours

Advising Notes:

In order to access post-secondary college credit for this CTAN, the **student** must:

- Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program
- Successfully complete the **ODE course [Solar and Wind Energy (010717)]** with a “C” or better from an approved secondary program and earn a **qualifying score of 52 or higher** on the corresponding End-of-Course examination
- Students must complete the **prerequisite - College Algebra**
 - Students will not receive credit for Solar Photovoltaic Energy until they have completed the pre-requisite requirement for College Algebra

To gain institutional approval for this CTAN, the **secondary institution** must:

- **Choose to teach either Wind Energy or Solar Photovoltaic**
 - A student may only earn credit for Wind Energy **OR** Solar Photovoltaic because both of these subject areas are included in the yearlong secondary course Solar and Wind Energy

CERTIFICATE OF AFFIRMATION: Can be used for course submission through CEMS.
<https://www.ohiohighered.org/transfer/ct2/affirmation>

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.

Requirements and Credit Conditions:

1. The receiving institution must have a comparable program, major, or course that has been approved through submission to the Ohio Department of Higher Education (CT)² approval process for the CTAN listed in this document.
2. 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.
3. The applicant must provide proof to the receiving institution that she/he completed a course that has been approved through the (CT)² approval process and that she/he holds the appropriate credential or has passed the end-of-course assessment(s).
4. 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.
5. A career-technical student who meets all eligibility criteria will receive the credit hour value for the comparable course(s) as offered at the receiving state institution of higher education.
6. The admission requirements of individual institutions and/or programs are unaffected by the implementation of (CT)² outcomes.
7. The transfer of credit, through this CTAG, will not exempt a student from the residency requirements at the receiving institution.
8. 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 Renewable Energy CTAG Faculty Review Panel. All submissions for approval must be submitted electronically through the Course Equivalency Management System (CEMS).

Secondary Career-Technical students must complete the Renewable Energy Pathway to be eligible for credit under this CTAG. This pathway is outlined in the Ohio Department of Education's *Agriculture and Environmental Systems Career Field Technical Content Standards*.

CTAE001/ORE001 – Introduction to Alternative and Renewable Energy

Credits: 3 Semester Hours

General Course Description: This course will provide a comprehensive review of various types energy sources, including conventional and new alternative energy. Students will be aware of the problems associated with the existing conventional energy sources. Knowledge about the types, components, construction and basic installation of the various advanced and renewable energy sources will be interpreted. Other subjects that will be explored are the alternative energy generation, storage, transportation, and efficiency. The students will also be familiarized with economic impact of the alternative energy.

Credits: 3 Semester Hours

Learning Outcomes:

1. * Introductory knowledge of renewable and alternative energy sources
2. * Knowledge of energy and energy systems for commercial and/or residential use
3. * Introductory knowledge about the types, components, construction and basic installation of the various advanced and renewable energy sources
4. * Knowledge of the roles, responsibilities, regulations, and economics pertaining to advanced and renewable energy
5. * Knowledge of disciplines and career areas associated with advanced and renewable energy

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

CTAE002/ORE005 – Wind Energy

Credits: 3 Semester Hours

General Course Description: This course will explain the wind physics and geographic considerations as well as the site assessment and sizing the wind plant. An overview of wind turbines will be given in terms of the structure and the components of the turbines such as nacelle, generator, gearbox and controllers. The basic considerations, regulations, and criteria for constructing a wind turbine in a given area will also be covered.

Credits: 3 Semester Hours

Learning Outcomes:

1. * Determine the potential wind available from a given area and calculate the electrical energy that could be achieved
2. * Summarize the sizes and variations of different wind turbines including residential and commercial systems
3. * Recognize the main components and construction of a wind turbine
4. * Discuss the basic considerations, regulations, and criteria for constructing a wind turbine in a given area
5. * Evaluate relevant conditions and determine size of and energy potential of a wind turbine in a given area
6. * Evaluate various monitoring devices related to turbine construction and use

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

General Course Description: This course will introduce the PV electricity and PV modules. Different types of solar cells will be discussed and their characteristic compared. PV system components will be interpreted. The operation and the connection to the power grid of the PV systems will be taught. Then the electrical and mechanical consideration in PV site assessment and installation will be explained. The safety issues and market of the PV technology will also be covered.

Credits: 3 Semester Hours

Learning Outcomes:

1. * PV markets and applications
2. * PV specific safety basics
3. * PV electricity basics
4. * Solar energy PV module fundamentals
5. * System components and PV system sizing principles
6. * PV system electrical design and mechanical design
7. * Performance analysis, maintenance and troubleshooting

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

**Renewable Energy Panel Participants
Spring 2016**

Feng Hua Susan Ramlo	Marion Technical College University of Akron	SCTAI Panel Lead Expert SCTAI Panel Lead Expert
Dan Burklo Duncan Estep Jeff Giesey Robert Gilbert Steven Hubbard	Northwest State Community College Lorain County Community College Ohio University Sinclair Community College Lorain County Community College	SCTAI Panel Expert SCTAI Panel Expert SCTAI Panel Expert SCTAI Panel Expert/Item Writer SCTAI Panel Expert
James Maloney James Menart Martin Shingler	Stark State Community College Wright State University Lakeland Community College	SCTAI Panel Expert SCTAI Panel Expert SCTAI Panel Expert
Brett Joseph Ed Mowrer	Lorain County Community College Belmont College	SCTAI Item Writer SCTAI Item Writer
Anne Skuce Craig Wiget	Ohio Articulation and Transfer Network Secondary Career Technical Alignment Initiative	Senior Associate Director, SCTAI SCTAI Special Coach

**Solar Photovoltaic Panel
Alternative and Renewable Energy Panel Participants
February 2012**

Aaron Bloomfield Allen Rioux Bob Gilbert Dan Burklo Dave Strickland Feng Hua Frank Calzonetti Greg Timberlake Jim Menart Karen Wylie Mack Bailey Marcia King-Blandford Margie Traband Nadene Howard Randy Wharton Vikram Kuppa Gayle Ashbridge	Northwest State Community College University of Toledo Sinclair Community College Northwest State Community College Scioto Tech Marion Technical College University of Toledo North Central State College Wright State University Northwest State Community College Hocking College University of Toledo University of Toledo University of Toledo Owens Community College University of Cincinnati Ohio Articulation and Transfer Network
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