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Lorain County Community College  
6/23/2009

# Wind Turbine Program Overview

*Lorain County Community College – Elyria, OH*

The objectives of the Alternative Energy Technology – Wind Turbine Major Program, One-Year Technical Certificate and Certificate of Completion are consistent with Governor Stickland's Turnaround Ohio plan which aims to educate 230,000 Ohioans in the next decade. These programs provide training in the high-growth technical field of wind turbine technology -- a discipline that focuses on the installation and maintenance of residential and utility applied, wind turbine power generation systems.



Lorain County Community College  
1005 N Abbe Road  
Elyria, OH 44035  
800-995-LCCC

## Executive Summary

The objectives of the Alternative Energy Technology – Wind Turbine Major Program, One-Year Technical certificate and Certificate of Completion are consistent with Governor Stickland’s Turnaround Ohio plan which aims to educate 230,000 Ohioans in the next decade. This program provides a two-year applied degree in the high-growth technical field of Wind Turbine Technology - a discipline that focuses on the installation and maintenance of residential and utility applied, wind turbine power generation systems.

Much interest has occurred concerning the use of sustainable energy resources recently due the spiraling cost of fossil fuels experienced during 2008 and the use of energy generation technologies that are less detrimental to the environment. The Federal Department of Energy issued the ground breaking report, *20% Wind Energy by 2030: Increasing Wind Energy’s Contribution to U.S. Electrical Supply*. This report estimates the creation of 500,000 jobs to support this emerging industry. Federal tax credit supporting the installation of wind turbine power generation systems coupled with subsidy grants from the state of Ohio have created a large demand for skilled workers in Ohio and the country at large, to support wind turbine systems.

Students will be prepared with the necessary skills to find employment as wind turbine technicians. Organizations have expressed needs to hire individuals able to support the direct installation and maintenance of wind turbine power systems. Individuals graduating from this program will be able to direct the installation and maintenance of residential wind appliances, considered to be the highest growth potential of the industry and will be able to support the installation and maintenance of utility scale wind turbines.

By offering these opportunities combined with low tuition rates, Lorain County Community College believes that this program will result in increased participation in higher education in the region and will create Ohio jobs and new businesses in a growing high-value and under-served industry.

Graduates of the Alternative Energy Technology – Wind Turbine Major Program will:

- Be prepared to function effectively in the wind turbine industry, with a theoretical understanding and direct hands-on experience in the installation and operation of wind turbine power generation systems.
- Be experienced in the installation of several residential scale wind turbine systems, siting of the turbine, rigging for installation, safe practices, regulatory considerations, electrical installation in a variety of off-grid applications and operation and maintenance of utility scale turbines.
- Demonstrate a high standard of professional ethics, attitudes, and values.
- Communicate effectively and work collaboratively in teams.
- Be prepared to pursue higher education and value lifelong learning.

## Rationale and Need for the Program

The primary intent of the program is to increase participation in higher education in Ohio as part of a multifaceted effort to improve the state's economy. Lorain County has experienced severe job losses in recent years due to outsourcing of manufacturing jobs. In 2004-2005, the Bureau of Labor Statistics showed that Lorain County, Ohio suffered the third largest percentage decline in employment nationwide. Subsequently, Lorain County lost over 2000 jobs in 2006 due to the closing of the Ford Lorain Assembly Plant and downsizing at Invacare, Columbia Gas, CenturyTel, and Emerson Network Power. Given that outsourcing of manufacturing remains a productive business practice, it is unlikely that all of these jobs can be recovered in the manufacturing sector.

Escalation of energy costs and an inordinate reliance on fossil fuels has spawned interest in sustainable energy technologies at the federal, state and local governmental level, as well as at the individual citizen level. Federal tax credits, at 30% have improved the overall economic incentive for wind turbine investment.

It has been determined that Northeast and Western Ohio currently has sufficient wind resources to support wind-power generation. A utility scale wind farm project is under consideration on Lake Erie and by last estimate, 17 utility scale projects are in the planning stages in western Ohio.

According to *The Wind Energy Market in Northeast Ohio, A Summary of Executive Interviews*, published by the Joint Center for Policy Research at Lorain County Community College (July, 2008), "a wide variety of job skills and professional expertise are needed with the wind energy sector." Workforce requirements cited include "installation of wind energy systems, manufacturing of wind energy components, and installing and maintaining individual installations and large-scale 'wind farms.'"

Lorain County Community College has developed a stackable curriculum in alternative energy focused on wind turbine technology that addresses directly the needs and targets the specific skills which have been identified as critical in this industry and provides comprehensive coverage of engineering technology principles and requirements to render the program transferable to four-year universities. This program is expected to help create and retain jobs while increasing participation in higher education within the Lorain County region.

ADI Wind has offered to participate in the Wind Turbine program to offer entrepreneurial opportunities to the wind turbine students. These students would then have direct employment opportunities with ADI Wind as the business grows. Lorain County Community College believes that this stackable curriculum will result in increased participation in higher education in the region, will create jobs and support new businesses in a growing, high-value industry in Ohio. ADI Wind has received funds from the Lorain County Community College Foundation Innovation Fund, and is working with the Great Lakes Innovation and Development Enterprise (GLIDE).

## Benefits to the Region

The Alternative Energy – Wind Energy Technology Program will provide the region with graduates who are skilled in the application, installation and maintenance of wind turbines. This program provides a model curriculum that can be utilized by other Ohio institutions in order to serve this new and rapidly emerging need locally, nationwide and worldwide. These graduates may form their own businesses installing and maintaining wind turbines, which will create new jobs.

The application of wind turbines reduces the reliance on fossil fuel power generation, which will reduce the generation of pollution and thus reduces the aggregate carbon footprint. The federal mandate to increase wind turbine generated power to 20% by 2030 is directly supported.

Direct economic benefit is received by landowners who typically receive \$3000 per year per utility-scale turbine lease income. Homeowners who choose to install residential wind turbines can benefit economically, by generation of their own electrical power and by providing a regional distributed resource for power generation.

### Cooperative Arrangements with Other Institutions

The essence of this program is the establishment of a partnership in alternative energy with Lakeland Community College, Stark State College of Technology, Cuyahoga Community College and all other interested educational entities. All participating colleges are agreeable to developing and sharing the curriculum of several alternative engineering technologies. This activity will provide the broadest delivery of alternative energy technology training at a minimum cost.

Lakeland Community College has already shared their Nuclear Engineering Technology program with Terra Community College. Lakeland delivers their Nuclear Engineering Technology program to students at Monroe County Community College in Michigan. Lakeland Community College is able to provide best practices based on these experiences.

Stark State College of Technology has successfully shared their First Energy Power Utility program with Lorain County Community College and is sharing their fuel cell curriculum with a number of educational institutions funded through a National Science Foundation grant.

Cuyahoga Community College has offered to share their Green Construction Technology program.

The history of successful partnership provides a solid foundation for alternative energy collaboration and a model from which sharing to other community colleges can be extended. Lorain County Community College will use existing infrastructure including distance learning and Course Resource Archives (CRA) to share wind turbine curriculum and resources.

In addition, Lorain County Community College is working with the Cuyahoga County-based Great Lakes Science Center to use their existing 225 kW Vestas wind turbine for the utility scale training required for the degree. The use of this turbine will minimize startup costs of the program.

The alternative energy collaborative will allow the Wind Energy Technology degree program to be offered initially at Lorain County Community College, Stark State College of Technology, Cuyahoga Community College and Lakeland Community College. The curriculum, common resources, lessons learned, successes and best practices identified through this collaboration shall be shared with other community colleges that express an interest in this program.

### Articulation Agreements

There are currently no formal articulation agreements in place for this program. However, the program's general education courses have been selected from courses approved in Ohio's Transfer Module so that students will find many of their credits will transfer to other state colleges in Ohio.

## Curriculum

The curriculum guide (pending approval of the Ohio Board of Regents) is attached as it will appear in the Lorain County Community College Annual Catalog.

## Staffing Requirements

No additional full-time faculty or staff will be required to coordinate or instruct courses associated with this program. Adjunct faculty will be engaged to teach all courses not able to be instructed by the program coordinator or other full-time faculty.

## Facilities and Support Services

Significant wind turbine equipment is required to support the training of wind turbine technicians. This type of program is hands-on and will require the installation of wind turbines of various sizes to support the application, installation and maintenance of residential and utility-scale wind turbine power generation systems. Existing underutilized laboratory space will be used for inside lab activities. An external wind turbine training area, where wind turbines will be erected is required to properly train students in this technology.

## Contact Information

Duncan Estep  
Lorain County Community College

Phone: 440-366-7016  
[destep@lorainccc.edu](mailto:destep@lorainccc.edu)

Attachment A

Lorain County Community College Associates Degree Curriculum

**Lorain County Community College**  
**Alternative Energy Technology - Wind Turbine Major**  
**Engineering Technologies Division**  
**Associate of Applied Science - Curriculum Code 6350**

The Wind Turbine Technology Program encompasses a wide range of electrical, mechanical and computer skills required to compete in the emerging Alternate Energy - Wind Turbine Industry. Individuals will be prepared for a range of analysis, installation and maintenance assignments associated with the Wind Turbine industry. Typical job responsibilities will include Design, Testing, R&D, Service, Maintenance and Installation Assignments. Lorain County Community College has articulation agreements with colleges and universities including programs offered by Lorain County Community College's University Partnership.

Course	Course Title	Credits	Contact Hrs.	Lec Hrs.	Lab Hrs.
<b>First Year</b>					
<b>Fall Semester</b>					
ALET 111	Introduction to Alternative Energy	3	4	2	2
ELCT 111	Electrical Circuits I	3	5	2	3
ENGL 161	College Composition I	3	3	3	0
MTHM 121	Technical Mathematics I	4	4	4	0
★ SDEV 101	College 101	1	1	1	0
TECN 111	Technical Problem Solving	3	5	2	3
		17			
<b>Spring Semester</b>					
> ELCT 112	Electrical Circuits II	4	6	3	3
> ENGL 162	College Composition II Technical Focus	3	3	3	0
> ALET 112	Wind Turbine Mechanical Systems	4	6	3	3
> MTHM 122	Technical Math II	3	3	3	0
AETC 121	Programmable Logic Controllers	3	4	2	2
		17			
<b>Second Year</b>					
<b>Fall Semester</b>					
> ALET 220	Wind Turbine Technology I	3	5	2	3
^ > ELCT 227	NEC & Electrical Systems Design	2-4	2	2	0
> PHYC 151	General Physics I	5	7	4	3
> ELCT 121	Digital Electronics	4	6	3	3
	Arts and Humanities Elective**	3			
		17-19			
<b>Spring Semester</b>					
> ALET 221	Wind Turbine Technology II	3	5	2	3
> AETC 241	Instrumentation and Control	3	5	2	3
> ELCT 211	Electrical Power and Devices	4	6	3	3
> CMNW 220	Digital Data Communications	4	0	0	0
	Social Science Elective***	3			
		17			
<b>Total Semester Credit Hours</b>		<b>68-70</b>	Established Mar 09 Effective Aug 09		

**Notes**

1. > Indicates that this course requires a prerequisite.
2. OR Indicates that a student may select either course, which may have an effect on the total credit hours.
3. \* Indicates that this course requires a prerequisite or may be taken concurrently.
4. \*\* Course selected from the following list: ARTS 243, 244, 245, 246, 254; ENGL 251, 252, 253, ENGL 254, 255, 257, 259, 261, 262, 265, 266, 269; HUMS 151, 161, 261, 262, 271, 274; MUSC 262; PHLX 165, 262; RELG 181, 261, 262; THTR 151.
5. \*\*\* Course selected from the following list: HSTR 151, 152, 161, 162, 171, 252, 267, 268, 269; PLSC 156.
6. ^ Indicates a student may substitute from this list: CMNW 101, 141, 145 or Work Based Learning (ALET 287, 288, for the equivalent number of credit hours for this course.
7. ★ A student must register for the orientation course when enrolling for more than six credit hours per semester or any course that would result in an accumulation of thirteen or more credit hours.