LAKESHORE TECHNICAL COLLEGE

WIND ENERGY TECHNOLOGY

Program Number 10-482-1
Associate Degree in Applied Science • Four Terms

ABOUT THE PROGRAM

The wind energy industry is the fastest growing segment of new energy production. Employers seek skilled technicians for operation and maintenance activities in wind farms. There is also a demand for advanced technicians with U.S. and international wind turbine manufacturers; these include: installation technicians, quality control technicians, and warranty and commissioning technicians. Operation and maintenance positions generally remain with a given wind farm location; other technicians travel extensively with the construction of new wind farms and repair/retrofitting of wind turbines around the world.

PROGRAM OUTCOMES

- Install, inspect, test, service, and repair wind turbine components.
- Wear proper Personal Protection Equipment, identify hazards, mitigate said hazards, and safely climb towers.
- Cognitively think and use deductive reasoning as well as manufacturer information while troubleshooting or maintaining a wind turbine.
- Clearly and responsibly communicate appropriate information with stakeholders under minimal supervision.
- Practice the basics of self-evacuation and rescue.

CAREER AND EDUCATION ADVANCEMENT OPPORTUNITIES

LTC credits transfer to over 30 universities. For more information visit gotoltc.edu/future-students/transfer.

ADMISSIONS AND FIRST SEMESTER ENROLLMENT STEPS

- Submit online application.
- Complete the online Student Success Questionnaire.
- Complete Technical Standards form.
- Schedule a Program Counseling Session with your assigned program counselor to plan your first semester schedule, review your entire plan of study, discuss the results of the Student Success Questionnaire.

**Submit transcripts and test scores (optional, highly recommended): College transcripts, along with high school transcripts and test scores from within the last five years, used for course registration. Official transcripts needed for transferring college credit(s) and for financial aid purposes.*

APPROXIMATE COSTS

- $141 per credit tuition (WI resident) plus $8.46 per credit student activity fee. Material fee varies depending on course. Other fees vary by program. Visit gotoltc.edu/financial-aid/tuition-and-fees for details.

FINANCIAL AID

This program is eligible for financial aid. Visit gotoltc.edu/Financial-Aid or talk with your Admissions Advisor about how to apply for aid.

SPECIAL NOTE

This program is an official shared program with students from FVTC, MPTC, and NWTC. Students attend electro-mechanical and general education classes at their local technical colleges. These students attend Wind Energy Technology specific courses at LTC in Cleveland and may graduate with both a degree from their respective colleges as well as a degree in Wind Energy Technology from LTC. LTC welcomes transfer students who are graduates of electro-mechanical and other energy-related programs or other universities. Interested transfer/dual-degree students are encouraged to contact the LTC program counselor at 920-693-1378.

CONTACT

LTC Admissions Advisor
920.693.1162 • Admissions@gotoltc.edu

Catalog No.	Class Title	Credit(s)
	Term 1	
10482101	Wind Systems Introduction	3
10482104	Wind Technician 1 - Rescue & Tools**	2
10482110	Energy and Solar Power	1
10620122	Industrial Wiring	2
10620103	Fluid Power 1	2
10620105	DC Fundamentals	2
10804113	College Technical Mathematics 1A OR 10804198 Calculus 1* (4 cr)	3
		15
	Term 2	
10482106	Wind Technician 2 - Safety and Maintenance**	3
10482124	Wind Technician 3 Lab**	1
10482132	10482132 Turbine Maintenance** OR 10482103 Wind Farm Practical Experience (2 cr)**	2
10620104	Fluid Power 2	3
10620138	Programmable Controllers - Allen Bradley	3
10620110	AC Fundamentals	2
10620141	Industrial Controls & Motors	3
		17
	Summer Term	
10482126	Wind Technician 4**	3
		3
	Term 3	
10482140	Solar Technician 1 Lab	1
10482128	Wind Technician 5 Lab**	2
10482133	Wind Systems Networking	2
10482135	Energy Power and Force OR 10806154 General Physics 1 (4 cr)	3
10482136	Energy Power and Force Lab OR 10806154 General Physics 1 (4 cr)	1
10620195	Industrial Troubleshooting	1
10620130	Mechanical Drive Systems	3
10620164	Electromechanical Systems	2
		15
	Term 4	
10801195	Written Communication	3
10809195	Economics OR 10809196 Introduction to Sociology (3 cr)	3
10801196	Oral/Interpersonal Communication	3
10809198	Introduction to Psychology	3
		12
		TOTAL 62

*Students who plan to also achieve a Bachelor's degree are encouraged to take this transferable course.

**These class dates and times may be rescheduled due to inclement weather. Students must be within safe-climbing, unequipped body weight of 115 to 295 pounds.

Curriculum and Program Acceptance requirements are subject to change. Program start dates vary; check with your advisor for details. The tuition and fees are approximate based on 2020-2021 rates and are subject to change prior to the start of the academic year.

AC FUNDAMENTALS...prepares the student to analyze electrical circuits using AC math, analyze AC waveforms, measure and analyze AC power, analyze capacitors and inductors in DC and AC circuits, analyze AC circuits containing reactance and calculate resonance, apply the elements and properties of basic measuring circuits, and describe transformer characteristics. PREREQUISITE: 10620105 DC Fundamentals or 10660105 DC Fundamentals

COLLEGE TECHNICAL MATHEMATICS 1A...prepares the student to solve linear, quadratic, and relational equations; graph; formula rearrangement; solve systems of equations; percent; proportions; and operations on polynomials. Emphasis will be on the application of skills to technical problems. PRERQUISITES: 10834110 Elementary Algebra w Apps or 10804107 College Mathematics or 31457318 Ind Mtnc Trades Math or 31420320 Machine Tool Math or math placement assessment equivalent

DC FUNDAMENTALS...prepares the student to convert values to scientific and engineering notations; calculate math quantities; describe basic atomic theory; identify basic electrical terms; use established symbols standards; describe DC voltage characteristics and current sources and electrical resistance; measure and analyze electrical quantities in series and parallel circuits; and desolder/solder single lead components. COREQUISITE: 10804113 College Tech Math 1A or 10804115 College Tech Math 1

ECONOMICS...provides the participant with an overview of how a market-oriented economic system operates, and it surveys the factors which influence national economic policy. Basic concepts and analyses are illustrated by reference to a variety of contemporary problems and public policy issues. Concepts include scarcity, resources, alternative economic systems. growth, supply and demand, monetary and fiscal policy, inflation, unemployment and global economic issues. COREQUISITE: 10838105 Intro to Rdg & Study Skills or Reading placement assssmt equiv or CONDITION: 610062 Agribusiness/Financial Basic prog adm met

ELECTROMECHANICAL SYSTEMS...prepares the student to communicate with, tune, run, and troubleshoot Allen-Bradley servos; utilize electrical control of hydraulic systems, explore PID control of motor speed; and investigate open and closed loop control systems. PREREQUISITES: 10620104 Fluid Power 2 and 10620110 AC Fund or 10660110 AC Fund

ENERGY AND SOLAR POWER...provides the learner with an overview of electrical energy generation and distribution and its relationship to the renewable energy industry. Various types of electric energy systems are compared and contrasted. Solar Energy and its differing applications, including solar hot water and passive solar, are explored. Students will measure the output of a photovoltaic array and learn how a PV system can be integrated into the existing infrastructure.

ENERGY POWER AND FORCE...studies the laws and theories of electric power generation that govern motion and how to apply them to a range of concepts including rotational inertia, acceleration, velocity, lift, force, torque, etc. Studies the law of Conservation of Energy and basic atomic theory and how these concepts apply to electric power generation. The use and function of simple machines, and how they relate to electric power generator function, is also explored.

ENERGY POWER AND FORCE LAB...applies the laws and theories that govern motion to energy power and force concepts including rotational inertia, acceleration, velocity, lift, force and torque. Exploration of basic atomic theory and how it applies to electric power generation is conducted. In addition, the law of conservation of energy is applied in the lab activities. The use and function of simple machines, and how they relate to generator function is also examined. COREQUISITE: 10482135 Energy Power & Force

FLUID POWER 1...prepares the learner to identify hydraulic and pneumatic component symbols; adjust a pressure relief valve; analyze the operation of a pilot operated relief valve; analyze Pascal's law; evaluate flow, velocity, work and power in industrial hydraulic and pneumatic circuits; analyze meter-in, meter-out, and bypass flow control circuits; identify basic hydraulic and pneumatic control valves; and assemble hydraulic circuits. COREQUISITES: 10804115 College Technical Math 1 or 10804114 College Tech Math 1A

FLUID POWER 2...enhances the learner's ability to read schematics containing fluid power component symbols; assemble systems using schematics; analyze system's operation using a schematic; evaluate the general characteristics and terms of fluids under pressure, fluid conditioning, conductors, reservoirs, accumulators, pressure control; and troubleshoot malfunctioning pressurized systems. PREREQUISITE: 10620103 Fluid Power 1 or 10620155 Industrial Maintenance Hydraulics and Pneumatics

INDUSTRIAL CONTROLS AND MOTORS...prepares the learner to select control devices by function and operation; illustrate electrical circuits using symbols, diagrams, and abbreviations; explain the operation of magnetic solenoids and apply motor control techniques and introduces the student to three-phase power motor circuits for industrial applications. PREREQUISITE: 10620122 Industrial Wiring and COREQUISITE: 10620110 AC Fundamentals or PREREQUISITE: 10660110 AC Fundamentals

INDUSTRIAL TROUBLESHOOTING...prepares the learner to conduct effective machine control troubleshooting techniques with an understanding of preventive maintenance methods designed to minimize motor and controls issues between preventive maintenance measures. PREREQUISITE: 10620141 Industrial Controls and Motors

INDUSTRIAL WIRING...prepares the learner to follow safety procedures; maintain a safe and healthy work environment; construct electrical circuits; measure electrical quantities using a VOM and/or DVM; analyze measured values using electrical circuit laws; construct typical industrial control circuits; and analyze typical industrial control circuits.

INTRODUCTION TO PSYCHOLOGY...introduces the students to a survey of the multiple aspects of human behavior. Involves a survey of the theoretical foundations of human functioning in such areas as learning, motivation, emotions, personality, deviance and pathology, physiological factors, and social influences. Directs student to an insightful understanding of the complexities of human relationships in personal, social, & vocational settings. PREREQ: Reading plcmnt assmnt equiv or COREQ: 10838105 Intro to Rdg & Study Skills

MECHANICAL DRIVE SYSTEMS...prepares the learner to use tools and fasteners safely; identify belt and chain drive components; install and adjust belt and chain drives; apply bearing and lubrication information; perform coupling alignment using straight edge, feeler gauge, and dial indicator and laser methods; identify various gear drives; calculate gear ratios; and analyze first-, second-, and third-class levers.

ORAL/INTERPERSONAL COMMUNICATION...provides students with the skills to develop speaking, verbal and nonverbal communication, and listening skills through individual speeches, group activities, and other projects. COREQUISITE: 10838105 Intro Reading and Study Skills or Reading placement assessment equivalent

PROGRAMMABLE CONTROLLERS - ALLEN BRADLEY...prepares the student to understand basic PLC structure and terminology; learn to create and troubleshoot basic PLC programs using the RSLOGIX 500 software and the RSLINX communication software; become familiar with communicating with programming SLC-500 PLCs. This course is highly computer based.

SOLAR TECHNICIAN 1 LAB...provides a hands-on lab-based environment where students learn the basic parts of photovoltaic systems, complete a solar site assessment, and learn how to size a solar system for desired power output, as well as to work safely around solar electric equipment.

TURBINE MAINTENANCE...prepares learners to climb, inspect and service wind turbines; use torque fasteners; check gearbox lubrication; add grease to moving and exposed parts; verify good electrical connections; perform an overall "system check" and routine maintenance on a wind energy system; in addition to fault determination and troubleshooting. Students will incorporate wind industry best safety practices, must be prepared to climb multiple times in a day, and work full days outside in varying weather conditions. COREQUISITE: 10482124 Wind Technician 3 Lab

WIND SYSTEMS INTRODUCTION...prepares the learner to assess the global energy picture, analyze the causes of wind flow and wind flow properties, write a site assessment, explore small, medium, and large wind turbine designs, assess the environmental effects of wind turbines, perform business assessments for wind energy projects, plan a wind energy project, evaluate the operation and maintenance requirements of wind turbines and their components, and analyze the future of wind energy.

WIND SYSTEMS NETWORKING...introduces the wind technician to the applications of SCADA, SCADA control processes, remote connections of generation assets, remote monitoring and remote control, IP addressing, installing and removing programs on PC's, downloading programs on PLC's, proper removal and replacement of communication and control components, as well as connecting to various components for troubleshooting, testing, and component addressing. COREQUISITES: 10482124 Wind Technician 3 Lab and 10620138 Programmable Controllers - Allen Bradley

WIND TECHNICIAN 1 - RESCUE AND TOOLS...prepares students for work at height and to perform equipment inspections on climbing and fall arrest gear; wear required PPE, PFPE, and apparel while working on wind turbine systems. Students will be SAFER certified in safe tower access, climbing, rescue, and confined space rescue, and will demonstrate proper knot tying and display professionalism and safe working habits during all tasks. Students are trained in use of hand tools and torque tools. COREQUISITE: 10482101 Wind Systems Intro

WIND TECHNICIAN 2 - SAFETY AND MAINTENANCE...familiarizes learners with OSHA regulations related to the wind industry and proper methods to eliminate and control hazards. Students receive training in First Aid, CPR, rigging, and confined space and receive the 10-hour OSHA for General Industry and the Tools at Height certifications. Participants develop skills in repair and maintenance of commercial wind turbines. Industry standards, training manuals, and field experience are course standards. COREQUISITE: 10482104 Wind Technician 1 - Rescue & Tools

WIND TECHNICIAN 3 LAB...certifies learner in torque tool techniques with Snap-on tools. Students will apply safe and proper techniques while using various styles of torque wrenches and adapters including hand torque and hydraulic torque wrenches. Students will demonstrate proficiency in performing a variety of maintenance functions on the GE 1.5 nacelle including oil filter changes, generator brush maintenance, and brake pad replacement while following proper safety and LOTO procedures. COREQ: 10482106 Wind Tech 2-Sfty & Mtnc

WIND TECHNICIAN 4...reviews arc flash requirements, power quality, power factor correction, transformer calculations, electrical distribution, and transmission systems. Student will learn the components and functions of a gearbox; how to inspect bearings and gears, troubleshoot the cooling system, and replace various gearbox components. Student will perform proper maintenance of the yaw system on the GE 1.5 nacelle, and will be responsible for completing troubleshooting/maintenance on the campus's wind turbines. PREREQUISITES: 10482124 Wind Tech 3, 10620141 Industrial Controls & Motors, 10620130 Mech Mech Intro, 10620138 Prog Cont-Allen Bradley and COREQUISITES: 10482132 Turbine Mtnc or 10482103 Wind Farm Intern & 10482128 Wind Tech 5 and 10620140 PLC Adv

WIND TECHNICIAN 5 LAB...familiarizes the students with schematic reading and prepares the student to use schematics for troubleshooting and LOTO. The student will demonstrate proficiency in the use of a multi-meter for troubleshooting and LOTO. The student will demonstrate proficiency in troubleshooting motors and safely changing out motors. In this capstone course, students will responsibly perform troubleshooting and maintenance of the wind turbines on LTC's campus. COREQUISITE: 10482126 Wind Technician 4

WRITTEN COMMUNICATION...teaches the writing process, which includes prewriting, drafting, revising, and editing. Through a variety of writing assignments, student will analyze audience and purpose, research and organize ideas, and format and design documents based on subject matter and content. Keyboarding skills are required for this course. It also develops critical reading and thinking skills through the analysis of a variety of written documents. PREREQUISITE: 10831103 Intro to College Wrtg or Wrtg placement assmt equiv and COREQUISITE: 10838105 Intro to Rdg & Study Skills or Rdg placement asssmt equiv