LTC LAKESHORE TECHNICAL COLLEGE

PART-TIME • DAYS

WIND ENERGY TECHNOLOGY

Program Number 10-482-1
Associate Degree in Applied Science

ABOUT THE PROGRAM

The wind energy industry is the fastest growing segment of new energy production. The U.S. and Canadian wind industry is experiencing annual growth of 25%. 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-evaluation and rescue.

CAREER AND EDUCATION ADVANCEMENT OPPORTUNITIES

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

ADMISSION TO DO'S

- Work with Career Coach to:
  - Submit application and $30 fee.
  - Submit official transcripts (high school and other colleges).

PROGRAM TO DO'S

- Work with Academic Advisor to:
  - Complete an assessment for placement (Accuplacer or ACT).
  - Complete Functional Abilities Statement of Understanding form.
  - Meet to plan your first semester schedule, review your entire plan of study, discuss placement assessment results and complete Program To Do's.

APPROXIMATE COSTS

- $134.20 per credit tuition (WI resident) plus $7.38 per credit student activity fee. $10 per credit online 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 Career Coach 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. During the summer months, 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. Please note that a video conference Intro to Wind Systems course runs each fall and spring as a prerequisite to the summer term. LTC welcomes transfer students who have completed one year of electro-mechanical and energy-related programs at LTC and other WTCS colleges. Interested transfer/dual-degree students are encouraged to contact the LTC program advisor at 920-693-1378 for more information and to determine eligibility to attend the summer program courses.

CONTACT

LTC Career Coach
920.693.1162 • CareerCoach@gotoltc.edu

Catalog No.	Class Title	Credit(s)
	Term 1 (Fall 2018)	
10-620-103	Fluid Power 1	2
10-660-105	DC Fundamentals	2
10-804-115	College Technical Math 1	5
		9
	Term 2 (Spring 2019)	
10-620-104	Fluid Power 2	3
10-620-138	Programmable Controllers - Allen Bradley	3
10-660-110	AC Fundamentals	2
		8
	Term 3 (Fall 2019)	
10-482-101	Wind Systems Intro	3
10-482-120	Wind Technician 1 Lab **	1
10-620-122	Industrial Wiring	2
		6
	Term 4 (Spring 2020)	
10-482-110	Energy Introduction	1
10-482-113	Wind Technician Health and Safety **	2
10-482-122	Wind Technician 2 Lab**	1
10-620-141	Industrial Controls & Motors	3
		7
	Term 5 (Summer 2020)	
10-482-132	10482132 Turbine Maintenance ** OR Internship	2
		2
	Term 6 (Fall 2020)	
10-620-130	Mechanisms Mechanics Introduction	3
10-620-193	NEC Codes	1
10-806-154	General Physics 1	4
		8
	Term 7 (Spring 2021)	
10-620-192	Frequency Drives	1
10-620-195	Industrial Troubleshooting	1
10-806-112	Principles of Sustainability	3
10-801-196	Oral/Interpersonal Communication	3
		8
	Term 8 (Fall 2021)	
10-482-124	Wind Technician 3 Lab **	1
10-620-164	Electromechanical Systems	2
10-620-140	Programmable Controllers - Allen Bradley Advanced	2
10-801-195	Written Communication	3
		8
	Term 9 (Spring 2022)	
10-482-126	Wind Technician 4 **	3
10-482-128	Wind Technician 5 Lab **	2
10-809-198	Introduction to Psychology	3
		8
		TOTAL 64

**These class dates and times may be rescheduled due to inclement weather. Students must be within safe-climbing, unequipped body weight of 100 to 275 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 2018-2019 rates.

2018-19

63 022217

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, applythe elements and properties of basic measuring circuits, and describe transformer characteristics. PREREQUISITES: 10660105 DC Fundamentals

COLLEGE TECHNICAL MATHEMATICS 1...prepares the student to solve linear, quadratic, and rational equations; graphing; formula rearrangement; solve systems of equations; percent; proportions; measurement systems; computational geometry; right and oblique triangle trigonometry; trigonometric functions on the unit circle; and operations on polynomials. Emphasis will be on the application of skills to technical problems. This course is the equivalent of successful completion of College Tech Math 1a and 1b. PRERQUISITES: 10834110 Elementary Algebra w Apps or 31457318 Ind Mtnc Trades Math or 31420320 Machine Tool Math or 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. COREQUISITES: 10804115 College Technical Math 1 or 10804114 College Tech Math 1B

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: Fluid Power 2 and 10660110 AC Fundamentals

ENERGY INTRODUCTION…provides the learner with an overview of electrical energy generation and distribution and their relationship to the Wind industry. Applications and tours include electricity from the following modes: wind, photovoltaic, coal-fired, hydro, and natural gas. Careers for wind maintenance technicians and associated careers are explored.

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 1B

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

FREQUENCY DRIVES...prepares the learner to explain the function, construction and troubleshoot frequency drives as well as select and change parameters to meet operational characteristics for the drive application. PREREQUISITE: 10620141 Ind Controls & Motors

GENERAL PHYSICS 1...presents the applications and theory of basic physics principles. Course emphasizes problem-solving, laboratory investigation, and applications. Topics include unit conversions and analysis, vectors, translational and rotational kinematics, translational and rotational dynamics, heat and temperature, and harmonic motion and waves. COREQ: 10804197 College Tech Math 1B or 10804114 College Tech Math 1B or 10804114M1 College Tech Math 1B Mod 1 & 10804114M2 College Tech Math 1B Mod 2 or 10804115 College Tech Math 1 or 10624105 Hlth Phys Calc & Stats & 10804118 Interm Algebra

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 thestudent to three-phase power motor circuits for industrial applications. COREQUISITES: 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 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 & pathology, physiological factors, & social influences. Directs the student to an insightful understanding of the complexities of human relationships in personal, social, & vocational settings. COREQ: 10838105 Intro Reading & Study Skills or Accuplacer Reading score of 74 or equiv

MECHANISMS MECHANICS INTRODUCTION TO...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.

NEC CODES...introduces the student to National Electric Codes NFPA 70. Prepares the learner to apply NFPA 70 to motor and control installations and repairs. PREREQUISITE: 10620141 Industrial Controls and Motors

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 equivalent

PRINCIPLES OF SUSTAINABILITY…prepares students to develop sustainable literacy, analyze interconnections among physical and biological sciences and environmental systems, summarize effects of sustainability on health and well-being, analyze connections among social, economic, and environmental systems, employ energy conservation strategies to reduce use of fossil fuels, investigate alternative energy options, evaluate options to current waste disposal/recycling in the U.S., and analyze approaches used by your community. COREQUISITE: 10838105 Intro Reading and Study Skills or 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.

PROGRAMMABLE CONTROLLERS - ALLEN BRADLEY ADVANCED...prepares the student to develop applications utilizing subroutine instructions, analog modules; gain a basic understanding of creating and troubleshooting programs using the ControlLogix, RSLOGIX5000 software. This course is highly computer based. PREREQUISITE: 10620138 Prog Cntrls/AB

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 ona 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.PREREQUISITES: 10660110 AC Fundamentals and 10620138 Programmable Controllers-Allen Bradley and 10804115 College Tech Math 1 or 10804114 College Tech Math 1B and 10620104 Fluid Power 2 and 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 TECHNICIAN 1 LAB…prepares the learner for work at height. Students will perform equipment inspections on climbing and fall arrest gear, wear required PPE, PFPE, and outdoor apparel while working on a wind turbine system. In addition the learner will be provided with the S.A.F.E.R. certification in safe tower access, climbing, rescue, and confined space rescue. Students will demonstrate proper knot tying ability and display professionalism and safe working habits during all tasks. COREQUISITE: 10482101 Wind Systems Introduction

WIND TECHNICIAN 2 LAB…students will perform basic maintenance and troubleshooting on the campus towers, including greasing, torqueing, and hydraulic station maintenance. Students will demonstrate safe rigging techniques while raising and lowering tools and associated gear up and down the towers. Students will demonstrate comprehension of the rescue gear usage through real-life scenarios and will learn to safely self-evacuate off the training tower and to complete the necessary paperwork associated with tasks. COREQUISITES: 10482120 Wind Technician 1 Lab and 10482113 Wind Tech Health & Safety

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. COREQUISITE: 10482122 WindTechnician 2

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 and 10482128 Wind Tech 5 and 10620140 PLC Advanced

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

WIND TECHNICIAN HEALTH AND SAFETY…familiarizes learners with Federal Safety and Health Regulations (OSHA) related to the wind energy industry. It introduces the student to proper methods and procedures to eliminate and control hazards related to potential injury/illness in the industry. Students will receive training in First Aid, CPR, rigging, and confined space and will receive a 10-hour OSHA for General Industry certification and Tools at Height certification upon completion of the course. PREREQUISITE: 10482101 Wind Systems Introduction

WRITTEN COMMUNICATION...teaches the writing process, which includes prewriting, drafting, revising, and editing. Through a variety of writing assignments, the 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 equivalent and COREQUISITE: 10838105 Intro Rdg & Study Skills or equivalent