



CURRICULUM PLAN

Wind Technician Associate Degree Cerro Coso College

Panel Members:

Nikki Cummings, Worldwind
Linda Parker, Kern Wind Energy Association
Jon Powers, Cal Wind
Eric Preher, NextEra Energy
Larry Venner, EnXco
Ivan Vamla, World Wind Service
Jack Wallace, Frontier Pro
Dale Whinery, Kern Community College District
David Winchester, NextEra Energy
Adolfo Zavala, EnXco

Attendees:

Kathy Alfano, CREATE
Suzie Ama, Cerro Coso
Larry Board, Cerro Coso
Jill Board, Cerro Coso
Laura Hinkle, Sierra Sands Unified School District
Robert Johnston, Kern Community College District
Valerie Karnes, Cerro Coso
Kathy Salisbury, Cerro Coso
Jennifer Schwerin, Cerro Coso
Angela Sellers, Cerro Coso
David Teasdale, Kern Community College District
Bev Thompson, Tehachapi High School

Facilitator: Dennis Faber, Principal Investigator
TIME Center

Recorder: Kathy Salisbury, Administrative Assistant to the President
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Date: December 2, 2010



Wind Technology Degree Framework—Industrial Technology Core Plus

General Education Requirements

Sciences	4	(Physical Science w/ lab)
Social/Behavioral Sciences	3	
Humanities	3	
English 101	3	
English 151 Tech Communications	3	(Technical Communications)
Math	4	(Technical Math for Trades)
Information Competency	1	(Beginning Power Point)
Diversity	3	
Health/Wellness	3	
Total	27	

Industrial Technology Core

CSCI 070	Computer Literacy	1	(Beginning Access)
CSCI 121	Beginning Word	1	
CSCI 123	Beginning Excel	1	
DRFT 108	Reading Tech Drawings	3	
ENGL 151	Technical Communications	3	
MATH 056	Technical Math for Trades	4	
MCTL 105	Basic Hand Tools	3	(Hand/Specialty Tools/Test Equip)
WELD 101	Oxy-Acetylene Welding	3	
INSF 070	Occupational Safety & Health	1	(Environmental Safety & Health)
Total		20	

Wind Technology Concentration (42.5 recommended units)

Environmental Safety and Health	1	(included above)
CPR and First Aid	0.5	
OSHA 10	1	
Introduction to Wind Technology	1	
Introduction to Mechanical Systems	3	
AC & DC Circuits	3	
Introduction to Hydraulics and Pneumatics	3	
Reading Technical Drawings and Manuals	3	(included above)
Electronics I	3	
Hand and Specialty Tools and Test Equipment	3	
Wind Technology I	4	
Work Experience for Wind Technicians	1	
Computer Productivity Tools	4	(included above)
Administrative Practices	1	
Technical Communications	3	(included above)
Technical Math for Trades	4	(included above)
Physical Science	4	(included above)
Total	23.5	(excludes 19 credits met by G.E. & Core)

Integrate Across the Curriculum—Communication, Trouble Shooting & Workplace Skills

Wind Technology Degree Framework—Stand Alone Degree

General Education Requirements

Sciences	4	(Physical Science w/ lab)
Social/Behavioral Sciences	3	
Humanities	3	
English 101	3	
English 151 Tech Communications	3	(Technical Communications)
MATH 056 Technical Math for Trades	4	(Technical Math for Trades)
Information Competency	1	(Beginning Power Point)
Diversity	3	
Health/Wellness	3	
Total	27	

Wind Technology Requirements

CSCI 070 Computer Literacy	1	(Beginning Access)
CSCI 121 Beginning Word	1	
CSCI 123 Beginning Excel	1	
Environmental Safety and Health	1	
CPR and First Aid	0.5	
OSHA 10	1	
Introduction to Wind Technology	1	
Introduction to Mechanical Systems	3	
AC & DC Circuits	3	
Introduction to Hydraulics and Pneumatics	3	
Reading Technical Drawings and Manuals	3	(included above)
Electronics I	3	
Hand and Specialty Tools and Test Equipment	3	
Wind Technology I	4	
Work Experience for Wind Technicians	1	
Computer Productivity Tools	4	(included above)
Administrative Practices	1	
Technical Communications	3	(included above)
Technical Math for Trades	4	(included above)
Physical Science	4	(included above)
Total	27.5	

Integrate Across the Curriculum—Communications, Trouble Shooting & Workplace Skills

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- A-1 Maintain a clean and safe work area E
 - A-2 Follow company and job-specific safety procedures E
 - A-3 Adhere to safe practices guidelines E
 - A-4 Discuss safety talk points with department members (daily, regularly) E
 - A-5 Complete safety training and exams E
 - A-6 Follow federal, state and local regulations E
 - A-7 Follow security requirements for the particular work area components E
 - A-8 Follow safe ergonomic practices E
 - A-10 Handle hazmats and materials according to MSDS requirements E
 - A-12 Perform safety inspections E
 - A-13 Follow environmental protection and hazardous chemical control procedures E
 - A-14 Maintain personal protective equipment E
 - A-15 Follow lock-out/tag-out procedures (energy flow/isolation) E
 - A-16 Follow company vehicle policies E
 - A-17 Participate in Job Safety Analysis (JSA) E
 - H-11 Complete incident reports E
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- H-8 Participate in audits F

K-17 Material Safety Data Sheets (MSDS)

K-26 Personal protective equipment

Certifications—Stand alone courses or modules within this course

CPR and First Aid	0.5 Unit	
OSHA 10	1.0 Unit	(OSHA 30 Certification may be needed in future)

K-1 Ability and willingness to work in all weather conditions

K-18 Weather patterns

Physical Requirements and Work Requirements

1. Ability to perform manual work, i.e.: standing, stooping, and walking.
2. Ability to lift up to 50 lbs.
3. Ability to climb a ladder 260+ feet above the ground without assistance on a frequent basis.
4. Ability to work outdoors in extreme cold and heat for extended periods of time from towers and platforms.
5. Pass drug and alcohol screening requirements
6. Drivers license and acceptable driving record
7. Criminal background clearance

Wind Industry Overview

- Role within renewable energy industry
- Transmission and distribution

Weather and Wind Energy Generation

Wind Farm Overview

- Types and characteristics of wind farms
- Technologies involved

Wind Turbine Components

Wind Technician Career Pathways

Skills Labs

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- C-1 Ensure proper fluid levels **E**
- C-2 Inspect fasteners **E**
- E-1 Select, control, inspect required tools and test equipment **E**
- E-8 Repair/replace consumable wear components **E**
- E-2 Follow operating and control check sheets and procedures **E**
- E-6 Torque and tension fasteners **E**
- E-5 Select and replace fasteners **E**
- E-4 Lubricate bearings, gears, and top offs **E**
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- D-4 Repair/replace motors and generators **F**
- D-7 Follow accepted standards and practices for mechanical and electrical assembly **F**
- D-8 Install and replace bearings **F**
- E-13 Inspect, maintain, and lubricate gearboxes **F**
- E-14 Align shafts using laser alignment equipment and procedures **F**
- E-15 Perform mechanical shaft alignments **F**
- E-10 Measure and interpret information from test equipment and tools **F**
- E-11 Perform component function tests **F**
- K-12 Gear Boxes
- Characteristics of gearboxes
 - Types of gear systems in gearboxes
 - Maintenance and lubrication-pumps and shaft end plates
 - Filters; Cleanliness; impurities
 - Gear teeth condition
- K-13 Lubrication—oil and grease; oil base (soap, clays, synthetic, animal byproduct);
- Types of lubricants and uses
 - Lubrication methods
 - Effects of poor lubrication
 - Impurities; contamination control
 - Byproducts
 - Self lubricators; grease guns
 - Maintenance and troubleshooting
 - Sampling
- K-14 Yaw Systems-- Function of Yaw control system including: wind vane, anemometer, yaw angle (alignment vs. misalignment), auto rewind function, yaw brakes and Yaw drive system
- K-15 Principles of shaft alignment
- K-16 Fasteners and torquing

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- A-11 Follow electrical safety procedures (low/medium/high voltage) **E**
- E-7 Inspect bonding and grounding points (including lightning protection) inside and outside of turbine **E**
- E-2 Follow operating and control check sheets and procedures **E**
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- C-3 Terminate and test components **E (terminate), F (test)**
- D-4 Repair/replace motors and generators **F**
- D-7 Follow accepted standards and practices for mechanical and electrical assembly **F**
- E-16 Inspect electrical components and connections **F**
- F-3 Trace circuits **F**

K-22 Basic understanding of how a wind turbine detracts and dissipates lightning

- Understand proper grounding techniques, theory, significance
- Bonding & grounding and lightning protection

K-24 Electrical Theory

- Understand and comprehend basic electrical theory.
- AC/DC voltage and current principles; resistance (series & parallel circuits), inductance, and capacitance
- Power generation principles
- Electrical components such as: motor starters, manual switches, control relays, transformers, motor controls
- Basic Wiring
- Analog and digital signals
- PLC's—basic functions and applications

K-25 Motors & Generators—basic theory and operation

Introduction to Hydraulics and Pneumatics 3 Units

E-2 Follow operating and control check sheets and procedures **E**

D-1 Troubleshoot, repair, and/or replace hydraulic systems **F**

E-19 Synchronize pitch and yaw systems **F**

K-11 Hydraulics and pneumatics

Reading Technical Drawings and Manuals 3 Units

F-13 Interpret sketches, schematics, and blueprints **F**

K-23 Wiring diagrams, schematics, US, European and Japanese component symbols

A-9	Follow ESD procedure (electro-static-discharge)	E
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C-4	Perform diagnostic checks	F
D-5	Repair/replace PLCs and controllers	F
E-12	Conduct circuit diagnostic testing	F
E-11	Perform component function tests	F
E-20	Interpret turbine operating system and efficiency data, including logs and alarms	F
E-17	Solder electrical components	F
E-2	Follow operating and control check sheets and procedures	E
E-18	Tune the circuit to meet parameters and test specs	F
F-11	Replace circuit boards	F
K-24	Electrical/ Electronics Theory	
	<ul style="list-style-type: none"> • Understand and comprehend basic electrical theory. • AC/DC voltage and current principles; resistance (series & parallel circuits), inductance, and capacitance • Power generation principles • Electrical components such as: motor starters, manual switches, control relays, transformers, motor controls • Basic Wiring • Analog and digital signals • PLC's—basic functions and applications 	

Hand and Specialty Tools and Test Equipment 3 Units

E-1	Select, control, inspect required tools and test equipment	E
B-1	Follow the established calibration schedule	E
B-2	Record performance check data	E
B-3	Red tag malfunctioning and out-of-calibration equipment	E
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B-4	Perform preventive maintenance on specialized equipment	F
B-5	Run performance checks	F
B-6	Maintain the test equipment where possible	F
B-7	Evaluate the usefulness of current equipment and the need for new equipment	F
K-19	Torque principles	

G-11	Employ proper hand signals (cranes, rigging)	E
C-4	Perform diagnostic checks	F
C-5	Perform reliability checks	F
D-6	Install, repair, replace equipment using cranes, hoists, and rigging techniques	F
G-13	Recommend changes to Standard Operating Procedures	F
C-6	Initiate pre-commissioning process	L
C-7	Energize turbine	L

Physical Requirements and Work Requirements

1. Ability to perform manual work, i.e.: standing, stooping, and walking.
2. Ability to lift up to 50 lbs.
3. Ability to climb a ladder 260+ feet above the ground without assistance on a frequent basis (height requirement to be finalized).
4. Ability to work outdoors in extreme cold and heat for extended periods of time from towers and platforms.

Certifications (preferred at entry but company will re-certify)

1. Confined Space
2. Tower Rescue

Installation & Commissioning process

- E-9 Seek help from other resources, when needed **E**
- G-2 Maintain working relationship with other departments **E**
- G-3 Interact with customers and vendors in a professional manner **E**
- G-4 Maintain a working relationship with co-workers **E**
- G-5 Work in small groups and teams to accomplish work tasks **E**
- G-6 Share information and expertise with co-workers **E**
- I-1 Participate in job or equipment-specific training **E**
- I-2 Maintain currency of technical skills **E**
- I-3 Follow a career development plan **E**

- F-10 Participate in root cause analysis sessions **F**
- G-12 Mentor co-workers **F**
- G-14 Supervise lower level technicians (1st line) **F**

- G-16 Plan work from a technical inspection or condition report **F**
- G-18 Prepare Standard Operating Procedures **L**

- K-8 Work with people of other cultures, age, gender, and beliefs
- K-9 Professional conduct, respectfulness, courteousness
- K-10 Customer service-skills to meet customer needs

Computer Productivity Tools

4 Units

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- F-8 Generate a non-conformance report **F**
- F-12 Load new control system software **F**
- H-12 Make presentations **F**
- K-5 Basic computer skills
- Complete forms
 - Manage files
 - Office productivity tools—word processing, spreadsheets, presentation, data bases
- K-21 SCADA Basics
- Operability and limitations of physical infrastructure
 - General components and connections
 - Data extracted from components
 - types of data collection and data use in industry
 - Computer process applications and networking

Administrative Practices

1 Unit

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- G-8 Interpret verbal directions/instruction **E**
- G-10 Follow manufacturer specifications in the operation & maintenance of equipment **E**
- H-2 Participate in meetings **E**
- H-3 Account for time with correct charge numbers **E**
- H-4 Complete time records (electronic and manual) **E**
- H-5 Maintain files and records **E**
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- H-7 Prepare written reports **F**
- H-11 Maintain inventory as required by department **F**
- H-9 Coordinate travel plans **F**
- H-10 Prioritize workload based on information from managers and supervisors **F**

Technical Communications

3 Units

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- H-1 Complete daily logs **E**
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- F-8 Generate a non-conformance report **F**
- F-9 Maintain detailed records and logs **F**
- G-15 Prepare written reports to convey technical information to others **F**
- H-7 Prepare written reports **F**
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- F-15 Use and/or develop troubleshooting aids and equipment manuals **F (Use), L (Develop)**
- G-18 Prepare Standard Operating Procedures **L**
- G-19 Communicate with regulatory agencies (written and verbal) **L**
- K-3 Written and verbal communicate skills

Technical Math for Trades

4 Units

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- K-4 Math Skills
- Working knowledge of measurements, layout, computation formulae, functions
 - Basic logic
 - Add, subtract, multiply, and divide in all units of measure

Physical Science

4 Units (including lab)

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- K-20 Science and engineering theories and concepts
- Basics physics
 - Behavior of matter
 - Gasses and liquids
 - Mechanical energy
 - Introductory mechanical engineering concepts
 - Levers, pulleys, machines
 - Renewable energy processes and industries
 - Environmental stewardship
 - Machines, friction, and bearings
 - Overview of power generation delivery grid systems from generation to end user including VARS (volts, amps, reactive)
 - High voltage electrical safety standards; OSHA 1910-33, NFPA 70-E
 - Aviation terminology and basic aerodynamics (physics)
 - Instrumentation and control logic theory
 - Fiber optics
 - Basic rigging

Communications Integrate Across the Curriculum

- G-1 Maintain open communication with supervisor **E**
- G-7 Present verbal reports **E**
- G-9 Employ three-way communication techniques **E**

- H-12 Make presentations **F**
- G-17 Provide informal/OJT training to co-workers **F**
- F-14 Notify the appropriate department/person of troubleshooting trends and results **F**

Trouble Shooting Integrate Across the Curriculum

- I-4 Suggest process and product improvements **E**

- F-1 Review the equipment/product information (manuals, schematics, e.g.) **F**
- F-2 Perform inspection (visual, audio, smell, touch, measurements) **F**
- F-3 Trace circuits **F**
- F-4 Apply troubleshooting techniques at the systems, sub-assembly and component level **F**
- F-5 Seek help from other resources, when needed **F**
- F-6 Verify operation of the test set/procedure **F**
- F-7 Repair/replace the equipment/product **F**
- F-8 Generate a non-conformance report **F**
- F-14 Notify the appropriate department/person of troubleshooting trends and results **F**
- F-15 Use and/or develop troubleshooting aids and equipment manuals **F (Use), L (Develop)**

Workplace Skills Integrate Across the Curriculum

- A-3 Adhere to safe practices guidelines

- K-3 Written and verbal communicate skills
- K-6 Take initiative and work without direct supervision