Degree Applicable

Glendale Community College
September, 2009

COURSE OUTLINE

Industrial Technology 160
Wind Turbine Technician Training

I. Catalog Statement

Industrial Technology160 introduces the industrial technology student to wind turbine mechanical related systems and their foundation; PLC (Programmable Logic Controllers) and control algorithms; turbine maintenance procedures; rotor construction, installation and airfoils; and SCADA (Supervisory Control and Data Acquisition) systems.

Units – 4.0
Lecture Hours – 3.0
Lab hours – 1.0
(Faculty Laboratory Hours 1.0 + Student Laboratory Hours 0.0 = 1.0 Total Laboratory Hours)

Prerequisite: None.

II. Course Entry Expectations

Skill Level Ranges: Reading 5; Writing 5; Listening/Speaking 5; Math 3.

III. Course Exit Standards

Upon successful completion of the required coursework, the student will be able to:
1. list mechanical related systems in a wind turbine;
2. describe what a PLC is used for in today's modern wind parks;
3. explain the expected lifetime of a turbine;
4. explain wind energy growth;
5. describe the parts of an airfoil;
6. explain the role of SCADA.

IV. Course Content

A. Wind Turbine Mechanical Systems 10.5 hours
   1. Mechanical related systems
   2. Foundation
   3. Tower and its function
   4. Yaw system
   5. Slew Ring

6. Yaw pinion
7. Rotor and its function
8. Types of generators
9. Gear box
10. Main shaft
11. Cowling/nacelle
12. High speed coupler
13. Fasteners and torque equipment

B. PLC's and Control Algorithms — 9 hours
1. PLC and how it operates
2. Programming a PLC
3. Simple controller logic
4. Recognizing various control system types
5. Servo mechanisms
6. Op Amps and Signal Conditioning
7. Control systems
8. Control systems switching devices
9. Control system sensors
10. Substations and transformers

C. Turbine Maintenance and Service Practices — 11 hours
1. Maintenance costs
2. Maintenance activities
3. Warranty trends and practices
4. Maintenance procedure program
5. Maintenance safety and occupational safety
6. Basic maintenance procedures
7. Trouble shooting techniques
8. Service reporting

D. Rotor Construction and Airfoils — 10 hours
1. Parts of an airfoil
2. Airfoil lift and angle of attack
3. Tip ratio speed
4. Rotor construction
5. Rotor assembly
6. Fiberglass repairs
7. Blade pitch and balancing

E. SCADA and Date Analysis — 7.5 hours
1. SCADA roles
2. SCADA monitors
3. Capacity factor
4. Power curve reports
5. Meteorological reports
6. Scatter plots

7. Data recovery
8. Data analysis
9. Remote monitoring
10. Meteorology

F. Laboratory 16 hours

V. Methods of Presentation

The following instructional methodologies may be used in the course:
1. lecture/discussion;
2. demonstration;
3. guest speakers;
4. field trips.

VI. Assignments and Methods of Evaluation

1. Midterm examination.
2. Final examination.

VII. Textbook

Gipe, P. Wind Energy Basics: A Guide to Home-and-Community Scale Wind Energy Systems. 2nd Ed.
White River Junction, VT: Chelsea Green Publishing Company, 2009.
10th Grade Reading Level. ISBN:978-1-60358-030-4

VIII. Student Learning Outcomes

1. Students will be able to list mechanical related systems in a wind turbine and airfoil.
2. Students will be able to describe what a PLC is used for in today's modern wind parks.
3. Students will be able to explain the factors that would affect the expected lifetime of a turbine.
4. Students will be able to explain the factors that will affect wind energy growth for the future.
5. Students will be able to explain the explain the role of SCADA (Supervisory Control And Data Acquisition) as it applies to wind turbine technology.