COURSE OUTLINE

AREA 303
WIND TURBINES

Prepared By: Michael J. Newtown, P.E.
Updated By: Michael J. Newtown, P.E.
A. **TITLE:** Wind Turbines

B. **COURSE NUMBER:** AREA 303

C. **CREDIT HOURS:** 3

D. **WRITING INTENSIVE COURSE:** No

E. **LENGTH OF COURSE:** 15 weeks

F. **SEMESTER(S) OFFERED:** Fall or Spring

G. **HOURS OF LECTURE:** 3 hours of lectures per week

H. **CATALOG DESCRIPTION:**
This course is an introduction to issues related to the production of electricity from wind power. The study of the atmospheric science necessary to locate wind turbines for the production of electricity will teach students how to interpret data. In addition, the study of design and control will allow for a comprehensive knowledge of all sub-components of a wind turbine. A complete analysis of all the technology utilized in the production of electricity will assist students in knowing the details involved in sizing and siting of wind turbines.

I. **PRE-REQUISITES/CO-REQUISITES:**
   a. Pre-requisites: ELEC 261, Electricity; and ELEC 215, Electrical Energy Conversion

J. **STUDENT LEARNING OUTCOMES:**
By the end of this course, the student will be able to:

<table>
<thead>
<tr>
<th>Course Objective</th>
<th>Institutional SLO</th>
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<tbody>
<tr>
<td>a. Describe appropriate locations for wind turbines and power transmission lines.</td>
<td>2. Crit. Thinking</td>
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<td>3. Prof. Competence</td>
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<td>b. Describe the most popular designs of wind turbines and the benefits and drawbacks of each.</td>
<td>1. Communication</td>
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<td>3. Prof. Competence</td>
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<td>c. Determine optional air foil shape to reduce wash effect on other turbines.</td>
<td>2. Crit. Thinking</td>
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<td>3. Prof. Competence</td>
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<td>d. Assess the standard life cycles of wind turbines using accepted engineering methods.</td>
<td>2. Crit. Thinking</td>
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<td>3. Prof. Competence</td>
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<td>e. Assess environmental issues associated with wind turbines.</td>
<td>1. Communication</td>
</tr>
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<td>2. Crit. Thinking</td>
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L. **REFERENCES:**

M. **EQUIPMENT:** Enhanced classroom

N. **GRADING METHOD:** (P/F, A-F, etc.): A-F

O. **MEASUREMENT CRITERIA/METHODS:**
   - Exam
   - Research Paper
   - Presentations
   - Homework

P. **DETAILED TOPICAL OUTLINE:**

1. Overview of electricity production from wind turbines
   A. History
   B. Current locations
   C. Proposed locations

2. Social and political issues
   A. Turbine site location considerations and zoning
   B. Transmission line considerations and zoning
   C. Property values
   D. Alternate land use
   E. Visual considerations
   F. Impact on wildlife
   G. Location near houses
   H. Noise
   I. Safety

3. Wind as fluid energy
   A. Meteorology, how wind is formed
   B. Atmosphere Layers
   C. Wind measurement
   D. Wind assessment data

4. Technical aspects of site location
   A. Geographic location
   B. Map reading
   C. Weather patterns
5. Physics of fluid flow/Aerodynamics
   A. Bernoulli’s law
   B. Air drag
   C. Vector forces
   D. Lift
   E. Stall

6. Turbine Design
   A. Material
   B. Machine Design
   C. Loads & Forces
   D. Components & Design
   E. Power Curves

7. Electrical Systems
   A. Basic Electricity
   B. DC to AC Convertors
   C. Control Systems Design

8. Technical aspects of turbine design
   A. Tower height
   B. Blade shape
   C. Blade material
   D. Turbine size

9. Weather considerations
   A. Air flow
   B. Icing of blades

10. Field trips
    A. Flat Rock Wind Farm on Tug Hill Plateau
    B. SUNY Canton wind turbine
    C. Area landowners

11. Future of wind turbines and electricity production