STATE UNIVERSITY OF NEW YORK !
COLLEGE OF TECHNOLOGY !
CANTON, NEW YORK !

MASTER SYLLABUS

COURSE NUMBER – COURSE NAME
AREA 303 - WIND TURBINES

Created by: Michael J. Newtown, P.E.

Updated by: Kibria Roman, Ph.D, P.E.

Canino School of Engineering Technology !

Department: Mechanical & Energy Technology !

Semester/Year: Fall/2018 !

A. **TITLE**: Wind Turbines

B. **COURSE NUMBER:** AREA 303

C. **CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)**

 # Credit Hours: 3
 # Lecture Hours: 3 **per week**
 # Lab Hours: **per week**
Other: **per week**

Course Length: 15 **Weeks**

D. **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

E. **GER CATEGORY: None:** ☒ **Yes:** GER !
***If course satisfies more than one*:** GER !

F. **SEMESTER(S) OFFERED: Fall** ☒ **Spring** ☒ **Fall & Spring** ☐

G. **COURSE 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.

H. **PRE-REQUISITES: None** ☐ **Yes** ☒ **If yes, list below:**

ELEC 261, Electricity; and ELEC 215, Electrical Energy Conversion

CO-REQUISITES: None ☒ **Yes** ☐ **If yes, list below:**

I. STUDENT LEARNING OUTCOMES: (*see key below*)

By the end of this course, the student will be able to:

Course Student Learning Outcome [SLO]	***Program Student Learning Outcome [PSLO]***	***GER*** *[If Applicable]*	***ISLO & SUBSETS***	
Describe appropriate locations for wind turbines and power transmission lines.	SO #1 An appropriate mastery of the knowledge, techniques, and skills, and modern tools of their disciplines utilizing renewable energy systems and design parameters		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	PS Subsets Subsets Subsets
Describe the most popular designs of wind turbines and the benefits and drawbacks of each.	SO # 7 An ability to communicate effectively through written, oral, and graphic methods related to renewable energy systems.		1-Comm Skills 5-Ind, Prof, Disc, Know Skills ISLO	W Subsets Subsets Subsets
Determine optional air foil shape to reduce wash effect on other turbines.	SO # 4 An ability to apply creativity in the design of systems, components, or processes.		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	CA Subsets Subsets Subsets
Assess the standard life cycles of wind turbines using accepted engineering methods.	SO #2 An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering, and technology by applying these areas to renewable energy systems		2-Crit Think 5-Ind, Prof, Disc, Know Skills ISLO	CA Subsets Subsets Subsets
Assess environmental issues associated with wind turbines.	SO # 6 An ability to identify, analyze and solve technical problems.		1-Comm Skills 2-Crit Think ISLO	W IA Subsets Subsets

KEY	**Institutional Student Learning Outcomes [ISLO 1 – 5]**
ISLO #	**ISLO & Subsets**
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit,/Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

*Include program objectives if applicable. Please consult with Program Coordinator !

J. APPLIED LEARNING COMPONENT: Yes ☒ No ☐

If YES, select one or more of the following categories:

- ☒ Classroom/Lab
- ☐ Internship
- ☐ Clinical Placement
- ☐ Practicum
- ☐ Service Learning
- ☐ Community Service
- ☐ Civic Engagement
- ☐ Creative Works/Senior Project
- ☐ Research
- ☐ Entrepreneurship (program, class, project)

K. TEXTS:

Wind Energy Explained by J. F. Manwell, J. G. McGowan, and A. L. Rogers c. 2002 John Wiley and Sons

L. REFERENCES:

Gipe, P. (1995) Wind Energy Comes of Age, Wiley, New York
Gasch, R. (Ed.) (1996) Wind Kraftanlagen (Windpower Plants); B.G. Teubner, Stuttgant
Eggleston, D. M., Stoddard, F.S. (1987) Wind Turbine Engineering Design, Van Nostrand Reinhold, New York
NWCC (1998) Permitting of wind energy facilities, A handbook, Prepared by the NWCC siting subcommittee, National wind coordinator committee, Washington, D.C., Mach, 1998

M. EQUIPMENT: None ☐ **Needed:** Enhanced classroom

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Exam
Research Paper
Presentations
Homework

P. DETAILED COURSE 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

Q. <u>LABORATORY OUTLINE</u>: None ☒ Yes ☐