COURSE OUTLINE

DEPT: WIND ENERGY
COURSE NUMBER: ELWT 1110
NUMBER OF CREDITS: 3 Credits (2 Lecture, 1 Lab)
COURSE TITLE: MECHANICAL SYSTEMS

CATALOG DESCRIPTION:
This course provides an understanding of wind turbine drive systems (gearboxes) and associated components. Students will be introduced to the different types of gearboxes and associated mechanical systems and subsystems of today’s wind turbines. Students will focus on lubrication, oil analysis, construction and preventative maintenance techniques for modern wind turbine drive systems.

AUDIENCE: Wind Energy Students

FULFILLS MN TRANSFER CURRICULUM AREA(s): (LEAVE BLANK IF NOT APPLICABLE)
AREA: BY MEETING THE FOLLOWING COMPETENCIES
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PREREQUISITES OR NECESSARY ENTRY SKILL/KNOWLEDGE: NONE

LENGTH OF COURSE: 1 SEMESTER

THIS COURSE IS USUALLY OFFERED:
EVERY OTHER YEAR: ☐ FALL: ☐ SPRING: ☒ SUMMER: ☐ UNDETERMINED: ☐

FOUR GOALS ARE EMPHASIZED IN COURSE AT MINNESOTA WEST COMMUNITY & TECHNICAL COLLEGE:

1) ACADEMIC CONTENT: The academic objectives of this course are:
   a. Identify different parts of a wind turbine drive system
   b. Identify with the past and current gearbox designs
   c. Describe how a gearbox system works
   d. Nomenclature of different components of a gearbox (bearing, gears & shafts)
   e. Explore the different types of braking, gear reduction and cooling systems

2) THINKING SKILLS: THIS COURSE WILL HELP STUDENTS IMPROVE THE EFFECTIVENESS OF THEIR THINKING SKILLS THROUGH:
   a. Completing homework (reading, reports, and worksheets)
   b. Participating in classroom discussions
   c. Taking open and closed book quizzes and tests
   d. Performing internet research on gearbox manufacturer specifications
   e. Disassembling a gearbox and performing a “Gear failure analysis”
   f. Creating an “Inspection Report” and “Service Report” from scratch
3) COMMUNICATIONS SKILLS: This course will help students improve their oral and written communication skills through:
   a. Participating in class discussions and reports
   b. Participating in assignments, worksheets, and reports
   c. Working with other students to collectively disassemble, inspect and reassemble a gearbox
   d. Working with other students on a gear failure analysis

4) HUMAN DIVERSITY: This course will help students recognize, understand, and appreciate human diversity through:
   a. Participating in classroom discussions
   b. Working closely with students from other cultures
   c. Working on effective communication to complete assigned tasks

TOPICS TO BE COVERED:
1) Basic drive train principles
2) Complete disassembly, inspection and reassembly of a gearbox
3) Gear/bearing failure analysis
4) Non-destructive testing techniques
5) Inspection & measuring tools and techniques
6) The purpose of a gearbox
7) Oil sample analysis
8) Brake system and oil system components
9) Metal composition and types of failures (fatigue, corrosion, lube, fractures, etc)

LIST OF EXPECTED OUTCOMES:
1) Students will be able to identify drive train parts and where they are located
2) Students will have a better understanding of gearbox operation and failures in wind energy
3) Students will have a better understanding of the past and future of wind turbine drive trains

LEARNING/TEACHING TECHNIQUES USED IN THIS COURSE:
X Collaborative Learning
X Interactive Lectures
X Lecture
X Other (describe below)
X Problem Solving
X Creative Projects
X Lab
X Student Presentations
X Individual Coaching
X Demonstrations

ASSIGNMENTS & ASSESSMENTS USED IN THIS COURSE MAY INCLUDE:
X Reading
X Tests
X Individual Projects
X Oral Presentations
X Worksheets
X Collaborative Projects
X Textbook Problems
X Papers
X Portfolio
X Group Problems
X Term Paper
X Other (as determined by the instructor)

EXPECTED STUDENT LEARNING OUTCOMES:
Students will learn wind turbine drive systems (gearboxes) and associated components. Students will be introduced to the different types of gearboxes and associated mechanical systems and subsystems of today’s wind turbines. Students will learn the characteristics of lubrication, oil analysis, construction and preventative maintenance techniques for modern wind turbine drive systems.

The information in this course outline is subject to revision

Veteran Services: Minnesota West is dedicated to assisting veterans and eligible family members in achieving their educational goals efficiently. Active duty and reserve/guard military members should advise their instructor of all regularly scheduled military appointments and duties that conflict with scheduled course requirements. Instructors will make every effort to work with the student to identify adjusted timelines. If you are a veteran, please contact the Minnesota West Veterans Service Office.
To receive reasonable accommodations for a documented disability, please contact the campus Student Services Advisor or campus Disability Coordinator as arrangements must be made in advance. In addition, students are encouraged to notify their instructor. This document is available in alternative formats to individuals with disabilities by contacting the Student Services Advisor or by calling 800-658-2330 or Minnesota Relay Service at 800-627-3529 or by using your preferred relay service.

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