DEPARTMENT: RNEW

COURSE NO. 1115

NUMBER OF CREDITS: 3

COURSE TITLE: Mechanical Fundamentals for Process Control

CATALOG DESCRIPTION:
This course covers the basic functions of equipment such as drive components, pumps, compressors, valves and basic electrical equipment. It explores various methods and the importance of equipment lubrication. Additional topics covered in this course include material handling equipment and procedures. Mechanical Fundamentals explains how equipment is used in systems such as piping systems, heat exchangers, cooling towers, refrigeration, furnace and boiler systems. Startup, shutdown, operation and troubleshooting procedures of various mechanical systems will be explained.

AUDIENCE: Trainees for process operation and production plant personnel.

LENGTH OF COURSE: _3_ credits ( _3_ lect/pres, ___lab, ___other)

THIS COURSE IS USUALLY OFFERED:
Every other year [ ] fall [ ] spring X summer [ ] undetermined [ ]

Four goals are emphasized in this course:

1) ACADEMIC CONTENT: This course will provide a basic knowledge of equipment and mechanical systems commonly found in a process facility.

2) THINKING SKILLS: The learner will use critical thinking skills to demonstrate their understanding of the information required to identify components and apply the concepts discussed in this course.

3) COMMUNICATIONS SKILLS: The learner will demonstrate written communication skills using appropriate technology that supports or facilitates communication.

4) HUMAN DIVERSITY: The student will gain self-awareness regarding the feelings towards people regardless of culture, values or socioeconomic status.
11. Troubleshooting
   11.1. Basic Concepts
   11.2. Process Examples
12. Valves
   12.1. Basic Types and Operation I and II
   12.2. Introduction to Actuators
   12.3. Electric and Hydraulic Actuators

EXPECTED LEARNING OUTCOMES:

1. State the purpose of piping & pipe fittings
2. Identify and describe common pipe fittings
3. Explain why and how pipe movement needs to be controlled
4. Describe the function and uses of both relief and safety valves.
5. Describe the purposes and uses of valves in a process system
6. Identify valve types used for on off flow control
7. Identify valve types used for throttling flow control
8. Describe the function of pneumatic actuators
9. Explain the use and rationale of valve positioners
10. Explain how pumps can be identified.
11. Identify the basic components of a pump system.
12. Describe the functions of pump auxiliary equipment and systems.
13. Identify the various types of centrifugal pumps.
14. Identify various types of rotary positive displacement pumps.
15. Describe the procedure for shutting down a typical rotary pump.
16. Describe the procedure for starting up a typical rotary pump.
17. Describe the general operating procedures of centrifugal pumps.
18. Describe various types of impellers used in centrifugal pumps.
19. Identify the general types of compressors.
20. Describe the procedure for starting up a compressor.
21. Describe the procedure for shutting down a compressor.
22. Describe the functions of compressor auxiliary equipment.
23. Identify the components of a typical compressed air system.
24. Describe the general operation of a reciprocating compressor.
25. Identify the main components of reciprocating compressors.
26. Identify the main components of a rotary compressor.
27. Explain the theory behind the concept of heat exchangers
28. Explain the basic operation of a plate and frame heat exchanger
29. Explain the basic concept of a shell in tube heat exchanger
30. Summarize the various factors that can affect heat transfer
31. Describe startup and shutdown procedures for a heat exchanger
32. Exhibit a basic understanding of the operation of a cooling tower
33. Exhibit a basic understanding of the operation of condensers
34. Exhibit a basic understanding of the operation of reboilers
35. Demonstrate understanding of basic refrigeration principals
36. State the basic requirements of steam production
37. State the basic requirements of combustion
38. Explain in general terms how a boiler produces steam
39. Exhibit a basic understanding of thermal oxidation

LEARNING/TEACHING TECHNIQUES used in the course are:

- [X] Collaborative Learning
- [ ] Student Presentations
- [ ] Creative Projects
- [ ] Lecture
- [ ] Demonstrations
- [ ] Lab
- [ ] Problem Solving
- [ ] Interactive Lectures
- [ ] Individual Coaching
- [X] Films/Videos/Slides
- [X] Other (describe below)
- Various online instructional tools

ASSIGNMENTS AND ASSESSMENTS FOR THIS CLASS INCLUDE:

- [X] Reading
- [ ] Oral Presentations
- [X] Textbook Problems
- [ ] Group Problems
- [X] Tests
- [ ] Papers
- [ ] Term Paper
- [X] Individual Projects
- [ ] Collaborative Projects
- [ ] Portfolio

EXPECTED STUDENT LEARNING OUTCOMES:
Learners will be able to identify equipment used in a process facility and develop a basic understanding of how each component works and interacts within a processing system. Startup, shutdown, operation and troubleshooting of mechanical systems will be introduced and learners will demonstrate their ability to identify and explain the purpose and functionality of each system and its components.

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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