

Course Outline

COURSE: WTRM 221 **DIVISION:** 50 **ALSO LISTED AS:** WTRM 121

TERM EFFECTIVE: Fall 2019 **CURRICULUM APPROVAL DATE:** 12/11/2018

SHORT TITLE: MECHANICAL MAINTENANCE

LONG TITLE: Mechanical Maintenance

Units	Number of Weeks		Contact Hours/Week		Total Contact Hours
3	18	Lecture:	3	Lecture:	54
		Lab:	0	Lab:	0
		Other:	0	Other:	0
		Total:	3	Total:	54

COURSE DESCRIPTION:

This course is designed to familiarize students with the basic principles of mechanical equipment design, installation, operation, maintenance, repair, overhaul and replacement. The course emphasizes understanding the value of preventative maintenance techniques such as equipment monitoring, lubrication analysis, machine alignment and scheduled overhaul. **ADVISORY:** WTRM 201: Introduction to Water/Wastewater Technology. This course was previously listed as WTRM 121.

PREREQUISITES:

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

02 - Lecture and/or discussion

05 - Hybrid

72 - Dist. Ed Internet Delayed

STUDENT LEARNING OUTCOMES:

1. Outline the basic parameters of a maintenance and preventive maintenance program.

Measure of assessment: Reading Assignments, Quiz, Design Project

Year assessed, or planned year of assessment: 2018

Semester: Fall

2. Explain the following approaches to maintenance/preventive maintenance: CMMS approach, reliability approach, and predictive mechanical maintenance.

Measure of assessment: Reading Assignments, Quiz, Design Project

Year assessed, or planned year of assessment: 2018

Semester: Fall

CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Curriculum Approval Date: 12/11/2018

3 Hours

Content: Introduction to Maintenance

Student Performance Objectives: Prepare an overview of maintenance requirements; including cleaning, equipment inspection, and parts replacement.

3 Hours

Content: Maintenance Skills - Equipment Lockout/Tagout

Student Performance Objectives: Discuss the importance of lockout/tagout as a first step toward any maintenance activity. Explain the procedures and techniques used for proper lockout/tagout; including mechanical lockouts, blocking, electrical lockouts, and other precautionary measures.

3 Hours

Content: Maintenance Skills - Lubrication and Bearings

Student Performance Objectives: Describe bearing technology, lubrication techniques, bearing failure causes, and bearing replacement techniques for different types of equipment.

3 Hours

Content: Maintenance Skills - Couplings and Alignment

Student Performance Objectives: Explain shaft alignment, coupling characteristics, floating couplings, rigid couplings, belt drives, and sheaves. List the potential costs of not doing this type of mechanical maintenance.

9 Hours

Content: Maintenance Skills -Pumps, Valves, and Pipelines

Student Performance Objectives: Recognize the makeup and maintenance requirements of centrifugal pumps, displacement pumps, reciprocating pumps and special service pumps. Discuss the different types of valves in a water system and identify repair and maintenance techniques for these valves. Explain the basic concepts of leak repair and the different techniques to repair and maintain pipe.

3 Hours

Content: Manage and Plan - History of Preventive Maintenance (PM)

Student Performance Objectives: Analyze the reasons for preventive maintenance and the importance of a good comprehensive maintenance program.

6 Hours

Content: Manage and Plan - PM Basics

Student Performance Objectives: Identify the basic preventive maintenance concepts including maintenance planning, man-hour investment, associated costs vs. benefit of doing maintenance, and other reliability issues.

12 Hours

Content: Manage and Plan - CMMS Approach to PM

Student Performance Objectives (SPO): Explain how Modern Water Utilities utilize a computerized maintenance management system to administer work effectively. Discuss the makeup, design, and operation of a CMMS system.

6 Hours

Content: Manage and Plan - Reliability Approach to Maintenance

Student Performance Objectives: Explain how to keep a system reliable with limited resources and how to integrate these challenges into an effective maintenance plan.

3 Hours

Content: Manage and Plan - Predictive Mechanical Maintenance

Student Performance Objectives: Identify techniques that will specifically address predictive maintenance that can be done periodically to mechanical equipment in a water system, water treatment plant, and waste/water treatment plant as part of an overall maintenance program.

2 Hours

METHODS OF INSTRUCTION:

Lecture, Video, Discussion

OUT OF CLASS ASSIGNMENTS:

Required Outside Hours: 68

Assignment Description: Out-of-Class Assignments: Read related chapter(s) in the textbook(s). Study for quizzes and exams.

Required Outside Hours: 36

Assignment Description: Problem Solving/Written Assignment: Design a maintenance plan project.

METHODS OF EVALUATION:

Percent of total grade: 10.00 %

Homework related to the development of the preventive maintenance project plan.

Problem-solving assignments

Percent of total grade: 30.00 %

Other: Design project for PM program.

Objective examinations

Percent of total grade: 60.00 %

Multiple Choice, True/False, Matching Items

REPRESENTATIVE TEXTBOOKS:

Recommended Representative Textbooks

J. Paul Guyer. An Introduction to Water System Pumps Operation and Maintenance, or other appropriate college level text. . Createspace Independent Publishing Platform,2015.

Reading Level of Text, Grade: 11th Verified by: MS Word

Required Other Texts and Materials

Glenn M. Tillman, Basic Mechanical Maintenance Procedures at Water and Wastewater Plants, CRC Publishing

Joel Levitt, Complete Guide to Predictive and Preventive Maintenance, Industrial Press Inc., N.Y.

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

CSU GE:

IGETC:

CSU TRANSFER:

Not Transferable

UC TRANSFER:

Not Transferable

SUPPLEMENTAL DATA:

Basic Skills: N

Classification: Y

Noncredit Category: Y

Cooperative Education:

Program Status: 1 Program Applicable

Special Class Status: N

CAN:

CAN Sequence:

CSU Crosswalk Course Department:

CSU Crosswalk Course Number:

Prior to College Level: Y

Non Credit Enhanced Funding: N

Funding Agency Code: Y

In-Service: N

Occupational Course: C

Maximum Hours: 3

Minimum Hours: 3

Course Control Number: CCC000530898

Sports/Physical Education Course: N

Taxonomy of Program: 095800