

Course Outline

COURSE: WTRM 214 **DIVISION:** 50 **ALSO LISTED AS:** WTRM 114

TERM EFFECTIVE: Fall 2019 **CURRICULUM APPROVAL DATE:** 11/13/2018

SHORT TITLE: LAB ANALYSIS WATER/WASTEWATER

LONG TITLE: Laboratory Analysis for Water, Wastewater

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 support an understanding and application of water quality laboratory basics in a practical setting. It prepares students to perform chemical, physical and bacteriological examination of water and wastewater. This class will help the student prepare for the CWEA Grade 1 Lab Analyst certification exam. This course was previously listed as WTRM 114. **ADVISORY:** WTRM 202 Beginning Water/Wastewater Mathematics or Eligible for Mathematics 430.

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. Define terminology used for basic chemical, physical, and bacteriological examination of water and wastewater.

Measure of assessment: Homework, Quiz, Exam

Year assessed, or planned year of assessment: 2018

Semester: Fall

2. Perform mathematical calculations required for basic laboratory analysis of water and wastewater.

Measure of assessment: Quiz, Homework

Year assessed, or planned year of assessment: 2018

Semester: Fall

3. Perform and/or explain basic chemical, physical, and bacteriological laboratory analysis of water and wastewater.

Measure of assessment: Written Homework, Demonstration, Exam

Year assessed, or planned year of assessment: 2018

Semester: Fall

4. Demonstrate the ability to meet the written test standards for the State of California CWEA Grade 1 Lab Analyst certification exam.

Measure of assessment: Quizzes, Exams, Worksheets

Year assessed, or planned year of assessment: 2018

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

Curriculum Approval Date: 11/13/2018

3 Hours

Content: Introduction to a Water/Wastewater Laboratory

Student Performance Objectives: Identify laboratory hazards, glassware, common reagents, and instrumentation, as well as laboratory documentation, significant figures, rounding, logbooks, and data sheets. Identify laboratory equipment utilized for basic analysis of water and wastewater.

3 Hours

Content: Explain physical and chemical analyses and their application in process control, including pH, conductivity, turbidity, dissolved oxygen, alkalinity, and hardness. Perform laboratory analyses using common reagents and instrumentation.

Student Performance Objectives: Run various experiments using the appropriate instruments. Perform collaborative laboratory exercises using reagents and instrumentation. Write a laboratory summary of experiments performed.

3 Hours

Content: Complete an analysis of alkalinity and hardness; solids (total suspended solids, volatile suspended solids, total solids, total dissolved solids, settleable solids and sludge volume index), as well as explain how these analyses apply to plant operation.

Student Performance Objectives: Run experiments and explain why solids are important in water quality analyses. Write a laboratory summary of experiments performed.

3 Hours

Content: Explain biochemical oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), and dissolved oxygen (DO).

Student Performance Objectives: Run experiments and explain the relationship among these analyses. Write a laboratory summary of experiments performed.

3 Hours

Content: Nitrogen - Ammonia, Nitrate, Nitrite, Total Kjeldahl Nitrogen

Student Performance Objectives: Outline the different methods of examination (e.g. briefly discuss ion chromatography vs. ion specific electrodes vs. distillation/titration). Describe why nitrogen is important in wastewater and water analyses. Run experiment of ammonia analysis (or relevant analysis based on available equipment). Write a laboratory summary of experiments performed.

6 Hours

Content: Quiz. Microbiological Examination of Water and Wastewater: Sampling and hold time for microbiological analyses. Preparing dehydrated media, know why media will test for which organism,

Multiple Tube Fermentation Technique and Membrane Filtration for coliforms, Most Probable Number, Heterotrophic Plate Count, Colilert 18 and 24 hours. Sterilization Techniques, Aseptically handling samples, and media; glassware used for analyses. Interpreting results.

Student Performance Objectives: Explain the different microbiological tests for water/wastewater and when each one is appropriate to run. Discuss what the test results mean and how to interpret the results. Prepare basic solutions and microbiological media for water/wastewater examination. Identify common microorganisms in water/wastewater. Write a laboratory summary of experiments performed.

3 Hours

Content: Microorganisms of Water/Wastewater

Student Performance Objectives: Identify the different organisms and explain what the presence of specific indicators means for a plant. Perform a Microscopic Examination of a drop of water and as a team identify the organisms in the water and draw a picture of what you see. Write a laboratory summary of experiments performed.

3 Hours

Content: Chlorine

Student Performance Objectives: Measure free (residual) and total chlorine. Explain how disinfection-by-products result from chlorination of a system. Discuss different forms of chlorine disinfection (gas, tablet, liquid). Discuss hazards associated with using chlorine as a disinfectant.

3 Hours

Content: Phosphate and Phosphorus

Student Performance Objectives: Analyze phosphate using the wet chemistry method. Describe differences between IC method vs. spectrophotometric method. Explain how endpoints differ in phosphorus. Explain when you would apply phosphates in the treatment process (water) and when they are naturally occurring (wastewater). Determine why phosphate and phosphorus are important for the treatment process (either water or wastewater).

3 Hours

Content: Chloride

Student Performance Objectives: Perform wet chemistry analysis of chloride and interpret results. Explain why chloride is important in the treatment process, especially in tertiary treatment. Write a laboratory summary of experiments performed. Perform chloride calculations and identify reagents used in analysis.

3 Hours

Content: Quiz. Quality Control and Quality Assurance

Student Performance Objectives: Describe what a "blank" is and how it is used in analysis. Prepare primary and secondary calibration standards. Discuss detection limits, warning limits, and control limits based on control charts. Explain why data is imperative for a laboratory to run with an analysis.

3 Hours

Content: Common Inorganic Metals in Water and Wastewater Analysis

Student Performance Objectives: Describe how metals are analyzed using an AA/GFAA/ICP. Explain the benefits and differences of each instrument. Describe how samples are prepared before analyzing on instruments

3 Hours

Content: Jar Testing

Student Performance Objectives: Run an experiment using a jar testing apparatus. Write a laboratory summary of experiments performed.

3 Hours

Content: Fluoride

Student Performance Objectives: Explain SPADNS vs. Ion Chromatography vs. Ion Selective Electrode method. Perform the wet chemistry method. Determine why fluoride is in the forefront of water treatment and how it affects wastewater treatment. Write a laboratory summary of experiments performed.

3 Hours

Content: Bioassay and Toxicity Testing

Student Performance Objectives: Describe which organisms the laboratory uses. Explain why bioassay testing is important. Discuss how treatment processes would be affected due to toxicity results. Write a laboratory summary of experiments performed.

4 Hours

Content: Field Trip to a Water Quality Laboratory

Student Performance Objectives: Identify appropriate glassware and equipment. Discuss reagent storage and advanced instrumentation. Research current issues related to analysis of water and wastewater that are performed and how they affect the general population.

2 Hours

METHODS OF INSTRUCTION:

Lectures, Discussions, Lab Demonstrations, Field Trips

OUT OF CLASS ASSIGNMENTS:

Required Outside Hours: 36

Assignment Description: Read related chapters in both water and wastewater textbooks. Study for quizzes and exams.

Required Outside Hours: 18

Assignment Description: Homework: Complete handout worksheets for each topic.

Required Outside Hours: 54

Assignment Description: Writing assignments: Write a summary of analyses performed based on readings and experiments performed. Do a literature examination of one component and how it affects treatment processes. Out-of-Class Assignments: For the organisms identified, write a brief summary of the organism, how it would affect a treatment process, or determine if it is an indicator of the health of a treatment process. Out-of-Class Assignments: Read associated text and find a current article/report on chlorine application and using the knowledge gained in class determine if one would measure total or free chlorine. Be prepared to discuss your article in class as groups. Out-of-Class Assignments: Describe the difference between a laboratory blank, replicate, and duplicate. Describe why it is important for an analyst to stay within control chart limits. Out-of-Class Assignments: From Jars 1-6, students will pick one part of the process and be able to describe what happened in that jar during testing. Be prepared to discuss your result with the entire class. Out-of-Class Assignments: Group assignment: Pros vs. Cons of Fluoride and which method student would utilize to analyze the amount of fluoride.

METHODS OF EVALUATION:

Writing assignments

Percent of total grade: 40.00 %

Percent range of total grade: 30% to 50% Written Homework, Term or Other Papers: Written Analysis of Lab Work Performed, Current Issues Related to Analysis of Water and Wastewater

Problem-solving assignments

Percent of total grade: 10.00 %

Percent range of total grade: 10% to 20% Homework Problems, Quizzes, Exams

Skill demonstrations

Percent of total grade: 10.00 %

Percent range of total grade: 10% to 20% Lab Exercises

Objective examinations

Percent of total grade: 30.00 %

Percent range of total grade: 20% to 50% Multiple Choice, Completion, Other: Math problems related to water quality analysis

Other methods of evaluation

Percent of total grade: 10.00 %

REPRESENTATIVE TEXTBOOKS:

Required Representative Textbooks

Geddes, Linda. Simplified Procedures for Water Examination, M12, Sixth Ed., or other appropriate college level text.. Denver, CO, 80235-3098: American Water Works Association,2014.

ISBN: 978-1-58321-997-3

Reading Level of Text, Grade: 13 Verified by: Dana Young

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: CCC000588792

Sports/Physical Education Course: N

Taxonomy of Program: 095800