

**Course Outline**

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

**TERM EFFECTIVE:** Fall 2018      **Inactive Course**

**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 and 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 course is now listed as WTRM 214. **ADVISORY:** WTRM 102 Beginning Water/Wastewater Mathematics or Eligible for Mathematics 205.

**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

**STUDENT LEARNING OUTCOMES:**

1. Identify laboratory equipment utilized for basic analysis of water and wastewater.

Measure: Quiz, Homework

PLO:

ILO: 2,3,7

Year assessed, or planned year of assessment: Fall 2015

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

Measure: Graded Homework

PLO:

ILO: 1,2,3,7

Year assessed, or planned year of assessment: Fall 2015

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

Measure: Quiz, Homework

PLO:

ILO: 3,7

Year assessed, or planned year of assessment: Fall 2015

4. Perform collaborative laboratory exercises using reagents and instrumentation.

Measure: Quiz, Homework

PLO:

ILO: 1,2,3,4,6,7

Year assessed, or planned year of assessment: Fall 2015

5. Prepare basic solutions and microbiological media for water/wastewater examination.

Measure: Quiz, Homework

PLO:

ILO: 3,7

Year assessed, or planned year of assessment: Fall 2015

6. Identify common microorganisms in water/wastewater.

Measure: Homework

PLO:

ILO: 1,2,3,4,7

Year assessed, or planned year of assessment: Fall 2015

7. Write a laboratory summary of experiments performed.

Measure: Paper

PLO:

ILO: 1,2,7

Year assessed, or planned year of assessment: Fall 2015

8. Research current issues related to analysis of water and wastewater that are performed and how they affect the general population.

Measure: Paper

PLO:

ILO: 1,2,3,4,6,7

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

Inactive Course: 11/13/2017

3 Hours

Content: Introduction to Laboratory

Student Performance Objectives (SPO): Identify laboratory hazards, glassware, common reagents, and instrumentation, as well as laboratory documentation, significant figures, rounding, logbooks, and data sheets

Out-of-Class Assignments: Read related chapters in both water and wastewater texts. Complete handouts from class (identifying glassware, reagents, instrumentation; rounding and significant figures)

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 (SPO): Run various experiments using the appropriate instruments

Out-of-Class Assignments: Write a summary of analyses performed based on reading and experiment 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 (SPO): Run experiments and know why solids are important in water quality analyses

Out-of-Class Assignments: Complete handouts from class

3 Hours

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

Student Performance Objectives (SPO): Run experiments and understand the relationship among these analyses

Out-of-Class Assignments: Write a summary of the analyses.

3 Hours

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

Student Performance Objectives (SPO): Outline the different methods of examination (e.g. briefly discuss ion chromatography vs. ion specific electrodes vs. distillation/titration); why nitrogen is important in wastewater and water analyses; run experiment of ammonia analysis (or relevant analysis based on available equipment).

Out-of-Class Assignments: Write a summary of the relationship among the analyses; and do a literature examination of one component and how it affects treatment processes. Prepare for a quiz on the first 5 weeks of class.

6 Hours

Content: 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 hr.

-Sterilization Techniques, Aseptically handling samples, and media; glassware used for analyses.

-Interpreting results

Student Performance Objectives (SPO): 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.

Out-of-Class Assignments: Review chapters in text and complete handouts associated with the text.

3 Hours

Content: Microorganisms of water/wastewater

Student Performance Objectives (SPO): Identify the different organisms and explain what the presence of specific indicators means for a plant.

-Microscopic Examination of a drop of water. As a team identify the organisms in the water and draw a picture of what the student sees.

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.

3 Hours

Content: Chlorine

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

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.

3 Hours

Content: Phosphate and Phosphorus

Student Performance Objectives (SPO): Analyze phosphate using the wet chemistry method; describe differences between IC method vs. spectrophotometric method; how do endpoints differ in phosphorus; explain when you would apply phosphates in the treatment process (water) and when they are naturally occurring (wastewater)

Out-of-Class Assignments: Read associated text and complete handouts; also be able to determine why phosphate and phosphorus are important for the treatment process (either water or wastewater)

3 Hours

Content: Chloride

Student Performance Objectives (SPO): Perform wet chemistry analysis of chloride; interpret results; explain why chloride is important in the treatment process, especially in tertiary treatment.

Out-of-Class Assignments: Prepare for quiz on second 5 weeks of class. Also, be able to perform chloride calculations and identify reagents used in analysis.

3 Hours

Content: Quality Control and Quality Assurance

Student Performance Objectives (SPO): 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

Out-of-Class Assignments: Describe the difference between a laboratory blank, replicate, duplicate; also describe why it is important for an analyst to stay within control chart limits.

3 Hours

Content: Common Inorganic Metals in Water and Wastewater Analysis

Student Performance Objectives (SPO): 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

Out-of-Class Assignments: Read associated chapters in text and complete handouts.

3 Hours

Content: Jar Testing

Student Performance Objectives (SPO): Run an experiment using a jar testing apparatus

Out-of-Class Assignments: From Jar s 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.

3 Hours

Content: Fluoride

Student Performance Objectives (SPO): 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

Out-of-Class Assignments: Group assignment: Pros vs. Cons of Fluoride and which method student would utilize to analyze the amount of fluoride.

3 Hours

Content: Bioassay and Toxicity Testing

Student Performance Objectives (SPO): Describe which organisms the laboratory uses, explain why bioassay testing important; discuss how treatment processes would be affected due to toxicity results

Out-of-Class Assignments: Read associated text, begin studying for final.

4 Hours

Content: Field Trip to a Water Quality Laboratory

Student Performance Objectives (SPO): Identify appropriate glassware, equipment, and discuss reagent storage and advanced instrumentation;

Out-of-Class Assignments: Study for final

2 Hours

Final

#### **METHODS OF INSTRUCTION:**

Lecture; lab exercises/demos, field trips, homework, quizzes, and final exam.

#### **METHODS OF EVALUATION:**

CATEGORY 1 - The types of writing assignments required:

Percent range of total grade: 40 % to 50 %

Written Homework

Term or Other Papers

If this is a degree applicable course, but substantial writing assignments are NOT appropriate, indicate reason:

Course primarily involves skill demonstration or problem solving

CATEGORY 2 - The problem-solving assignments required:

Percent range of total grade: 10 % to 20 %

Homework Problems

Quizzes

Exams

CATEGORY 3 - The types of skill demonstrations required:

Percent range of total grade: 10 % to 15 %

Class Performance/s

CATEGORY 4 - The types of objective examinations used in the course:

Percent range of total grade: 20 % to 30 %

Multiple Choice  
Completion  
Other: Math problems related to water quality analysis  
CATEGORY 5 - Any other methods of evaluation:  
Participation  
Percent range of total grade: 10 % to 20 %

**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:

Transferable CSU, effective 201230

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: WTRM

CSU Crosswalk Course Number: 114

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: CCC000529239

Sports/Physical Education Course: N

Taxonomy of Program: 095800