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

<table>
<thead>
<tr>
<th>Units</th>
<th>Number of Weeks</th>
<th>Contact Hours/Week</th>
<th>Total Contact Hours</th>
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<tbody>
<tr>
<td>3</td>
<td>18</td>
<td>Lecture: 3</td>
<td>Lecture: 54</td>
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<td>Lab: 0</td>
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<td></td>
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<td>Total: 3</td>
<td>Total: 54</td>
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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

1/25/2018
2. Define terminology used for basic chemical, physical, bacteriological examination of water and wastewater.
Measure: Graded Homework
PLO:
ILO: 1,2,3,7

3. Perform mathematical calculations required for basic laboratory analysis of water and wastewater.
Measure: Quiz, Homework
PLO:
ILO: 3,7

4. Perform collaborative laboratory exercises using reagents and instrumentation.
Measure: Quiz, Homework
PLO:
ILO: 1,2,3,4,6,7

5. Prepare basic solutions and microbiological media for water/wastewater examination.
Measure: Quiz, Homework
PLO:
ILO: 3,7

6. Identify common microorganisms in water/wastewater.
Measure: Homework
PLO:
ILO: 1,2,3,4,7

7. Write a laboratory summary of experiments performed.
Measure: Paper
PLO:
ILO: 1,2,7

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
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, regents, 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.

1/25/2018
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; 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
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