

**WWTR 120 Course Outline as of Fall 2024****CATALOG INFORMATION**

Dept and Nbr: WWTR 120 Title: WASTEWATER TREATMENT 1  
 Full Title: Wastewater Treatment 1  
 Last Reviewed: 10/23/2023

Units	Course Hours per Week		Nbr of Weeks		Course Hours Total	
Maximum	3.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	3.00	Lab Scheduled	0	6	Lab Scheduled	0
		Contact DHR	0		Contact DHR	0
		Contact Total	3.00		Contact Total	52.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00

Total Student Learning Hours: 157.50

Title 5 Category: AA Degree Applicable

Grading: Grade Only

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly: ENVT 120

**Catalog Description:**

In this course, students are introduced to wastewater treatment plant operations and the role of the operator including the origins and characteristics of wastewater, wastewater collection and treatment systems, and associated mathematical computations. This course will help students prepare for State Water Resources Control Board (SWRCB) Wastewater Operator Certification Examination Grade 1. A field trip to a wastewater facility during regular class hours is required.

**Prerequisites/Corequisites:**

Course Completion or Current Enrollment in WWTR 112

**Recommended Preparation:****Limits on Enrollment:****Schedule of Classes Information:**

Description: In this course, students are introduced to wastewater treatment plant operations and the role of the operator including the origins and characteristics of wastewater, wastewater collection and treatment systems, and associated mathematical computations. This course will help students prepare for State Water Resources Control Board (SWRCB) Wastewater Operator

Certification Examination Grade 1. A field trip to a wastewater facility during regular class hours is required. (Grade Only)

Prerequisites/Corequisites: Course Completion or Current Enrollment in WWTR 112

Recommended:

Limits on Enrollment:

Transfer Credit:

Repeatability: Two Repeats if Grade was D, F, NC, or NP

## **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

<b>AS Degree:</b>	<b>Area</b>	Effective:	Inactive:
<b>CSU GE:</b>	<b>Transfer Area</b>	Effective:	Inactive:

<b>IGETC:</b>	<b>Transfer Area</b>	Effective:	Inactive:
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<b>CSU Transfer:</b>	Effective:	Inactive:
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<b>UC Transfer:</b>	Effective:	Inactive:
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**CID:**

**Certificate/Major Applicable:**

Both Certificate and Major Applicable

## **COURSE CONTENT**

### **Student Learning Outcomes:**

At the conclusion of this course, the student should be able to:

1. Explain the processes commonly used to treat domestic and industrial waste and the purpose of each process.
2. Apply mathematical formulas commonly used to characterize wastewater and control treatment processes.
3. Explain the requirements of California Title 23 and qualify to take the State of California Water Resources Control Board, Wastewater Treatment Plant Operator Certification Examination Grade 1.
4. Be prepared to take the California Water Environment Association (CWEA) voluntary tests for certification in Collection System Maintenance and/or Wastewater Treatment Plant Maintenance.

### **Objectives:**

At the conclusion of this course, the student should be able to:

1. Recognize and properly apply both the metric and English units used in the field of wastewater treatment to describe concentration, flow, volume, mass, energy, strength, or other characteristics.
2. Define and correctly use standard terminology related to wastewater collection and treatment systems.
3. Recognize safety hazards and comply with standard record keeping and safety requirements.
4. Troubleshoot common wastewater treatment operational process problems and make decisions about appropriate corrective actions.
5. Identify common microorganisms used in wastewater operations and the common disease-causing organisms found in wastewater.

6. Recognize chemical symbols, properties, and reactions.
7. Apply mathematical formulas to computations involving concentration and mass.
8. Describe the effects of temperature on biological processes and chemical reactions.
9. Apply nutrient cycle concepts to wastewater process control and problem solving.
10. Recognize classes of contaminants found in wastewater and describe their relationship to wastewater treatment.
11. Define coliform organism and describe the test procedures used in measuring disinfection effectiveness.
12. Describe components and operations of the common types of pumps used in wastewater treatment processes.
13. Discuss the laws governing wastewater treatment operators and penalties that may be applied to operators and facilities.
14. Access reference sources appropriate to operational problems in the wastewater treatment field.

## **Topics and Scope:**

### **I. Introduction to Wastewater Operations**

- A. History of wastewater treatment
- B. Treatment plant operator roles and responsibilities
- C. Overview of wastewater plant treatment facilities and processes
- D. Standard terminology used in:
  1. Wastewater treatment
  2. Collection systems
  3. Industrial waste treatment
- E. Plant safety and good housekeeping

### **II. Wastewater Conveyance Infrastructure**

- A. Sanitary sewer including laterals and mains
- B. Storm and combined sewer(s)
- C. Force main sewer
- D. Collection systems
  1. Design parameters
  2. Operational considerations
  3. Maintenance and operations

### **III. Pretreatment**

- A. Processes including racks, screens, and comminutors
- B. Grit removal
- C. Design parameters
- D. Methods of operation

### **IV. Primary Treatment Processes: Sedimentation and Flotation**

- A. Clarifiers
  1. Detention time
  2. Surface settling rate
  3. Organic loading rate
  4. Weir overflow rate

### **V. Biological Factors in Wastewater Treatment**

- A. Nutrients
- B. Temperature
- C. Photosynthesis and cell respiration
- D. Types of organisms
  1. Indicator organisms
  2. Pathogens

- 3. Filamentous bacteria
- VI. Secondary Treatment
  - A. Fixed film
    - 1. Trickling filters
    - 2. Rotating biological contactors
    - 3. Hybrid devices
  - B. Activated sludge
    - 1. Conventional
    - 2. Batch reactors
    - 3. Oxidation ditches
    - 4. Package plants
  - C. Bio-solids digestion and handling of solids
  - D. Process control calculations
    - 1. Recirculation ratio
    - 2. Hydraulic loading
    - 3. Organic loading
    - 4. Mean cell residence time
    - 5. Food to mass ratio
- VII. Lagoon Systems
  - A. Design and operational control
  - B. Aeration methods and types
  - C. Surface and organic loading rates
- VIII. Overview of Wastewater Sample Collection and Preservation
  - A. Biochemical Oxygen Demand BOD
  - B. Total Suspended Solids (TSS)
  - C. Coliform organisms
  - D. Other sampling methods
  - E. Chain of custody
- IX. Overview of Centrifugal and Positive Displacement Pumps
  - A. Pump operations related to wastewater treatment plants
  - B. Considerations for selecting appropriate type of pump for pumping applications
- X. Disinfection and Chlorination Methods
  - A. Chemical
  - B. Ultraviolet
  - C. Other
  - D. Test procedures
  - E. Safety
- XI. Disposal
  - A. Effluent disposal
    - 1. Waterways
    - 2. Reclaimed/recycled
    - 3. Groundwater recharge
  - B. Solids disposal
    - 1. Land application
    - 2. Burial
    - 3. Grease/scum treatment
    - 4. Compost
- XII. Maintenance
  - A. Preventive
  - B. Planned
  - C. Scheduling
- XIII. Regulatory Requirements and Exam Preparation

- A. Data collection and analysis
- B. Records and report writing
- C. California Title 23 requirements
- D. State of California Water Resources Control Board Wastewater Treatment Plant Operator Certification exam
- E. CWEA voluntary certification test
  - 1. Collection System Maintenance
  - 2. Wastewater Treatment Plant Maintenance
- F. Renewal requirements
- G. Education and experience requirements for certification grades

**Assignment:**

- 1. Reading assignments (25-40 pages per week)
- 2. Weekly problem-solving homework assignments
- 3. Project 1: Math problems relating to the operation of a wastewater treatment plant
- 4. Project 2: Wastewater treatment plant tour and observation report
- 5. Quizzes (10-15)
- 6. Midterm exam and Final exam

**Methods of Evaluation/Basis of Grade:**

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Project 2 (observation report)	Writing 10 - 20%
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**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems; Project 1 (math problems)	Problem solving 10 - 25%
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**Skill Demonstrations:** All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None	Skill Demonstrations 0 - 0%
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**Exams:** All forms of formal testing, other than skill performance exams.

Quizzes; midterm exam and final exam	Exams 45 - 60%
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**Other:** Includes any assessment tools that do not logically fit into the above categories.

Attendance and participation	Other Category 0 - 10%
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**Representative Textbooks and Materials:**

Operation of Wastewater Treatment Plants, Volume I. 8th ed. Kerri, Ken. California State University, Sacramento. 2019.  
Instructor prepared materials