

San Bernardino Valley College
Curriculum Approved: 03/09/2015
Board Approval: 04/09/2015
Unique course Identification Number:
TOP Code: 0958.00 - Water and Wastewater Tech

I. CATALOG DESCRIPTION:

A. Department Information:

Division: Applied Technology, Transportation & Culinary Arts

Department: WATER SUPPLY TECHNOLOGY

Course ID: WST091

Course Title: Wastewater Treatment I

Units: 3

Lecture: 3 contact hour(s) per week
48 - 54 contact hours per semester

Departmental Advisory:

WST 053

Corequisite:

MATH 942C or eligibility for MATH 952 as determined by SBVC assessment process.

B. Catalog Description:

This is an introductory course in wastewater treatment. The course covers material included in the State Water Resources Control Board (SWRCB) grade I certification exam.

C. Schedule Description:

This is an introductory course in wastewater treatment. The course covers material included in the State Water Resources Control Board (SWRCB) grade I certification exam.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. COURSE OBJECTIVES FOR STUDENTS:

Upon successful completion of the course the student should be able to:

- A. Explain the SWRCB requirements for certification and the procedure required to obtain and maintain certification
- B. Analyze, identify, distinguish and explain the operations of wastewater treatment and how it protects the environment

- C. Define, discuss and explain the physical, chemical and biological aspects of wastewater treatment
- D. Identify and understand the responsibilities of a wastewater treatment operator
- E. Define and discuss the physical and mechanical functions of a wastewater treatment
- F. Identify the characteristics and sources of municipal sewage
- G. Diagram a wastewater collection system and describe the basic processes in a treatment plant
- H. Explain the differences in wastewater stabilization ponds (aerobic, anaerobic and facultative) and the factors which influence and control pond treatment processes
- I. Define and discuss safety laws, regulations and practices in the wastewater industries
- J. Compare and contrast wastewater treatment unit processes including preliminary, primary, secondary and tertiary treatment
- K. Perform basic mathematical calculations and conversions relating to water flow, pressure, volume, velocity, chemical dosage, and hydraulic and organic loading
- L. Understand the employment requirements and opportunities within the wastewater industries.

IV. COURSE CONTENT:

- A. Safety procedures
 - 1. Confined space entry
 - 2. Lockout/tag-out procedure
 - 3. Personnel protective equipment (PPE)
 - 4. Head, foot and hand protection
- B. Wastewater treatment system operator
 - 1. Typical work and duties
 - 2. Job opportunities and sources to locate openings
 - 3. SWRCB requirement for certification, application deadlines training and education required for license
- C. Relationship of sewage to public health
 - 1. Reasons for sewage treatment
 - 2. Sources
 - 3. Characteristics
 - 4. Estimate quantity
- D. Individual treatment and disposal systems
 - 1. Imhoff tank
 - 2. Septic tank
 - 3. Leach field systems
 - 4. Drying beds
- E. Preliminary treatment
 - 1. Grit removal, aerated and non-aerated quantities
 - 2. Screening and comminution
- F. Primary treatment
 - 1. Sedimentation and flotation, theory
 - 2. Removal efficiency
 - 3. Hydraulic loadings
 - 4. Weir overflow rates
 - 5. Tank design
 - 6. Configuration: rectangular vs. circular
 - 7. Removal of sludge and floatables
- G. Secondary Treatment

1. Trickling Filters
 - a. Theory of operation
 - b. Roughing filter
 - c. Low and high rate filter
 - d. Recirculation ratio
 - e. Treatment efficiencies
2. Activated sludge
 - a. Theory of operation
 - b. Conventional activated sludge
 - c. Applicability to various types of waste
3. Oxidation ponds
 - a. Theory of operation
 - b. Aerobic ponds
 - c. Anaerobic ponds
 - d. Facultative ponds
 - e. Hydraulic and organic loadings
 - f. Efficiencies
- H. Introduction to sampling and simple analysis of wastewater constituents: pH, BOD, chlorine residual, dissolved oxygen, coliform bacteria
- I. Disinfection processes
 1. Chlorination
 2. Theory of disinfection
- J. Introduction to secondary and tertiary treatment
- K. Math calculations
 1. Volumes and surface areas
 2. Overflow rates
 3. Pumping rates
 4. Detention time
 5. Flow, velocity and area
 6. Solid concentration
 7. Removal efficiency (percent removal)
 8. Chlorine feed, demand, dosage, and residual

V. METHODS OF INSTRUCTION (May include any, but do not require all, of the following):

- A. Lecture
- B. Distributed education
- C. Guest speakers
- D. Class and/or small group discussion
- E. Use of films, videotapes, or other media
- F. Use of written materials: texts, journals, etc.
- G. Classroom demonstrations
- H. Field trips
- I. Instructor generated handouts

VI. TYPICAL OUT-OF-CLASS ASSIGNMENTS:

- A. Reading assignments are required and may include (but are not limited to) the following:

Read the chapter on wastewater stabilization ponds.

1. Be prepared to discuss, in class, the difference between aerobic, anaerobic, and facultative ponds.
2. Be prepared to discuss, in class, the difference between wastewater lagoon, oxidation ponds, and polishing ponds.

- B. Critical thinking assignments are required and may include (but are not limited to) the following:

1. Calculate the Biochemical Oxygen Demand (BOD) removal, in percentage, when influent BOD is 245 mg/L and the effluent BOD is 22 mg/L.
2. Calculate the number of pounds of BOD entering a treatment plant if the flow to the plant is 2 million gallons per day (MGD) and BOD concentration is 200 mg/L.

- C. Writing assignments are required and may include (but are not limited to) the following:

1. Write a one-page report on safety hazards commonly found at a typical wastewater treatment plant.
2. Write a one-page report describing the effect of algae on the chemical characteristics of water in a stabilization pond.

VII. METHODS OF EVALUATION

- A. Class participation
- B. Examinations
- C. Homework
- D. Presentations (oral or visual)
- E. Projects
- F. Written papers or reports
- G. Quizzes
- H. Cumulative finals or certifications

VIII. TYPICAL TEXT(S):

The most current edition of the text books are listed. The books on this topic are usually published by industry trade groups and CSU, Sacramento and are not updated frequently.

- A. Kerri, K Operation of Wastewater Treatment Plants, Volume 2. 7th ed. California State University, Sacramento, 2008.
- B. Kerri, K. Operation of Wastewater Treatment Plants, Volume 1. 7th ed. California State University, Sacramento, 2008.
- C. The Task Force, WEF Operation of Municipal Wastewater Treatment Plant, 3 vol. set. 6th ed. Water Environment Federation, 2007.

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

- A. A scientific calculator