

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: WST092

Course Title: Wastewater Treatment II

Units: 3

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

Prerequisite:

WST 091

Departmental Advisory:

WST 053

B. Catalog Description:

This is a second course in a series on wastewater treatment. It includes material usually found in the State Water Resources Control Board (SWRCB) Grade II Certificate exam.

C. Schedule Description:

This is a second course in a series on wastewater treatment. It includes material usually found in the State Water Resources Control Board (SWRCB) Grade II Certificate 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. Examine the classification of wastewater treatment plants and the SWRCB certification requirement for employment within the wastewater industries
- B. Formulate a plan to practice safety procedures required to work in the wastewater industries as required by current laws and regulations
- C. Describe social responsibilities of a wastewater treatment plant operator and relate it to the protection of our environment
- D. Identify the physical, chemical and biological characteristics of the typical municipal sewage and assess its impact on the treatment procedures required
- E. Diagram the physical layout of a typical wastewater treatment plant and describe, in

- detail, the function(s) of each unit
- F. Evaluate wastewater treatment unit processes including preliminary, primary, secondary and tertiary treatment
 - G. Solve problems including hydraulic loading, activated sludge food to micro-organism (F/M) ratio, activated sludge mean cell residence time (MCRT), and pumping rates which are commonly found in wastewater treatment

IV. COURSE CONTENT:

- A. Safety
 - 1. Rules and regulations
 - a. California Code of Regulations (CCR) 8
 - b. Code of Federal Regulation(CFR) Title 40
 - 2. Confined space
 - 3. Lock-out/tag-out procedure
 - 4. Chemical and biological hazards
 - 5. Hydrogen sulfide and oxygen deficiency
 - 6. Material Safety Data Sheet (MSDS)
 - 7. Employee Right-to-Know Laws
- B. Relationship between waste treatment and public health
 - 1. Purpose of treating waste
 - 2. Sources
 - 3. Characteristics
 - 4. Estimate quantities
 - 5. Familiarity with effluent disposal regulations
 - a. National Pollutant Discharge Elimination System (NPDES)
 - b. Federal Clean Water Act
 - c. California Code of Regulation (CCR) Title 23, Chapter 26
- C. Wastewater collection systems
 - 1. Gravity
 - 2. Force main
 - 3. Flow diagrams of typical treatment processes
- D. Preliminary treatment
 - 1. Odor control
 - 2. Pre-aeration
 - 3. Flow equalization
 - 4. Chemical addition
 - 5. Grit removal-aerated and non-aerated
 - 6. Screening
 - 7. Comminution
- E. Primary treatment
 - 1. Sedimentation and flotation theory
 - 2. Removal efficiency
 - 3. Hydraulic loading
 - 4. Surface overflow rates
 - 5. Weir overflow rates
 - 6. Tank design-rectangular vs. circular
 - 7. Removal of sludge and floatables
- F. Secondary treatment processes
 - 1. Waste stabilization ponds
 - 2. Theory of biological treatment

- a. Trickling filters
- b. Activated sludge systems
- c. Nitrogen cycle
- G. Tertiary treatment processes
 - 1. Physical treatment
 - 2. Chemical treatment
- H. Effluent disinfection
- I. Solids Handling and Disposal
 - 1. Anaerobic digestion
 - 2. Drying beds
- J. Sampling and simple analysis of wastewater constituents
- K. Solve wastewater related math problems
 - 1. Volume and surface areas
 - 2. Flow and velocity
 - 3. Wet-well capacity
 - 4. Screening removal rate
 - 5. Screening pit capacity
 - 6. Grit removal rate
 - 7. Grit channel velocity
 - 8. BOD testing and concentration
 - 9. Population equivalents
 - 10. Detention times
 - 11. Hydraulic loading rate
 - 12. Surface overflow rate
 - 13. Solids loading rate
 - 14. Organic loading rate
 - 15. Weir overflow rate
 - 16. Activated sludge
 - a. SVI index
 - b. F/M ratio
 - c. MCRT
 - 17. Pumping rate
 - 18. Detention time
 - 19. Chlorine dose, demand and residual
 - 20. Percent volatile solids reduction
 - 21. Volatile acid/alkalinity

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:
1. Read the chapter on trickling filters. Be prepared to discuss, in class, the causes of ponding and the steps needed to correct a ponding problem.
 2. Read the chapter on wastewater treatment ponds. Be prepared to discuss, in class, the process of bio-flocculation in the removal of waste loads.
- B. Critical thinking assignments are required and may include (but are not limited to) the following:
1. At a 5.32 MGD wastewater treatment plant the final effluent is determined to have a suspended solids concentration of 23.5 mg/L. How many pounds of suspended solids are being discharged daily? What plant adjustments would be made based on these values if any?
 2. A trickling filter wastewater treatment plant receives a flow of 1.95 MGD. Calculate the organic loading, in pounds of BOD removed per 1,000 cubic feet per day, to this plant if it has 135 feet diameter trickling filter with a 5 feet media depth and has a primary effluent BOD concentration of 110 mg/L. Identify the classification of trickling filter based on the organic loading value.
- C. Writing assignments are required and may include (but are not limited to) the following:

Write a one page report on evaluation and identification of one of the following observations at a treatment plant. Describe how you would develop a comprehensive corrective program.

- (1) Floating sludge (bulking)
- (2) Black and odorous septic wastewater entering the secondary clarifier
- (3) Black and odorous septic wastewater leaving the primary clarifier
- (4) Sludge hard to pump from the hopper
- (5) Scum escaping in the clarifier effluent

VII. METHODS OF EVALUATION

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

VIII. TYPICAL TEXT(S):

Most current editions 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 II. 7th ed. Office of Water Program, CSU Sacramento, 2008.
- B. Kerri, Kenneth Operation of Wastewater Treatment Plants Volume I. 7th ed. Office of Water Program, California State University, Sacramento, 2008.
- C. Title 23. California Code of Regulations, 2000.

IX. OTHER SUPPLIES REQUIRED OF STUDENTS:

- A. A scientific calculator