

Mt. San Jacinto College
Integrated Course Outline of Record

Form B

Submitted by:	Melita Caldwell-Betties	Date:	10/08/2020
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Department	Subject	Course Number	Title
Water Technology	Water Technology WATR	522	Wastewater Plant Operations III, IV & V (formerly WATR-122)

Units/Hours

Each lecture unit requires 1 hour per week of class time, and 2 hours per week of study outside of class.
Each laboratory unit requires 3 hours per week of class time.
Each activity unit requires 2 hours per week of class time and 1 hour per week of study outside of class.

Lecture Units

3.00

Total Units

3.00

Lecture Contact Hours

48.00 - 54.00

Total Contact Hours

48.00 - 54.00

Lecture Homework Hours

96.00 - 108.00

Stand Alone:

Program Applicable

AA/AS Degree General Ed Breadth Area(s):

-none-

General Education Justification:

Maximum Enrollment:

40

Maximum Enrollment Justification:

Justification:

Grading Method:

Letter Grade or P/NP

TOP code:

0958.00*

Can be Taken

1

time(s) for credit (max 4)

- Visual or Performing Arts course that is required to meet major requirements for UC/CSU
- Intercollegiate athletics course
- Academic/vocational competition course

Catalog Description:

(Please do not refer to transferability or degree, certificate, or employment concentration applicability. Please only describe the course).
(75 words or less in gray box below).

This course explores the scope, limits, and methods of secondary and advanced treatment, solids handling, disinfection, and the reclamation of wastewater, through readings, discussions, analysis, and laboratory study. This course is designed for individuals seeking employment or already employed in the wastewater field. It covers the wastewater operator's job-related knowledge identified by the California State Water Resources Control Board examination developers as essential for a minimally competent Wastewater Treatment Plant Operator Grade III or above.

Schedule Description:

(Please do not refer to transferability or degree, certificate, or employment concentration applicability. Please only describe the course).
(25 words or less in gray box below).

This course is designed to familiarize students with advanced wastewater treatment systems, including secondary and tertiary treatment, solids handling, disinfection, and reclamation of wastewater.

Need for the course:

This course compliments other courses in the Water Technology Program. It enhances student understanding of the technical aspects of water/wastewater treatment in preparation of State certification testing. This course is an elective in the Water degree/certificate as well as the Environmental Studies: Water and Soil Technologies/Environmental Engineering Emphasis degree.

Prerequisite(s):

Prerequisites go through a separate approval process. See Forms E1-E6 for details.
(For further clarification, contact the Prerequisite Subcommittee)

- WATR 520 with a Grade of C or better.

Corequisite(s):

Corequisites go through a separate approval process. See Forms E1-E6 for details.

-none-

Recommend Preparation:

Recommended Preparation goes through a separate approval process. See Forms E1-E6 for details.

-none-

Other Enrollment Criteria:

-none-

Learning Objectives:

(please number each objective and express in behavioral terms)
Upon the completion of the course the student will be able to do the following:

1. Define, discuss and explain the physical, chemical and biological aspects of wastewater treatment
2. Analyze, synthesize, and evaluate advanced wastewater treatment operations in an increasingly complex manner.

- 3. Calculate unit process removal efficiency, disinfection dosages, chemical oxygen demand and biological oxygen demand.
- 4. Interpret federal and state laws and regulations as they relate to wastewater treatment processes
- 5. Identify abnormal operation procedures including the application of laboratory results to process control, equipment and facilities maintenance
- 6. Demonstrate in writing an in-depth understanding of flow diagrams of typical treatment processes
- 7. Employ effective oral, written, mathematical, and problem-solving skills.

Course Content:

(please number the outline of main topics and subtopics)

- 1. Safety
- 2. Wastewater treatment system operator
 - 1. Typical work and duties
 - 2. Job opportunities and sources to locate openings
 - 3. SWRCB requirements for certification, application deadlines, training and education
 - 4. Confined Space
 - 5. Lock-out/Tag-out procedures
 - 6. Chemical and biological hazards
 - 7. Employee Right-to-Know
 - 8. Laws rerequired for licensing
- 3. Relationship between wastewater treatment and public health
 - 1. Reasons for treating wastewater
 - 2. Sources
 - 3. Characteristics
 - 4. Estimate quantities
 - 5. Familiarity with effluent disposal regulations
 - 1. National Pollutant Discharge Elimination System (NPDES)
 - 2. Federal Clean Water Act
 - 3. California Code of Regulation (CCR) Title 23, Chapter 26
 - 6. Operation and maintenance procedures for wastewater treatment
 - 7. Odor control
 - 8. Wastewater treatment processes
- 4. Secondary Treatment Processes
 - 1. Biological
 - 2. Activated sludge (pure oxygen and operational control options)
 - 3. Biological nutrient removal
- 5. Tertiary Treatment Processes
 - 1. Chemical physical processes
 - 2. Phosphorus removal
 - 3. Nitrogen removal
 - 4. Filtration
 - 1. Solids production
 - 1. Thickening
 - 2. Stabilization
 - 2. Solids stabilization
 - 1. Anaerobic digestion
 - 2. Aerobic digestion
 - 3. Sludge dewatering
 - 1. Belt presses
 - 2. Centrifuge
 - 4. Sampling and simple anaysis of wastewater constituents
 - 5. Evaluation of wastewater unit processes-troubleshooting and process control
 - 1. Solve wastewater related math problems
 - 2. Hydraulic and organic loading rate

- 3. Activated sludge
- 4. MCRT
- 5. Wasting rate
- 6. Chemical dosage
- 7. Sludge production and thickening
- 8. Sludge digestion
- 9. Sludge dewatering
- 10. BOD calculations
- 11. Pumping rate
- 6. Effluent disinfection
- 7. Wastewater reclamation

Methods of Instruction:

Methods of instruction may include, but are not limited to the following:

- **Method:** Lecture presentation and discussion
Integration: Presentation and discussion with supporting visual materials (PowerPoints, overheads, or multimedia) of the water/wastewater topics will be used as an instructional tool to introduce concepts and terminology relevant to wastewater treatment principles throughout the course.
- **Method:** Group discussion
Integration: Small group discussion allows for students to discuss in detail, review, and application of content. This allows for students to put into practice/use terminology, processes, and issues in the field of wastewater treatment operations.
- **Method:** Videos and/or slides
Integration: Videos and/or slides will be used to provide a better understanding of wastewater processes. Videos will include operation and maintenance activities as well as safe methods and techniques used in water supply, delivery, and treatment operations.
- **Method:** Homework
Integration: Various writing assignments will be given to summarize major concepts discussed relevant to wastewater treatment plant operations.
- **Method:** Activity
Integration: Supplemental material will include reviews of current news articles concerning water or wastewater issues such as new technology, advances in process control, filtration, sludge removal, sedimentation, changes in certification, and safety.
- **Method:** Guest Lecturers
Integration: Guest lecturers will enhance students comprehension by exposing students to people who are up to date in water technology and real world field experience.

Methods of Evaluation:

A student's grade shall be determined by the instructor using multiple measures of performance related to the course objectives. Methods of evaluation may include but are not limited to the following:

- **Method:** Class Work
Integration: Students will be evaluated on a variety of written assignments demonstrating an understanding of and ability to analyze and define wastewater treatment terminology, concepts, and a variety of process control variables for certain treatment processes.
- **Method:** Exams/Tests
Integration: Students will be evaluated on a variety of written assignments demonstrating an understanding of and ability to analyze and define wastewater treatment terminology, concepts, and a variety of process control variables for certain treatment processes.
- **Method:** Quizzes
Integration: Periodic short objective tests of course-related concepts such as how wastewater treatment systems operate; safety; and, identifying process control variables for treatment processes such as dissolved air floatation, chlorine disinfection and nitrification.

- **Method:** Special Projects and Case Studies
Integration: Students will conduct research related to concepts and skills developed throughout the course. Students will compare and contrast a variety of wastewater treatment processes as well as operational costs.
- **Method:** Homework
Integration: Written out of the classroom assignments to determine understanding of content, terminology and knowledge as well as demonstrate proficiency in the subject matter.
- **Method:** Midterm and Final Examination
Integration: Periodic testing at the midpoint and final week of the semester will be utilized to determine content understanding of terminology, knowledge of subject matter, and the ability to evaluate wastewater treatment operations.

Examples of Assignments:

Students will be expected to understand and critique college level texts or the equivalent. Reading and writing, as well as out of class assignments are required. These assignments may include but are not limited to the following:

1. Identify and describe the variables influencing secondary waste water treatment.
2. Read the chapter on devices used for measuring flows in open channels and be prepared to discuss, in class, the basic principles associated with open channel devices such as V-notch weirs and parshall flumes.
3. It is time to clean a large digester that has been in service eight years. The digester is in a large metropolitan wastewater treatment facility using plant staff. Outline a comprehensive plan for the project, including disposal of grit and scum.
4. Describe various operating conditions resulting in foaming of activated sludge and routine methods for control.
5. Calculate how many pounds per day volatile solids are pumped to the digester, given a total of 3,600 gallons per day of sludge is pumped to a digester with a 5.7% solids content and 71% volatile solids?

Textbooks:

- California State University, Sacramento, CA. (2006). *Advanced Wastewater Treatment, A Field Study Program* Cal St. University, Sacramento. ISBN: 9781593710354
- Office of Water Programs (2007). *Operation of Wastewater Treatment Plants, A Field Study Program, Volume II* Cal St. University, Sacramento. ISBN: 978-1-59371-038-5
- Water Environment Federation (2013). *Wastewater Treatment Process Modeling, Second Edition (MOP 31) (WEF Manual of Practice) 2nd Edition* McGraw-Hill Education. ISBN: 978-0071798426
- Mishra, Ajay Kumar (2016). *Smart Materials for Waste Water Applications* John Wiley and Sons, Inc. ISBN: 978-1-119-04118-4
- Bitton, Gabriel (2014). *Microbiology of Drinking Water Production and Distribution* John Wiley and Sons, Inc. ISBN: 978-1-118-74392-8

Other Resources:

Minimum Qualification

- Environmental Technologies