

Mt. San Jacinto College
Integrated Course Outline of Record

Form B

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Date: 10/08/2020

Department	Subject	Course Number	Title
Non-Credit Water Technology	Non-Credit Water Technology NC/WATR	917	Test Preparation for Water Distribution Operations

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.

Total Units

Total Contact Hours

8.00 - 16.00

Stand Alone:

Stand Alone

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

-none-

General Education Justification:

Maximum Enrollment: 40

Maximum Enrollment Justification:

Justification:

Grading Method: NC-P/SP/NP

TOP code: 0958.00*

Can be Taken 99

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 refresher course covers the expected Range of Knowledge (ROK) required to obtain the California State Water Resources Control Board (SWRCB) Water Distribution Systems Operator License at the D1 and D2 level which serves as the foundation of the (SWRCB) Exam.

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 covers the exam preparation knowledge to obtain the industry certification as a Water Distribution Systems Operator at the level D1 and D2 level.

Need for the course:

There is an increasing demand for refresher course offerings in Water Technology (WST). This course is designed to prepare students for entry-level state certification examinations as a Water Distribution Systems Operator at the level D1 and D2 level. This noncredit exam preparation course will also allow students to participate in job-specific technical training.

Prerequisite(s):

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

-none-

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.

- WATR 507

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. Examine the specific requirements for passing the State Water Resources Control Board (SWRCB) Water Distribution Operator One (D1) or Water Distribution Operator Two (D2) Exam and attain certification.
2. Categorize the knowledge, skills, and abilities (KSA’s) related to the duties of an entry-level water distribution operator, which serves as the foundation of the (SWRCB) Exam.
3. Describe the examination format and scoring rubric of the state certification examination.
4. Review practice test questions including actual questions designed to measure the industry competencies required for certification.
5. Dissect multiple-choice questions of the type that appear on the state certification exam.
6. Infer basic waterworks math processes to word problems typically encountered on the SWRCB Water Treatment

- examinations utilizing the appropriate mathematical formulas to calculate design and operational values.
- 7. Integrate valuable test preparation strategies such as note-taking, time management, reading for comprehension, and identification of math concepts essential to passing the state examination.
 - 8. Explain at a level understandable by a non-technical person how to apply process and operational concepts discussed in the course to relevant real-life situations.

Course Content:

(please number the outline of main topics and subtopics)

- 1. Water distribution system operator
 - 1. Typical work and duties
 - 2. Job opportunities and sources to locate openings
 - 3. SWRCB requirements for certification, application deadlines, and continuing education units
- 2. Hydrologic cycle
 - 1. Sources of supply and source water protection
 - 2. Groundwater and surface water
 - 3. Well location, construction, yield, and terminology
 - 4. Surface water, storm water runoff, and infiltration
- 3. Water quality and its impact on human health
 - 1. Chemical, physical, and bacteriological characteristics
 - 2. Significance of organic and inorganic matter in water
 - 3. Fluoride - prevention of carries and mottling in teeth
 - 4. Nitrates and nitrites - methemoglobinemia
 - 5. Lead and copper - mental development, kidney and liver damage
 - 6. Calcium and magnesium - hardness
 - 7. Iron and manganese - stains, iron bacteria
 - 8. Coliform group - occurrence, significance, potential waterborne diseases
 - 9. pH - scale, measurement, significance
- 4. Maintenance of water quality in a distribution system-flushing operation
 - 1. Backflow prevention and cross-connection control
 - 2. Sampling requirements and collection procedures
 - 3. Bacteriological samples
 - 4. Copper and lead samples
 - 5. Volatile Organic Compound (VOC) samples
 - 6. Chlorine demand; its significance and relation to dose
 - 7. Chlorine residual measurement and reagents used
- 5. Purpose, configuration, and operation of a distribution system
 - 1. Water storage facilities such as elevated, standpipe, hydropneumatic, surge, clearwell, underground
 - 2. Valve such as gate, butterfly, globe, check, ball, and plug
 - 3. Meters such as positive displacement, current, compound, venturi, proportional
 - 4. Hydrants such as wet barrel and dry barrel
- 6. Pumps and electric motors
 - 1. Causes of water hammer and cavitation
 - 2. Routine maintenance such as packing, bearings, alignments, priming
- 7. Piping installation, operation capacities and pressure
 - 1. Effects of pipe size, type and C factor
 - 2. Significance of head loss
 - 3. Causes and effects of tuberculation
- 8. Disinfection Purpose
 - 1. Chlorine and chlorine compounds
 - 1. Characteristics
 - 2. Storage Containers
 - 3. Detection of leaks
 - 4. Hazards and safety requirement

- 2. Effects of pH, turbidity and temperature on chlorination
 - 3. Standard disinfection methods for new/repaired distribution mains
 - 4. Disinfection by products (DBPs) and formation of Trihalomethanes (THMs)
- 9. Safety Tailgate meeting
 - 1. Basic first aid Confined space entry
 - 2. Traffic control
- 10. Trenching and shoring
 - 1. Occupational Safety and Health Administration (OSHA) compliance
 - 2. Respiratory protection and chlorine leaks
- 11. Safety Data Sheets (SDS)
- 12. Lock-out/tag-out procedures
- 13. Emergency Response
 - 1. Public Relations
 - 2. Security
- 14. Water distribution mathematics
 - 1. Units and conversion factors
 - 1. Cubic feet to gallons and cubic yards
 - 2. Pressure - head to pounds per square inch (psi) and psi to head
 - 3. Gallons per minute (gpm) to cubic feet per second (CFS)
 - 2. Volume of water in cylindrical, rectangular tank, pipes
 - 3. Water level, given the volume of water and diameter of tank
 - 4. Well drawdown given the static and dynamic level
 - 5. Relation between the flow, velocity, and area
 - 6. Relation between chlorine dosage, demand, and residual

Methods of Instruction:

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

- **Method:** Activity
Integration: Activities such as word problems will be assigned with increasing levels of difficulty and will utilize algebraic reasoning to demonstrate proficiency in basic waterworks mathematics.
- **Method:** Lecture
Integration: Lecture presentation and discussion with supporting visual materials (overhead slides or multimedia) will be employed introducing concepts and terminology relevant to water treatment principles (e.g., sources of water supplies, and related water quality issues, types of disinfection and their appropriate applications, water system operation, regulatory impacts and safety issues in the water treatment industry).
- **Method:** Discussion
Integration: Individual and/or group activities such as discussions will examine basic and emerging technologies pertinent to distribution systems operations and maintenance.
- **Method:** Readings
Integration: Students will synthesize water distribution principles from authentic materials, such as textbooks, journals, and manuals will validate course content identified as industry best practice.
- **Method:** Film/video Viewing and Discussion
Integration: Film or videos will be used to illustrate various aspects of water distribution facilities, operation, and maintenance. Small group discussions will follow each viewing to analyze the video content in relation to operational criteria such as system reliability.

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 Participation
Integration: Class participation will be evaluations of small group activities and discussion of concepts or operation and maintenance strategies. These activities may be rewarded with points for participation, but not

necessarily graded with variable points. Students will be assessed on comprehension and knowledge of water distribution systems terminology, facilities, disinfection, and safety procedures. The final work product will be graded on demonstrated mastery of the subject matter.

- **Method:** Class Work
Integration: Class work will consist of practice worksheets assessed on the ability to extract relevant mathematical data as well as articulate process, operational, and design parameters. The final written work product will be graded for accuracy, completeness, and demonstrated mastery of the subject matter.
- **Method:** Quizzes
Integration: Periodic short objective tests of course-related concepts will be used to assess the students' comprehension and retention in water distribution systems operation and basic waterworks mathematics. The final written work product will be graded for accuracy, completeness, and demonstrated mastery of the subject matter.
- **Method:** Exams/Tests
Integration: A combination of objective questions of important concepts will be given to assess the students' knowledge and comprehension on material covering an operator's job-related knowledge as identified by the California State Water Resources Control Board as essential for minimally competent water industry operators. Topic areas to be examined included such as basic waterworks mathematics, water sources, operational processes, water quality, and chemical conditioning. The final written work product will be graded for accuracy, completeness, and demonstrated mastery of the subject matter.

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. Review the handout entitled "Well and Well Head Protection." Become familiar with the elements of an effective well head protection program. Be prepared to discuss in class how to maintain and rehabilitate a well.
2. Review the assigned mathematical worksheet "Blending and Dilution Calculations." Perform the basic mathematical calculations to determine the required dosage, feed rate, and concentration of a sequestering agent to be used to control corrosion at a given flow rate.
3. In preparing for the state examination, an understanding of its structure and content is helpful. Typically, the questions are divided into two types: multiple choice and math problems. The expected ranges of knowledge under examination will cover the following subjects: drinking water regulations, operator certification, water sources, and distribution system design. Specific questions on equipment operation, maintenance, plus inspection, along with water mains and piping will also be examined. This practice test consists of a variety of sample test questions designed by the state examiners to measure the industry competencies required for certification. You will be given 2½ hours to complete the examination. Prior to the submitting the examination for scoring, you are encouraged to go back, review all questions, and make changes(if any) within the time allotted. To pass the test, you must achieve a minimum total score of 70 percent.

Textbooks:

- California State University, Office of Water Programs (2018). *Water Distribution System Operation and Maintenance, 7th edition* California State University. ISBN: 978-1-323-83891-4
- California State University, Office of Water Programs (2018). *Small Water System Operation and Maintenance, 6th edition* California State University. ISBN: 978-1-323-80066-9
- Shamas, Nazih K., Wang, Lawrence K. (2015). *Water Engineering: Hydraulics, Distribution and Treatment, ed.* Wiley, John & Son Inc. . ISBN: : 978-0-470-39098-6

Other Resources:

Minimum Qualification

- Environmental Technologies