Mt. San Jacinto College
Integrated Course Outline of Record

Form B

Submitted by: Melita Caldwell-Betties **Date:** 10/08/2020

Department	Subject	Course Number	Title
Water Technology	Water Technology WATR	509	Water Distribution III, IV & V (formerly WATR-109)

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	Total Units
3.00	3.00
Lecture Contact Hours	**Total Contact Hours**
48.00 - 54.00	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 exposes students to advanced principles in the operation and maintenance of a water distribution systems. State regulations, administrative duties, and basic supervision responsibilities will also be examined.

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 exposes students to advanced principles in the operation and maintenance of a water distribution systems.

Need for the course:

This advanced course in the series enhances student understanding of the technical aspects of water distribution in preparation of state certification testing. This course is also an elective in the Water Technology 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 507 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. Distinguish environmental impacts and advances in water distribution technologies.
2. Identify sources of water and their uses.
3. Distinguish and identify the basic elements of a water distribution system, as well as their operation, maintenance and their hydraulic characteristics.
4. Solve advance mathematical calculations and conversions such as: velocity, flow rate, pump pressure, horse power, evaluation of pump performance, friction or energy losses.
5. Assess water quality issues and how they relate to the operation of a water distribution system.

6. Evaluate new development in disinfection options and their benefits/drawbacks.
7. Assess the safety issues pertinent to the water industry.
8. Diagram a typical water distribution system.

Course Content:

(please number the outline of main topics and subtopics)

1. Sources of supply and source water protection
    1. Groundwater and surface water
    2. Watershed management
    3. Sanitary survey
    4. Well head protection
2. Water mains and fittings
    1. Installation, joining, fittings, tapping, handling safety
    2. Rehabilitation, inspection, maintenance and record-keeping
    3. Service connections
3. Valves
    1. Types and appropriate choice for different function
    2. Procedures for safe opening and closing
    3. Installation, inspection, maintenance, repairs and record-keeping
4. Hydrants
    1. Dry and wet barrel design
    2. Flushing, flow testing, filling water tank trucks
    3. Inspection, installation, maintenance, repairs and record-keeping
    4. Auxiliary hydrant valves
5. Types of pumps used in water distribution with emphasis on centrifugal pump
    1. Volute
    2. Diffuser
    3. Single and double suction
    4. Axial and mixed flow
    5. Vertical turbine
    6. Submersible
    7. Deep well
    8. In-line booster
    9. Jet
6. Motors/drives
    1. Types and operations
    2. Static, dynamic, suction, and discharge head
    3. Installation, inspection, maintenance, and record-keeping
7. Generator, transformers, electrical controls
    1. Ohms law-relationship between amps, ohms, watts and volts
    2. AC/DC current
    3. Circuits
8. Distribution system maintenance
    1. Routine preventative maintenance
    2. Flushing and cleaning
    3. Disinfecting lines
    4. Pressure and leak survey
    5. Leak detection and repair
9. Meter types, sizing, installation
    1. Meter boxes and pits, shutoff valves (curb stops)
    2. Manual and automatic/remote meter reading
    3. Meter inspection for damage and tampering
    4. Meter testing and recordkeeping

10. Water system operations
    1. Daily operating procedures, monitoring process information, regulation of flows
    2. Disinfection of pipelines and storage facilities
    3. Corrosion control-causes and effects
    4. Cross connection control
    5. Water quality regulations
        1. Sampling and reporting requirements
        2. Maximum Contaminent Levels (MCL)
11. Chemical Addition
    1. Three methods recommended by American Water Works Association (AWWA); advantage/disadvantage of each method
    2. Nitrite and chloramine formation and breakpoint chlorination d. Loss of chlorine residual and water quality degradation
12. Safey
    1. Applied principles of trenching and shoring
    2. Working in a confined space
    3. Working around construction equipment
    4. OSHA (Occupational Safety and Health Administration) and the State regulations
    5. MSDS (Material Safety Data Sheets) documentation
13. Maps and drawings
    1. Engineering
    2. Importance, analysis and interpretation of commonly used symbols
    3. Convention and terminology
    4. As-built and design drawings
14. Types of records-data collection
    1. Supervisory Control and Data Acquisition
    2. Results of quality monitoring, variances, exemption
    3. Chemical use and handling operationsand reports
    4. Important system component maintenance
15. Water Distribution Mathematics
    1. Calculate pressure given volume of water in a tank
    2. Calculate horsepower requirements and cost of pumping
    3. Convert 4-20 mA signal to head in feet
    4. Calculate chlorine dose, feed, and demand
16. Utility management and leadership skills
    1. General principles of organizations
    2. Administration
    3. Water rates and finance
    4. Communication and leadership
    5. Public relations
        1. Assessment and response to water quality complaints
        2. Interpretation and evaluation of water quality standard violations
        3. Standards for public notification and dealing with the public
        4. Communication and dealing with the media
    6. Emergency planning
        1. Hazard assessment and vulnerability analysis
        2. Response during emergencies
        3. Security administration

Methods of Instruction:

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

- **Method:** Lecture presentation and discussion
  Integration: Lecture presentation and discussion with supporting visual materials (overhead slides or

multimedia) will be utilized introducing advance concepts and terminology relevant to water distribution principles throughout the course (e.g., watershed management, water system operations, preventative maintenance, and safe operating procedures).

- **Method:** Group discussion
  Integration: Group discussion on current news articles will be assigned regarding water supply and delivery alternatives; e.g. desalinization, recycle water, ground water recharge, and emerging technologies in the field. Readings from current periodicals will be examined on recent advances in water resource management and related topics pertinent to the course.
- **Method:** Film/video Viewing and Discussion
  Integration: Videos and/or slides will be used to provide a better understanding of drinking water processes. Videos will include operation and maintenance activities as well as safe methods and techniques used in water supply and delivery operations.
- **Method:** Field Trips
  Integration: A field trip will be conducted to tour a water facility to expose students to municipal water distribution operations.
- **Method:** Homework
  Integration: Written out of the classroom assignments will be assigned to examine advance course content, terminology, and demonstrate proficiency in the subject matter.
- **Method:** Visiting Lecturers
  Integration: Guest lecturers will enhance student comprehension of the subject matter by exposing students to additional course content important to the water technology discipline of and consistent with their individual learning needs.

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 water treatment terminology, advance concepts, and a variety of process control variables for certain treatment processes. The final written work product will be graded for accuracy, completeness, demonstrated mastery of the subject matter.
- **Method:** Exams/Tests
  Integration: Periodic testing at the midpoint and final week of the semester will be utilized to determine student's understanding of advanced terminology, knowledge of subject matter, and the ability to evaluate water distribution operations in an increasingly complex manner. The final written work product will be graded for accuracy, completeness, demonstrated mastery of the subject matter.
- **Method:** Homework
  Integration: Written out of the classroom assignments will be utilized to access the student's understanding of subject content, terminology, and knowledge. The written work product will be graded on accuracy, completeness, and demonstrated 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 advance water distribution operations. The final written work product will be graded for accuracy, completeness, demonstrated mastery of the subject matter.
- **Method:** Quizzes
  Integration: Periodic short objective tests of course-related concepts will be utilized such as the design of distribution systems to include system components, preventative maintenance, water quality monitoring variables, disinfection processes, and operator safety. The work product will be graded on accuracy, completeness, and demonstrated proficiency in the subject matter.
- **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 various water storage options and determine the level of system optimization

necessary to ensure delivery of reliable potable water. The final work product will be graded for 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. Read the section in the textbook on hazard communications and worker right-to-know laws in the workplace. Discuss in class, the responsibility of a lead operator to ensure operator safety during a confined space entry.
2. Write a notice to inform the public about excavation work planned in a residential neighborhood. Or, write a report for presentation to the city council identifying the need for a new truck. Describe all the features required and the cost breakdown for three different models.
3. Due to predicted population growth, the demand for water in a district is expected to increase. Write a plan which describes alternatives to meet the demand, i.e. additional storage reservoir(s), public education campaign to conserve water and reduce usage, progressive increase in rates to reduce usage, leak detection program, etc.
4. Calculate the number of pounds of chlorine gas required to disinfect a 12-inch diameter, 230 foot deep well, with static water level at 60 feet, if chlorine dosage is 50 mg/L. Discuss the factors which must be considered before sizing a facility to store chlorine gas cylinders.

Textbooks:

- Shammas, Nazih K., Wang, Lawrence K. (2015). *Water Engineering: Hydraulics, Distribution and Treatment* Wiley, John & Son Inc., . ISBN: 978-0-470-39098-6
- Office of Water Programs (2018). *Water Distribution System Operation and Maintenance, 7th Edition* California State University at Sacramento. ISBN: 978-1-323-83891-4
- Feldman, David L. (2012). *Water* John Wiley and Sons, Inc. ISBN: 978-0-7456-5032-6
- Lane, A., Norton M., Ryan, S. (2017). *Water Resources: A New Water Architecture* Wiley-Blackwell. ISBN: 978-1-118-79390-9

Other Resources:

Minimum Qualification

- Environmental Technologies