Mt. San Jacinto College
Integrated Course Outline of Record

Form B

Submitted by: Melita Caldwell-Betties **Date:** 12/17/2020

Department	Subject	Course Number	Title
Water Technology	Water Technology WATR	533	Introduction to Water Use Efficiency

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 introductory water conservation course is designed for students interested in working as a water use efficiency practitioner. It includes the expected range of knowledge required for the American Water Works Association (AWWA) Water Use Efficiency Practitioner I Certificate.

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 for students interested in working as a water use efficiency practitioner. It includes the expected range of knowledge required for certification.

Need for the course:

Throughout the nation the issue of water conservation is growing in importance. Due to drought conditions and water supply reliability concerns in the California, the need for the training and certification of water conservation personnel is crucial to the water industry. This introductory water conservation course would be designed for students interested in working as a water use efficiency practitioner. It would include the expected range of knowledge required for the American Water Works Association (AWWA) Water Use Efficiency Practitioner I Certificate. More importantly, a well-trained and knowledgeable workforce is vital to protecting public health and the environment as well as ensuring the long-term sustainability of water and wastewater systems. This course is 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)

-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.

-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. Describe the sources of water supplies in California and analyze the relationship between local and imported supplies.
2. Classify water demand and supply and how each classification affects conservation programs.
3. List and define the roles of various regulatory agencies that oversee the public water supply.
4. Assess the role and duties of a water conservation practitioner.
5. Articulate the value of water conservation to an individual and society.
6. Appraise and quantify the residential uses of water and calculate the cost effectiveness of a conservation measure.
7. Diagram industrial, commercial, and institutional use of water and recommend conservation measures for each classification.
8. Design a cost effective and sustainable water conservation program for landscape and outdoor use.

Course Content:

(please number the outline of main topics and subtopics)

1. Water supply and demand
    1. Water supplier and regulator roles and responsibilities
    2. Water rights
    3. Groundwater supplies
    4. Surface water supplies
    5. Other supplies of water
        1. Imported supplies
        2. Recycled water
        3. Desalination
        4. Groundwater recharge
        5. Water transfer
    6. Urban demand and best management practices
        1. Single and multi-family residential dwellings
        2. Commercial
        3. Industrial
        4. Institutional
        5. Irrigation
    7. Agricultural demand and best management practices
    8. Role of water conservation
    9. Long-term versus short-term conservation programs
        1. Urban water management plans
        2. Water shortage contingency plans
2. Sources of water
    1. California and Nevada
        1. Bay Delta
        2. Colorado River
        3. Truckee River
        4. Owens River
        5. Santa Ana River
        6. United States
3. Utility water demand characteristics, operations, and measures
    1. Common units of measurement
        1. Gallons per capita day
        2. Customer billing units
        3. Acre feet
        4. Million gallons
    2. Basic math
        1. Volume
        2. Percentage
        3. Unit conversion
    3. Customer demand characteristics

1. User classification
2. Demand hardening

4. Utility conservation measures
    1. System water pressure
    2. Impacts on demand
    3. Public health issues
    4. Water loss control
        1. System audits
        2. Leak detection
        3. Non-revenue water
    5. Water meters
        1. Types
        2. Functions
        3. Accuracy
        4. Leak detection
        5. Water waste ordinance
5. Customer billing
    1. Cycles
    2. Rate structures
    3. Conservation fixture standards
        1. California, Nevada, and the U. S. plumbing standards
        2. U. S. Energy Policy Act of 1992
        3. WaterSense standard

4. Residential uses and measures
    1. Indoor end-uses of fixtures and appliances
    2. Water usage in fixtures and appliances
        1. Conventional
        2. Water saving
        3. High efficiency
        4. Leak detection, field tests and measurements
        5. Indoor water conservation measures
        6. Water loss audits
        7. Toilets
            1. Operation and hardware
            2. Sources of leaks
            3. Dye test
            4. Flush volume measurement
        8. Shower and faucet
            1. Standard flow rates
            2. Methods of flow measurements
    3. Meter leak detection test
    4. Clothes washer water usage
    5. Dishwater water usage
5. Outdoor water conservation measures
    1. Water-efficient irrigation and landscape
    2. Water use survey techniques, recommendations and incentives
6. Commercial, Industrial and Institutional (CII) uses and Best Management Practices (BMP)
    1. Indoor end-users of fixtures and appliances
    2. Conventional, water saving, and high efficiency fixtures and appliances water usage
    3. Leak detection, field tests, and measurements
7. Indoor water conservation measures
    1. Toilets
    2. Shower and faucet standard flow rates
    3. Clothes washer and dishwasher water usage

8. Landscape uses and gray water
    1. Soil, water, and plant relationships
    2. Water efficient landscaping principles
        1. Hydro zones
        2. Irrigation systems
            1. Efficiency
            2. Distribution uniformity
            3. Evapotranspiration
            4. Sprinklers v. weather-based irrigation controller
            5. Appropriate plant materials
        3. California Irrigation Management Information System (CIMIS)
        4. Soil improvement and mulching
        5. Xeriscape principles and problems
9. Water use survey
    1. Water budget
    2. Irrigation controllers
    3. Irrigation efficiency
    4. Area measurement
    5. Turf-grass
        1. Types
        2. Horticultural practices
        3. Alternatives to turf-grass
10. Other outdoor water conservation measures
    1. Non-potable water
    2. Recycled
    3. Graywater
        1. Water quality issues
        2. System design
        3. Cost and water savings
        4. Rain capture

Methods of Instruction:

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

- **Method:** Lecture
  Integration: Presentation and discussion with supporting visual materials (PowerPoints, overheads, or multimedia) of the water topics will be used as an instructional tool to introduce concepts and terminology relevant to water resource management principles throughout the course.
- **Method:** 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 and regulatory constraints typically employed in the field of water conservation.
- **Method:** Film/video Viewing and Discussion
  Integration: Videos and/or slides will be used to provide a better understanding of the regulatory climate if water conservation. Videos will include field examples of the best accepted practices in water resource management, including usage, conservation, and the concepts of urban water reuse.
- **Method:** Homework
  Integration: Various writing assignments will be given to summarize major concepts discussed relevant to water conservation activities.
- **Method:** Visiting Lecturers
  Integration: Guest lecturers will enhance students comprehension by exposing students to people who are up to date in the field of water conservation and can share real world field experiences.

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 analyzing course concepts in water resource management such as demand, conservation, and urban water reuse. The final written work product will be graded for accuracy, completeness, and 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 content understanding of terminology, knowledge of subject matter, for example, the ability to promote water conservation efforts within a community. The final written work product will be graded for accuracy, completeness, and demonstrated mastery of the subject matter.
- **Method:** Homework
  Integration: Written out of the classroom assignments will be administered to determine the students' understanding of course concepts such as knowledge of the basic and emerging principles of water conservation. 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 such as the demands of water usage within a region, the relationship between local and imported supplies and best accepted practices in water resource management, such as conservation, and urban water reuse. The final written work product will be graded for accuracy, completeness, and demonstrated mastery of the subject matter.
- **Method:** Research Projects
  Integration: Students will conduct research related to concepts and skills developed throughout the course. Students will characterize the best accepted practices of water resource management, and identify methods to prevent, identify, and/or respond to water loss including leak detection, monitoring, or surveys of water supply. The final written work product will be graded for 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 article which describes how one water utility purveyor in Southern California which has enacted a water waste ordinance. After reviewing the article, discuss alternatives other than penalties to reduce water use and the pros/cons of each method in class.
2. Select an industrial building of choice. Utilizing the best accepted practices taught in the course, evaluate the indoor water-using fixtures and landscape irrigation system. The findings will be summarized in a one to two page written report offering suggestions, if any, on improvements in water efficiency.
3. In a group setting, evaluate a conservation oriented rate structure as a research project which will culminate into a group presentation. Additional discussion items to be examined durong the research project include the following sub-topics:
    1. The reasons why a conservation oriented rate structure sometimes leads to demand hardening.
    2. The different ways to reduce vulnerability of a water system to future drought and thereby increase the overall system reliability.
4. Since water is a commodity that is produced by a public water system (PWS), a water loss control program becomes very critical. Utilizing a math worksheet, use specific formulas and operating data from a PWS to perform mathematical calculations to determine "apparent" and "real" water losses. The result of the calucations will be used to initate response activities to minimize water loss including leak detection, monitoring, or sanitary surveys of water supply.

Textbooks:

- Gupta, Ram S. (2017). *Hydrology and Hydraulic Systems. 1st ed.* Waveland Press. ISBN: 978-1577664550
- Vickers, Amy. (2001). *Handbook of Water Use and Conservation.* WaterPlow Press. ISBN: 978-1931579094
- Water Environment Education (2013). *Layperson's Guide To Water Rights Law.* Water Environment Education. ISBN: : 1-893246-27-2

Other Resources:

Minimum Qualification

- Environmental Technologies