



ANTELOPE VALLEY COLLEGE  
Academic Affairs  
Course Outline of Record

**Academic Affairs Only**

- |                                     |                    |                              |
|-------------------------------------|--------------------|------------------------------|
| <input checked="" type="checkbox"/> | New Course         | 3/11/2010                    |
| <input checked="" type="checkbox"/> | Effective Date     | 201070<br>(for articulation) |
| <input type="checkbox"/>            | COR Revision       |                              |
| <input type="checkbox"/>            | Pre Req/Advisories |                              |
| <input type="checkbox"/>            | Other Changes      |                              |
| <input checked="" type="checkbox"/> | SLOs               | 2/22/2010                    |

**COURSE SUBJECT & NUMBER:** WDTO 120

**COURSE NAME:** \*Water Treatment I

**COURSE UNITS:** 3 **COURSE HOURS:** 3

**COURSE REQUISITES:** *(Follow format of similar courses found in the college catalog.)*

Advisory: Eligibility for ENGL 099, READ 099, and MATH 070.

**COURSE DESCRIPTION:** *(Write a short paragraph providing an overview of topics covered. Be sure to identify target audience--transfer, major, GE, degree/certificate, etc. If repeatable, state the number of times at end of description as (R#).*

This course is designed to train potential and current water treatment professionals in understanding the water treatment process. The course content, selected from expected range of knowledge for Grades 1 & 2 Operator Certification, Drinking Water Program, State of California, includes sources of raw water supplies, treatment requirements for different sources, various water quality parameters and their significance in drinking water with regard to public safety. Students will learn how to operate a drinking water treatment plant according to State regulations. Topics include treatment processes for removal of contaminants; elementary water chemistry; chemical dosage problems; water supply regulations; water source protection; water quality monitoring; distribution system operation; and customer complaints investigation.

The student must attend at least 36 hours of class time (contact hours) to receive a certificate of successful completion. This ensures acceptance of the certificate by the California Department of Public Health, Operator Certification Branch as a prerequisite to take state exams or contact hours for certificate renewal.

**COURSE OBJECTIVES:** *( Title 5 requires that courses show evidence of critical thinking skills. Use Bloom's taxonomy to formulate concise, performance-based measurable objectives common to all students. Objectives must be closely aligned with course content, assignments, and methods of evaluation)*

**Upon completion of course, the successful student will be able to:**

1. Analyze sources of water supply, their physical and chemical characteristics and potential contamination issues, hydrological cycle and characteristics of aquifers and surface waters
2. Demonstrate basic level competence in calculating and solving water treatment math problems including chemical dosage and feed rates; flow rates; areas and volumes; units and conversions; detention times; head losses; backwash rates; horsepower requirements; and metering.
3. Explain basic water chemistry.
4. Describe treatment processes such as coagulation, flocculation, sedimentation, filtration and disinfection.
5. Appraise water quality parameters; microbiological and chemical quality.
6. Demonstrate a basic understanding of system operation.
7. Define and analyze other miscellaneous treatment techniques including activated carbon; fluoridation; ion exchange; iron and manganese removal; advanced oxidation; softening; nitrate removal; tastes and odor causes and removal; and reduction methods of total dissolved solids.
8. Apply water regulations and the authoritative bodies responsible for their promulgation and enforcement.

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**COURSE CONTENT:** *(Enter course content in terms of specific topics or a specific body of knowledge that each instructor must cover. Put topics in outline form with major and minor headings. Each instructor must cover all material listed below.)*

I. Source Water

- A. Potential contamination in groundwater
- B. Groundwater characteristics
- C. Well drawdown calculation
- D. Hydrological cycle and changes
- E. Calculation of disinfectant dosage, well drawdown, well specific capacity
- F. Microbial contamination and potential sources of contamination in surface water
- G. Flow measurement devices and calculation of flow rates, volumes, detention time and chemical dosage
- H. Normal and abnormal characteristics (odor, color, temperature, turbidity, pH, level, etc), stratification, seasonal changes and sample collection from surface water sources/reservoirs and finished water tanks/reservoirs (clearwells)

II. Water Treatment Processes

- A. Coagulation/Flocculation/Sedimentation
  - 1. Maximum dose levels and calculation of chemical solution concentration
  - 2. Water sample analysis for process control parameters
- B. Filtration
  - 1. Turbidity causing matter
  - 2. Filtration mechanisms (absorption, adsorption), head loss effects
  - 3. Calculation of filter aid dosage, filtration rate, and filter backwash rate
- C. Disinfection
  - 1. Chlorine chemistry/breakpoint chlorination
  - 2. Safe chlorine handling practices
  - 3. Calculation of flow rates, volumes, dilution factors, feed rates, chemical concentrations and dechlorination dosage, ammonia/chlorine ratio
  - 4. Calibration and adjustment of chemical feed pumps
- D. Corrosion Control
  - 1. Causes and problems of corrosion and control methods
  - 2. Health effects of lead and copper
- E. Fluoridation
  - 1. Health effects of fluoride
  - 2. Chemical dosage
- F. Iron and Manganese
  - 1. Iron and Manganese problem
  - 2. Iron and Manganese removal processes
- G. Water Softening
  - 1. Water hardness and causes of hardness
  - 2. Water softening processes
  - 3. Unit conversions between gpg and ppm

H. Chemical Feeders

- 1. Components
- 2. Dosage calculation
- 3. Component replacement
- 4. Speed and stroke setting

I. Instrumentation

- 1. Basic SCADA system components and capabilities
- 2. On-line analyzers
- 3. Flow meters

J. Laboratory Procedures and General Laboratory Practices

- 1. Basic Chemistry - atoms, molecules, elements and compounds; pH, acids and bases; alkalinity and hardness; anions and cations; gases, liquids, and solids; organic and inorganic compounds; solutions, concentrations, and precipitation
- 2. Proper sampling (sample containers/sizes) and preservation techniques
- 3. Sample maximum holding times
- 4. Chain of Custody
- 5. Calculation of dilution factors and performing accurate dilutions
- 6. Routine test procedures – free and total chlorine, pH (acids and bases), alkalinity, temperature, conductivity, TDS, hardness, color, taste and odor, total coliform and E. Coli, HPC and membrane filtration

K. Safety

- 1. Safe working practices and habits
- 2. Personal Protective Equipment (PPE)
- 3. Safety Equipment
- 4. Hazardous chemical handling
- 5. Lock-out/tag-out procedures
- 6. Compressed gas safety procedures
- 7. Electrical safety

L. Administrative Duties

- 1. Drinking Water Regulations including Public Notification Rule
- 2. Standard Operating Procedures
- 3. Monitoring and reporting requirements
- 4. Data management and record keeping

M. Regulations

- 1. Turbidity level requirements
- 2. Disinfection residual requirements
- 3. MCLs and MRDLs of disinfectants
- 4. Public Notification Rule
- 5. Record keeping and reporting requirements
- 6. Corrective actions of regulatory violations

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**TYPICAL HOMEWORK ASSIGNMENTS: (Do not include in-class work, quizzes, or tests)**

*This information is necessary for all credit courses. Assignments should be closely related to course objectives, content, and methods of evaluation. (See sample of a "Model Outline" in the AP&P Standards & Practices Handbook.) Include a range of assignments (minimum of three) from which faculty may choose when designing their syllabus.*

**1. Describe nature and frequency of typical reading assignments if applicable; note if any are required:**

Reading assigned textbooks, approximately 20 to 30 pages weekly, as well as appropriate handouts.

**2. Describe nature and frequency of typical writing assignments if applicable; note if any are required:**

Homework assignments every two weeks based on previous lecture materials.

**3. Describe nature and frequency of typical computational assignments if applicable; note if any are required:**

Students will be required to compute between 2 to 10 math problems weekly.

**4. Describe other types of homework assignments that students may be asked to complete (oral presentations; special projects; visual/performing arts; etc); note if any are required:**

NA

**For categories 1-4 above, list the estimated hours per week it would take a student to complete assignments. Title 5 (section 55002) requires that each unit must be shown to require three hours of work per week by the student either in or out of class.**

**Homework formula: 3 hours of class work *times* each unit of credit *minus* classroom hours *equals* required homework hours.**

***Reading Assignments:*** 3 hours

***Writing Assignments:*** 1 hour

***Computational Assignments:*** 2 hours

***Other Assignments:*** 0 hours

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**METHODS OF INSTRUCTION:** *(Methods must be consistent with content and appropriate to objectives; state in terms of what instructor will be doing in order to present course content to students: for example, lecture, demonstration, present audio/visual materials; facilitate group work, etc. Do not list specific instructional equipment.)*

Lecture and instructor-led discussion  
Problem solving demonstrations by instructor  
Instructor-led small and large group exercises  
Instructor-led field trips or audio/visual aids

**METHODS OF EVALUATION:** *(These must be clearly related to course objectives and reflect course content and assignments in order to comply with Title 5 requirements. Describe what instructor will be looking for when evaluating various assignments and tests in order to determine whether students have met course objectives. Grades must be based on demonstrated proficiency in subject matter and determined, where appropriate, by essays, objective and essay tests, research papers or projects, problem solving exercises, or skills' demonstrations.)*

Multiple-choice tests will be used to assess knowledge of water treatment. (1-8)  
Homework will be evaluated for accuracy and completeness on a continuous basis as bi-weekly assignments based on most recent topics covered in class. (1-8)  
Midterm test will cover all topics covered up to that point and the final exam will encompass the whole course content. (1-8)  
Completion of 36 hours class time as required by the California Department of Public Health Operator Certification Branch.(1-8)

**Suggested Texts or Other Instructional Materials**

*(List several when possible; include title, author, publisher, date, and latest edition. If older than five years, provide brief rationale.)*

Water Treatment, Principles and Practices of Water Supply Operations  
Third Edition, 1979, 1995, 2003 American Water Works Association  
Most recent edition.