
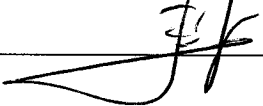




SACRAMENTO  
STATE

# Program Proposal Form B



<b>Academic Group (College):</b> College of Engineering and Computer Science	<b>Date of Submission to College Dean:</b> September 20, 2007
<b>Academic Organization (Department):</b> Department of Civil Engineering	<b>Requested Effective:</b> Fall __, Spring <u>X</u> , 200 <u>8</u> .
<b>Department Chair:</b> Ramzi Mahmood, Ph.D. PE	<b>Contact if not Department Chair:</b> Kurt Ohlinger, Ph.D. PE
<b>Title of the Program:</b> Wastewater Treatment Plant Operation Specialist Certificate Program – Certificate of Academic Achievement	
<b>Type of Program Proposal:</b>  <input checked="" type="checkbox"/> <u>XX</u> New Programs <input checked="" type="checkbox"/> <u>X</u> New Certificate Program	
<b>Briefly describe the program proposal (new or change) and provide a justification.</b>  <p>U.S. society has made significant investments in wastewater infrastructure with the objectives of protecting public health and protecting aquatic environments. The people responsible for operating and maintaining that infrastructure system and consistently meeting those public health and environmental objectives are the operators of wastewater treatment plants and wastewater collection systems. Wastewater treatment plant operators must be licensed by their state, which tests operators for competence and verifies their work experience prior to licensing them to treat wastewater for reuse and for discharge to the environment. Educating prospective wastewater treatment plant operators and providing continuing education for experienced operators is a critically important responsibility to help assure public health and protection of the environment. The proposed Wastewater Treatment Plant Operator Certificate program is designed to provide students with the technical, scientific, and application background to obtain licensure and the knowledge, skills, and abilities to competently work in the wastewater treatment industry. Specific objectives of the proposed certificate program are to provide students with the skills and knowledge to:</p> <ul style="list-style-type: none"> <li>• effectively and safely operate and maintain wastewater treatment plants</li> <li>• provide the public with consistently safe recycled water</li> <li>• protect aquatic environments by producing clean, safe treated wastewater</li> <li>• prevent public health hazards from water-borne pathogens</li> <li>• consistently provide needed recycled water volumes for water conservation purposes.</li> </ul> <p>The College of Continuing Education currently offers Certificate Programs in a variety of subject areas. As the need to increase the competency and number of qualified wastewater treatment operators increases with increasing population and increasing sophistication of wastewater treatment technology, there is an urgent demand to develop this certificate program to serve those who work to provide the public and the environment with safe water.</p>	
<b>Approvals:</b>	
<b>Department Chair:</b> <u></u>	<b>Date:</b> <u>9/19/07</u>
<b>College Dean:</b> <u></u>	<b>Date:</b> <u>9/24/07</u>
<b>University Committee:</b> _____	<b>Date:</b> _____
<b>Associate Vice President and Dean for Academic Affairs:</b> _____	<b>Date:</b> _____

## CSUS EXTENDED LEARNING PROGRAMS

### PROPOSED WASTEWATER TREATMENT PLANT OPERATION SPECIALIST CERTIFICATE PROGRAM Certificate of Academic Achievement

- 1.0 TITLE: Wastewater Treatment Plant Operation Specialist Certificate Program.
- 2.0 TYPE OF CERTIFICATE TO BE AWARDED: Certificate of Academic Achievement
- 3.0 PROGRAM OVERVIEW, GOALS AND OBJECTIVES:
  - 3.1 Program overview:
    - 3.1.1 U.S. society has made significant investments in wastewater infrastructure with the objectives of protecting public health and protecting aquatic environments. The people responsible for operating and maintaining that infrastructure system and consistently meeting those public health and environmental objectives are the operators of wastewater treatment plants and wastewater collection systems. Wastewater treatment plant operators must be licensed by their state, which tests operators for competence and verifies their work experience prior to licensing them to treat wastewater for reuse and for discharge to the environment. Educating prospective wastewater treatment plant operators and providing continuing education for experienced operators is a critically important responsibility to help assure public health and protection of the environment. The proposed Wastewater Treatment Plant Operator Certificate program is designed to provide students with the technical, scientific, and application background to obtain licensure and the knowledge, skills, and abilities to competently work in the wastewater treatment industry.
  - 3.2 Specific goals are as follows:
    - 3.2.1 To prepare students for careers as wastewater treatment professionals, with all of the consummate skills and knowledge required to reliably provide wastewater treatment services that protect public health and the environment.
    - 3.2.2 To teach students the origins, risks, and assessment of water contaminants.
    - 3.2.3 To introduce the use of selected technologies for removing contaminants from wastewater, and the operational and maintenance techniques necessary to effectively utilize those technologies.

3.2.4 To teach students about the risks associated with chemicals and equipment used in wastewater treatment and to teach proper techniques and procedures necessary to protect themselves, co-workers, and the public.

3.2.5 To teach students how to work within and comply with the requirements of the regulatory structure associated with treating, discharging, and reusing wastewater.

3.3 General Objective:

3.3.1 The overall objective of this proposed certificate program is to provide quality and relevant course work specifically designed to prepare a participant to be a successful Wastewater Treatment Plant Operation Specialist.

3.3.2 This program meets the guidelines outlined in the University Policy Manual for a Certificate of Academic Achievement. It will be offered by the College of Continuing Education and will carry academic credit.

4.0 STRUCTURE OF PROGRAM – List all Certificate Programs Requirements

4.1 The Wastewater Treatment Plant Operations Specialist Certificate Program, Certificate of Academic Achievement, will consist of three 90-hour courses, for a total of 270 hours (18 units) for the certificate program. Students are required to take all three courses to earn the Certificate of Academic Achievement.

4.1.1 Proposed curriculum

<b>CORE COURSES</b>	<b>REQUIRED/ELECTIVE</b>
CE 38A – Operation of Wastewater Treatment Plants I (6 units)	Required
CE 38B – Operation of Wastewater Treatment Plants II (6 units)	Required
CE 39 – Advanced Waste Treatment (6 units)	Required

Elective courses: None

Attachment A contains course descriptions for all courses.

4.2 Scheduling: Classes will be scheduled in an appropriate format to meet the needs of the student profile, which will include a combination of asynchronous and synchronous offerings. Asynchronous offerings, which are projected to constitute the majority of enrollments, will initially be correspondence. Computer-based training will be developed to complement correspondence course delivery. Synchronous offerings will be a combination of evening, day, and weekend offerings.

5.0 NAMES AND QUALIFICATIONS OF THE INITIATORS AND/OR ACADEMIC UNITS

- 5.1 CSUS Office of Water Programs; CSUS College of Continuing Education; CSUS College of Engineering and Computer Science (Department of Civil Engineering).
- 5.2 Primary Coordinators: for the CSUS Office of Water Programs: Kurt Ohlinger, Associate Director and Director of Certificate Programs, Grade 5 Wastewater Treatment Plant Operator; for the CSUS College of Continuing Education: Kirsten Ryden, Program Director, Department of Information Systems and Computer Technology; and for the CSUS College of Engineering and Computer Science, Ramzi Mahmood, Chair and Professor of Civil Engineering and Director, CSUS Office of Water Programs.
- 5.3 Advisory Board: Kenneth Kerri, CSUS Professor Emeritus of Civil Engineering and former Director of the CSUS Office of Water Programs; Kirsten Ryden, CSUS College of Continuing Education; William P. Lewis, Director of Utilities and Grade 5 Wastewater Treatment Plant Operator, City of Yuba City; Ramzi Mahmood, Director, CSUS Office of Water Programs; Kurt Ohlinger, Associate Director, CSUS Office of Water Programs.
- 5.4 Instructors will be state licensed wastewater treatment plant operators with significant practical experience operating and managing wastewater treatment facilities or engineers qualified to teach safe operation and maintenance of wastewater treatment facilities.
- 6.0 DURATION OF PROGRAM: Ongoing. Students should be able to complete the program within one year
- 7.0 RESOURCES NEEDS FOR THE PROGRAM: It is anticipated that this will be a self-supporting program. Asynchronous training support will be provided by Office of Water Programs staff, which is currently responsible for providing support to over 12,000 correspondence students per year. Office of Water Programs staff and College of Engineering faculty, with funding support from the Office of Water Programs, will develop computer-based training, which will provide an alternative asynchronous training delivery method. Primary site for "on-ground" classes will be at CSUS campus and CCE satellite facilities.
- 8.0 EXPECTED NUMBER OF STUDENTS AND THEIR PROBABLE BACKGROUND: We expect a variety of students to be enrolled in this program including: 1) entry level students pursuing a career in wastewater treatment, 2) experienced wastewater treatment operators seeking to enhance fundamental skills, 3) experienced water treatment plant operators seeking licensure for wastewater treatment, and 4) engineers and other professionals

working in the wastewater treatment industry. Participants may be either seeking to complete the courses for the entire certificate program or may choose to take one or more courses as part of their professional development, including preparation for certification examinations and earning education credit to renew their licenses.

We initially anticipate 100 – 150 students in each class in the program, with most students opting for asynchronous course delivery. The potential exists for significant growth as 50% of the over 5,000 licensed wastewater treatment plant operators in California are projected to retire within the next five years and the people replacing them will need training and education to enter and progress in the profession.

9.0 OTHER PERTINENT INFORMATION:

9.1 For method of evaluation, see the individual course outlines in Attachment A.

9.2 Associations and Organizations Supporting the Program:

CSUS College of Engineering and Computer Science  
CSUS Office of Water Programs  
~~CSUS Office of Regional and Continuing Education~~  
*College of Continuing Education*

# ATTACHMENT “A”

## COURSE DESCRIPTIONS AND OUTLINES

**Course Title: Operation of Wastewater Treatment Plants Volume I – CE 38A**  
6.0 Academic Credits

**Course Description**

This introductory course is designed to train operators in the safe and effective operation and maintenance of wastewater treatment plants. CE 38A emphasizes the knowledge and skills needed to operate wastewater treatment plants as efficiently as possible. Operators will gain an understanding of the basic operational aspects of their plant and learn how to analyze and solve operational problems.

**Course Outline**

- I. Introduction - The Treatment Plant Operator
- II. Why Treat Wastes?
  - A. Prevention of Pollution
  - B. What is Pure Water?
  - C. Types of Waste Discharges
  - D. Effects of Waste Discharges
  - E. Solids in Wastewater
  - F. Natural Cycles
  - G. NPDES Permits
- III. Wastewater Treatment Facilities
  - A. Collection, Treatment, Disposal
  - B. Collection of Wastewater
  - C. Treatment Plants
  - D. Preliminary Treatment
  - E. Flow Measuring Devices
  - F. Primary Treatment
  - G. Secondary Treatment
  - H. Solids Handling and Disposal
  - I. Waste Treatment Ponds
  - J. Advanced Methods of Treating Wastewater
  - K. Disinfection
  - L. Effluent Disposal
  - M. Solids Disposal
- IV. Racks, Screens, Comminutors and Grit Removal
  - A. Caution
  - B. Preliminary Treatment
  - C. Bar Screens and Racks
  - D. Comminution

- E. Grit Removal
- F. Operational Strategy
- G. Design Review
  
- V. Sedimentation and Flotation
  - A. Purpose of Sedimentation and Flotation
  - B. Operation and Maintenance
  - C. Sampling and Laboratory Analysis
  - D. Sludge and Scum Pumping
  - E. General Maintenance
  - F. Safety
  - G. Principles of Operation
  - H. Review of Plans and Specifications
  - I. Flotation Processes
  - J. Combined Sedimentation-Digestion Unit
  - K. Imhoff Tanks
  - L. Septic Tanks
  
- VI. Trickling Filters
  - A. How a Trickling Filter Works
  - B. Classification of Filters
  - C. Starting, Operating, and Shutting Down a Filter
  - D. Sampling and Analysis
  - E. Operational Strategy
  - F. Maintenance
  - G. Safety
  - H. Loading Criteria
  - I. Trickling Filter/Solids Contact (TF/SC) Process
  - J. Review of Plans and Specifications
  
- VII. Rotating Biological Contactors
  - A. Description of Rotating Biological Contactors
  - B. Process Operation
  - C. Maintenance
  - D. Safety
  - E. Review of Plans and Specifications
  - F. Loading Calculations
  
- VIII. Activated Sludge (Package Plants & Oxidation Ditches)
  - A. The Activated Sludge Process
  - B. Requirements for Control
  - C. Package Plants (Extended Aeration)
  - D. Oxidation Ditches
  - E. Review of Plans and Specifications

- IX. Wastewater Stabilization Ponds
  - A. Use of Ponds
  - B. History of Ponds in Waste Treatment
  - C. Pond Classifications and Applications
  - D. Explanation of Treatment Process
  - E. Pond Performance
  - F. Starting the Pond
  - G. Daily Operation and Maintenance
  - H. Surface Aerators
  - I. Sampling and Analysis
  - J. Safety
  - K. Review of Plans and Specifications
  - L. Eliminating Algae from Pond Effluents
  
- X. Disinfection and Chlorination
  - A. Need for Disinfection
  - B. Points of Chlorine Application
  - C. Chlorination Process Control
  - D. Chlorine Safety Program
  - E. Chlorine Handling
  - F. Chlorination Equipment and Maintenance
  - G. Other Uses of Chlorine
  - H. Dechlorination

**Required Text**

*Operation of Wastewater Treatment Plants, Volume I, 6<sup>th</sup> Ed.* (2004), Prepared by the CSU Sacramento Office of Water Programs.

**Recommended Reference**

*Standard Methods for the Examination of Water and Wastewater, 20<sup>th</sup> Ed.* (1998), Prepared by the American Public Health Association, American Water Works Association, and Water Environment Federation.

**Expected Learning Knowledge, Behavior, and Attitude Outcomes and Competencies**

1. Demonstrate understanding of basic wastewater treatment and laboratory analysis processes.
2. Articulate the skills and knowledge necessary to operate and to administer operation of treatment processes at wastewater treatment plants to produce and deliver a clean, safe plant effluent suitable for reuse or for safe discharge to the environment. Unit treatment processes include: screening, grit removal, sedimentation, fixed film and suspended growth biological treatment processes, and disinfection.

3. Understand and apply safe operation practices for working in a wastewater treatment facility.

### **Assessment Strategies and Evidence of Competency**

1. Pass unit examinations for each training unit comprising the course.
2. Pass a comprehensive final exam covering all aspects of wastewater treatment plant operation covered during the course.

**Course Title: Operation of Wastewater Treatment Plants Volume II – CE 38B**  
6.0 Academic Credits

*Course Description*

This intermediate course is a continuation of the Operation of Wastewater Treatment Plants Volume I, and is designed to train operators in the safe and effective operation and maintenance of wastewater treatment plants. CE 38B emphasizes more complex treatment processes. This course also introduces operators to supervisory and management practices, including using good management practices, administering maintenance programs, record-keeping, uses of computers, and preparation and writing of reports.

*Course Outline*

- I. Activated Sludge (Conventional Activated Sludge Plants)
  - A. The Activated Sludge Process
  - B. Aeration Systems
  - C. Safety
  - D. Checking Out a New Plant
  - E. Process Start-Up Procedures
  - F. Routine Operational Control
  - G. Abnormal Operation (Operational Problems)
  - H. Equipment Shutdown, Abnormal Operation, and Maintenance
  - I. Modifications of the Activated Sludge Process
  - J. Sequencing Batch Reactors (SBRs)
  - K. Microbiology for Activated Sludge
  
- II. Sludge Digestion and Solids Handling
  - A. Need for Sludge Digestion
  - B. Components in the Anaerobic Sludge Digestion Process
  - C. Operation of Anaerobic Digesters
  - D. Anaerobic Digestion Controls and Test Interpretation
  - E. Operational Strategy
  - F. Digester Cleaning
  - G. Aerobic Sludge Digestion
  - H. Digested Sludge Handling
  - I. Sludge Disposal
  - J. Review of Plans and Specifications
  
- III. Effluent Disposal
  - A. Importance of Effluent Disposal
  - B. Effluent Disposal by Surface Discharge
  - C. Operating Procedures
  - D. Receiving Water Monitoring

- E. Sampling and Analysis
  - F. Safety
  - G. Maintenance
  - H. Review of Plans and Specifications
  - I. Other Types of Receiving Waters
- IV. Plant Safety
- A. Why Safety?
  - B. Types of Hazards
  - C. Specific Hazards
  - D. Safety in the Laboratory
  - E. Fire Prevention
  - F. Water Supplies
  - G. Safety Equipment and Information
  - H. "Tailgate" Safety Meetings
  - I. How to Develop Safety Training Programs
  - J. Hazard Communication (Worker Right-To-Know Laws)
  - K. Safety Summary
- V. Maintenance
- A. Treatment Plant Maintenance – General Program
  - B. Mechanical Equipment
  - C. Beware of Electricity
  - D. Electrical Equipment Maintenance
  - E. Motors
  - F. Records
  - G. Additional Reading
  - H. Mechanical Maintenance
  - I. Unplugging Pipes, Pumps, and Valves
  - J. Flow Measurements – Meters and Maintenance
  - K. Review of Plans and Specifications
- VI. Laboratory Procedures and Chemistry
- A. Importance of Laboratory Procedures
  - B. Basic Laboratory Words, Equipment, and Techniques
  - C. Safety and Hygiene in the Laboratory
  - D. Sampling
  - E. Laboratory Procedures for Plant Control
  - F. Laboratory Procedures for NPDES Monitoring
- VII. Applications of Computers for Plant O & M
- A. Computers in a Treatment Plant?
  - B. How Can I Use a Computer?
  - C. How Do You Get a Computer?
  - D. Time Savings

- E. Cautions
  - F. Scada Systems
  - G. Conclusions
- VIII. Analysis and Presentation of Data
- A. Need for Analyzing and Presenting Data
  - B. Causes of Variations in Results
  - C. Manometer and Gage Reading
  - D. Chart Reading
  - E. Average or Arithmetic Mean
  - F. Range of Values
  - G. Median and Mode
  - H. Geometric Mean
  - I. Moving Averages
  - J. Graphs and Charts
  - K. Variance and Standard Deviation
  - L. Metric Calculations
- IX. Records and Report Writing
- A. Need for Records and Report Writing
  - B. Records
  - C. Report Writing
  - D. Typical Monthly Report
  - E. Emergency Planning
  - F. Additional Reading
- X. Treatment Plant Administration
- A. Need for Utility Management
  - B. Functions of a Manager
  - C. Planning
  - D. Organizing
  - E. Staffing
  - F. Communication
  - G. Conducting Meetings
  - H. Public Relations
  - I. Financial Management
  - J. Operations and Maintenance
  - K. Emergency Response
  - L. Safety Program
  - M. Record Keeping
  - N. Security Measures
  - O. Acknowledgments
  - P. Additional Reading