

# Environmental Technology

## Overview

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Folsom Lake College offers courses and/or programs in environmental technology (ENVT) in two areas:

### Environmental Technology

Folsom Lake College offers courses to provide foundational content to students interested in environmental protection, sustainability, regulatory compliance, and workplace safety and health applications. Students pursuing study in environmental technology, environmental studies, sustainability, natural resources, and related fields may continue their studies at other two- or four-year institutions. Students completing degrees in these and related disciplines may be employed by businesses and governmental agencies that require a knowledge of techniques for storage, treatment, transport, and disposal of hazardous materials; a basic understanding of the chemical and biological phenomena which underlie environmental protection; and an understanding of environmental health and safety. Technicians may be employed in remediation, monitoring, compliance, or environmental information applications.

### Water/Wastewater Management

Folsom Lake College offers courses to prepare students in competency areas to enter the field or to enhance existing abilities of individuals already employed in the field seeking to advance in Certified Operator Grade Level. Students may seek employment by private and municipal wastewater treatment facilities or industrial treatment plants. Careers in water/wastewater technology generally involve the administration, operation, troubleshooting, and maintenance of water/wastewater treatment facilities as well as sewer collection systems. Significant opportunities also exist in raw water distribution, recycled water production, desalination, advanced treatment of wastewater for indirect and direct potable use, water storage and distribution, water conservation, and enhancing the energy efficiency of wastewater treatment facilities.



## Career Options

### Environmental Technology

- Agricultural Chemical Manufacture & Application Firms
- Analytical Laboratories
- Electronics Semiconductor Industry
- Energy & Environmental Audit/Inventories
- Engineering/Consulting Firms
- Governmental Compliance Agencies
- Solid Waste Disposal Landfills
- Storage, Treatment, and Disposal Facilities
- Warehouse-Transportation Systems

- Workplace Health and Safety Support

### Wastewater Management

- Backflow Program Manager
- California Certified Drinking Water Treatment Plant Operator
- California Certified Wastewater Treatment Plant Operator
- Cross Connection Control Specialist
- Equipment Maintenance Operator
- Instrumentation and Control Technician or Supervisor
- Mechanical Systems Technician
- Meter Maintenance Technician
- Plant Process Control Supervisor
- Recycled Water Inspector
- Water Systems Technician

Many career options require more than two years of college study. Classes beyond the associate degree may be required to fulfill some career options or for preparation for transfer to a college or university program.

## Highlights

### Environmental Technology

- Broad-based field with applications ranging from recordkeeping to pollution cleanup to emergency response

### Wastewater Management

- Streamlined curriculum designed to meet the competency areas for students interested in entering into the field of water and wastewater management and to enhance the existing abilities of an individual already employed in the field
- Broad-based field providing a firm foundation of the training regulations, general management, and operational challenges associated with water, wastewater, and recycled water industries
- Lecture and laboratory settings with field trips to a variety of treatment plants in the region
- Work experience and internship opportunities with local water and wastewater agencies and related providers

## Program Maps

[Science, Technology, Engineering, and Mathematics Undecided Major \(/flc/main/doc/instruction/program-maps/STEM-Uncecided-major.pdf\)](/flc/main/doc/instruction/program-maps/STEM-Uncecided-major.pdf)

[Environmental Technology, Water/Wastewater Management, Certificate of Achievement \(/flc/main/doc/instruction/program-maps/Water-Wastewater-Management-Certificate.pdf\)](/flc/main/doc/instruction/program-maps/Water-Wastewater-Management-Certificate.pdf)

Dean [Vicky Maryatt \(/about-us/contact-us/faculty-and-staff-directory/vicky-maryatt\)](/about-us/contact-us/faculty-and-staff-directory/vicky-maryatt)

Department Chair [Sherry Rogers \(/about-us/contact-us/faculty-and-staff-directory/sherry-rogers\)](/about-us/contact-us/faculty-and-staff-directory/sherry-rogers)

Meta-Major [Science, Technology, Engineering, and Mathematics \(/academics/meta-majors/science-technology-engineering-and-mathematics\)](/academics/meta-majors/science-technology-engineering-and-mathematics)

Phone (916) 608-6927

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## Certificate of Achievement

### Water/Wastewater Management Certificate

This program is designed to meet competency areas for students interested in entering the field of Water and Wastewater Management, and to enhance the knowledge and abilities of an individual already employed in the field.

Catalog Date: June 1, 2020

### Certificate Requirements

COURSE CODE	COURSE TITLE	UNITS
BUSTEC 110	Business Procedures for Professional Success	3 <sup>1</sup>
ENVT 351	Math for Water and Wastewater Operators	3
ENVT 353	Science for Water and Wastewater Operators	4
ENVT 354	Waste Water Management: Basic Instrumentation and Electrical Controls	4
ENVT 355	Introduction to Water, Wastewater and Recycled Water Management	3

COURSE CODE	COURSE TITLE	UNITS
ENVT 380	Water and Wastewater Treatment Plant Operations I	3
ENVT 381	Water and Wastewater Treatment Plant Operations II	3
ENVT 382	Water and Wastewater System Regulations and Management	3
ENVT 383	Water Distribution and Wastewater Collection Systems	3
<b>Total Units:</b>		<b>29</b>

<sup>1</sup>Business course offered by other department. In the event this course is unavailable or cancelled, other similar business courses with like content may be substituted, as approved by faculty.

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- review the history and importance of community water and wastewater systems, their social benefits, common operational challenges, and how they support and promote the welfare of all modern societies.
- evaluate water and wastewater system regulations (federal and state), water pollution control and safe drinking water laws, environmental economics that influence pollution control strategies, the importance of environmental stewardship, application of scientific concepts in water/wastewater management, and other factors that influence programs that protect public health and the environment.
- examine common water and wastewater treatment processes and principles, including fundamental physical, chemical, and biologic treatment processes common in the proper operation of water and wastewater facilities.
- evaluate hydraulic and fluid dynamic principles of water, and application of these principles to wastewater collection and water distribution systems.
- use, define, and apply industry terminology, nomenclature, and common water and wastewater treatment technical terms to classify, compare, and differentiate water and wastewater processes.
- formulate mathematical models and equations to analyze, plan, evaluate, manage, troubleshoot, correct, and predict water and wastewater system processes.
- assess professional and ethical responsibilities of a water/wastewater treatment practitioner as it relates to the principle objectives of public and environmental health.
- explain occupational health and safety protocols to address risks encountered in water/wastewater treatment, wastewater collection, water distribution, and water recycling operations.
- apply personal safety practices which demonstrate an understanding of personal safety practices in the water, wastewater and recycled water industries.
- seek employment in the water and wastewater industries in the region.

## Career Information

Students with certificates in Water/Wastewater Management are prepared to acquire professional licenses as required for employment in the field, and perform the duties of water and wastewater operators. Career opportunities are numerous, in both private and public agency settings, as most all communities have water and wastewater facilities that require individuals with specialized training to oversee their operations and management.

## Environmental Technology (ENVT) Courses

### ENVT 351 Math for Water and Wastewater Operators

<b>Units:</b>	3
<b>Hours:</b>	54 hours LEC
<b>Prerequisite:</b>	None.
<b>Advisory:</b>	ENVT 355 and MATH 100
<b>Transferable:</b>	CSU
<b>Catalog Date:</b>	June 1, 2020

This course provides an introduction to quantitative analysis of wastewater and water processes. Topics covered include general math, including significant figures and proper rounding, applicable algebraic and geometry equations, unit analysis, volumes, flows, pressures, conversions, solution strengths, and applicable laboratory and chemistry equations used in water and wastewater treatment operations.

### Student Learning Outcomes

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

- review and reinforce basic math skills for quantitative analysis, calculating operation criteria, and solving problems associated with water and wastewater operations.
- organize data and develop basic graphs and charts to plot data and demonstrate process understanding of water and wastewater operations.
- calculate operational conditions and perform quantitative analysis of static and dynamic hydraulic conditions and systems (for example, hydraulic grade line, flow, velocity, friction loss, surface/filter/weir loading rates, detention time, pumping rates, well hydraulics, and horsepower equations).
- analyze the mathematical aspects of basic chemistry principles related to water/wastewater, and perform quantitative analysis of chemical dosing, mixing, and percent strengths of solutions.

### ENVT 353 Science for Water and Wastewater Operators

<b>Units:</b>	4
<b>Hours:</b>	54 hours LEC; 54 hours LAB
<b>Prerequisite:</b>	ENVT 351 with a grade of "C" or better
<b>Advisory:</b>	ENVT 355
<b>Transferable:</b>	CSU
<b>Catalog Date:</b>	June 1, 2020

This course will cover three topic areas, Biology, Chemistry, and Physics as they apply to operation, maintenance, and management of water and wastewater facilities. The course is intended to provide the

student with a fundamental understanding of the sciences underlying studies of water and wastewater conveyance and treatment. Field trips may be required.

## Student Learning Outcomes

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

- evaluate the role of science in water and wastewater operations, including scientific laws and theories, scientific methods, and how these provide a foundation for environmental technology fields, including water and wastewater.
- evaluate physical laws and principles associated with water/wastewater, including gravity settling, static pressure, energy and dynamics in water systems, and flow continuity.
- conceive basic chemistry principles, the structure and classification of matter, hypothesize chemical reactions and bonding, and predict the impact of commonly used chemicals on water and wastewater processes.
- solve water/wastewater chemistry problems involving chemical balancing, atomic mass, percent strength, concentrations, and molar solutions; quantify feed rates and dosing of chemicals.
- assess the role of microbes in water and wastewater operations, and how the presence or absence of microbes has a significant impact on water and wastewater operations.

## ENVT 354 Waste Water Management: Basic Instrumentation and Electrical Controls

<b>Units:</b>	4
<b>Hours:</b>	54 hours LEC; 54 hours LAB
<b>Prerequisite:</b>	ENVT 353 with a grade of "C" or better
<b>Transferable:</b>	CSU
<b>Catalog Date:</b>	June 1, 2020

This course is an introduction to power and electrical circuits, induction motors, electromagnetic concepts, and various devices used to control and measure flow, pressure, depth, chemical feed, and other operating parameters associated with water and wastewater distribution and treatment systems. Field trips may be required.

## Student Learning Outcomes

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

- assess and understand control circuits, circuit interpretation and the theories related to electrical phenomenon, including volts, amps, resistance, capacitance, frequency, conductors, etc.
- distinguish and identify modern control devices including programmable logic controllers (PLCs), remote terminal units (RTUs), supervisory and data acquisition (SCADA) systems, relays, operators interfaces, set points, data communication systems, data collection and reporting, alarms, etc.
- demonstrate and understand the types, functions, and use of flow control devices, including flow meters, globe valves, modulating valves, pneumatic systems, Parshall flumes, sonic and magnetic flow measuring devices, registers and reading devices and systems, hydropneumatic tanks, etc.
- compile and categorize the types, functions, and use of pressure measuring devices, including gauges, sonics, transducers, Burdon tube (mercoïd), pressure reducing valves, pressure sustaining valves, pressure relief valves, etc.
- identify various types of motor devices, including starters, surge protection, VFD's, overload protection, heaters, housings, vibration, start/stop delays, horsepower, efficiencies and costs, matching motors and pumps, and other important components associated with electric motors.
- understand the type, use, and function of chemical analyzing and feed/dosing systems, including chlorine analyzers, turbidimeters, and other instruments used for automated monitoring and control.
- evaluate general electrical safety and maintenance practices, emergency backup power systems, security systems, chlorine scrubbers, etc.

## ENVT 355 Introduction to Water, Wastewater and Recycled Water Management

<b>Units:</b>	3
<b>Hours:</b>	54 hours LEC
<b>Prerequisite:</b>	None.
<b>Transferable:</b>	CSU
<b>Catalog Date:</b>	June 1, 2020

This course provides an introduction to water, wastewater and recycled water management. Topics covered include management of public and private utilities, the history of water supply, water and treatment and distribution, wastewater collection and treatment, and recycling water in the world and in the United States; water rights in California, environmental economics related to pollution, and an overview of the State and federal regulations governing water supply, wastewater treatment and recycled water use, including permitting requirements and operator certification program. Field trips will be required.

## Student Learning Outcomes

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

- explain the local and regional hydrology of California and explain the variability of rainfall locally and throughout California and the United States.
- analyze water usage and the need for a practical water management program.
- describe the benefits of a sound water quality program to ensure that there are standards for water supply and wastewater disposal.
- explain the basic processes of identifying sources of water supply, both groundwater and surface water, including collection, treatment, storage and distribution.
- explain the basic processes of wastewater treatment, including collection, treatment, disposal, solids management and recycled water.
- describe the importance of a safety program for both water and wastewater systems.
- describe the regulatory structure in California for water and wastewater operating procedures.
- explain the licensing program for water and wastewater treatment plant operators, distribution and collection system operators.

## ENVT 380 Water and Wastewater Treatment Plant Operations I

<b>Units:</b>	3
<b>Hours:</b>	54 hours LEC
<b>Prerequisite:</b>	None.
<b>Corequisite:</b>	ENVT 351
<b>Advisory:</b>	ENVT 355
<b>Transferable:</b>	CSU
<b>Catalog Date:</b>	June 1, 2020

This course provides an introduction to water and wastewater treatment plant operations and maintenance. Topics covered include responsibilities of the plant operator, preliminary treatment systems including racks, screens, grit removal, comminutors, sedimentation, clarification, flotation, biological treatment processes, activated sludge, chemical treatment processes, filtration, disinfection and chlorination. Field trips and/or a semester project may be required.

## Student Learning Outcomes

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

- analyze the role and responsibilities of a treatment plant operator.
- evaluate preliminary treatment processes, the equipment and processes involved, purpose, and typical maintenance and operation activities associated with preliminary treatment.
- evaluate gravity settling treatment processes (i.e. basins and clarifiers), the equipment and processes involved, purpose, and typical maintenance and operation activities associated with gravity settling treatment.
- evaluate biological treatment processes, the equipment and processes involved, purpose, and typical maintenance and operation activities associated with biological treatment.
- evaluate chemical treatment processes, the equipment and processes involved, purpose, and typical maintenance and operation activities associated with chemical treatment.
- describe disinfection processes and chlorine reactions with water.

## ENVT 381 Water and Wastewater Treatment Plant Operations II

<b>Units:</b>	3
<b>Hours:</b>	54 hours LEC
<b>Prerequisite:</b>	ENVT 380 with a grade of "C" or better
<b>Corequisite:</b>	ENVT 353
<b>Transferable:</b>	CSU
<b>Catalog Date:</b>	June 1, 2020

This course provides an advanced level of understanding of treatment operations and maintenance. Topics covered include industrial wastes, activated sludge, sludge digestion, membrane treatment systems, ion exchange treatment systems, activated carbon treatment systems, solids and backwash water handling, microbial identification and life-cycles, effluent disposal, plant safety and good housekeeping, maintenance, basic laboratory procedures. Field trips may be required.

## Student Learning Outcomes

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

- analyze the different design and operational variables of aeration methods and the activated sludge process, the purpose of aeration, and mechanical aeration systems.
- evaluate solids and backwash water handling systems, including sludge digestion; de-watering processes; and recovery, use, and disposal of waste byproducts.
- examine the importance of safety programs, and the hazards associated with treatment facilities.
- assess the importance of operational procedures for water monitoring of effluent disposal, report writing, and data interpretation.
- demonstrate knowledge of advanced treatment systems including membranes, ion exchange, and activated carbon.
- use knowledge of microbiology to understand activated sludge processes, collection of samples, sample preparations, microscopic observations, microbial life-cycles, and process monitoring.

## ENVT 382 Water and Wastewater System Regulations and Management

<b>Units:</b>	3
<b>Hours:</b>	54 hours LEC
<b>Prerequisite:</b>	ENVT 355 with a grade of "C" or better
<b>Transferable:</b>	CSU
<b>Catalog Date:</b>	June 1, 2020

This course provides an understanding of existing and emerging concerns in the water and wastewater fields, including conservation, recycled water, groundwater basin management, source water protection, energy and water, asset management and mapping programs, and challenges on the horizon, such as emerging contaminants, regulations, and impacts of climate change.

## Student Learning Outcomes

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

- review the requirements of the Safe Drinking Water Act and Clean Water Act regulations, and discuss how these influence water and wastewater operations.
- identify the recycled wastewater value, use, and treatment level requirements, and the challenges and benefits of its use.
- recognize problems associated with resource scarcity, and how to prepare for periods of drought.
- examine the relationship between water and energy, and how water use impacts energy needs and climate change.
- examine and evaluate emergency preparedness for source water emergencies.
- identify water conservation codes, demand mitigation measures, and use of conservation as a "source".
- assess the impact of changing climate and hydrology on water source supplies.

- identify emerging contaminants and technologies that may impact water and wastewater programs.
- prepare asset management reports and understand the benefits of GIS mapping systems for asset management.

## ENVT 383 Water Distribution and Wastewater Collection Systems

<b>Units:</b>	3
<b>Hours:</b>	54 hours LEC
<b>Prerequisite:</b>	None.
<b>Corequisite:</b>	ENVT 351
<b>Advisory:</b>	ENVT 355
<b>Transferable:</b>	CSU
<b>Catalog Date:</b>	June 1, 2020

This course provides an understanding of water distribution and wastewater collection systems operation and maintenance. Topics covered include: design criteria, storage, pumping, construction methods, system testing, control of water quality in a water distribution system, federal and state regulations pertaining to potable and non-potable supplies, maintenance and administration of a distribution and collection system. This course prepares students for state distribution and CWA collection operator exams. Field trips may be required.

### Student Learning Outcomes

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

- evaluate design criteria for a distribution system, components of distribution systems flow control.
- analyze maintenance programs associated with water distribution systems, the disinfection of water distribution facilities, and how to maintain and protect the water quality in a distribution system.
- evaluate related safety concerns and practices associated with water distribution and collection systems.
- assess wastewater collection systems and the basic operation and maintenance of wastewater collection systems.
- understand the importance of backflow prevention and cross connection control.
- identify the purpose of wastewater collection systems including components, design, and safety procedures.

## ENVT 495 Independent Studies in Environmental Technology

<b>Units:</b>	1 - 3
<b>Hours:</b>	54 - 162 hours LAB
<b>Prerequisite:</b>	None.
<b>Transferable:</b>	CSU
<b>Catalog Date:</b>	June 1, 2020

## ENVT 498 Work Experience in Environmental Technology

<b>Units:</b>	1 - 4
<b>Hours:</b>	60 - 300 hours LAB
<b>Prerequisite:</b>	None.
<b>Enrollment Limitation:</b>	Student must be in a paid or non-paid internship, volunteer opportunity, or job related to career interests.
<b>Advisory:</b>	ENGWR 101 or ESLW 320
<b>Transferable:</b>	CSU
<b>General Education:</b>	AA/AS Area III(b)
<b>Catalog Date:</b>	June 1, 2020

This course provides students with opportunities to develop marketable skills in preparation for employment or advancement within the field of Environmental Technology. Course content will include understanding the application of education to the workforce; completing required forms which document the student's progress and hours spent at the work site; and developing workplace skills and competencies. During the semester, the student is required to attend orientation. Students must complete 75 hours of related paid work experience, or 60 hours of related unpaid work experience, for one unit. An additional 75 hours of related paid work experience or 60 hours of related unpaid work experience is required for each additional unit. The course may be taken for a maximum of 16 units. Students should have access to a computer, the Internet, and some computer media such as a USB drive to store data files. Online students must have an email account. Only one Work Experience course may be taken per semester.

### Student Learning Outcomes

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

- apply industry knowledge and theoretical concepts in a field of study or career as written in the minimum 3 learning objectives created by the student and his/her employer or work site supervisor at the start of the course.
- manage personal career plans and decision making using industry & workforce information and online resources.
- behave professionally and ethically, exhibit adaptability, initiative, self-awareness and self-management as needed.
- exhibit effective communication, collaboration, and leadership skills at work with consideration to workplace dynamics and social and diversity awareness.
- demonstrate critical and creative thinking skills as they apply to the workplace.

## ENVT 499 Experimental Offering in Environmental Technology

<b>Units:</b>	0.5 - 4
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Prerequisite: None.  
Transferable: CSU  
Catalog Date: June 1, 2020

## Faculty

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### Mike Crow

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## Science, Technology, Engineering, and Mathematics

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This program is part of the Science, Technology, Engineering, and Mathematics meta-major.

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