



Water & Environmental Technology

*Associate of Applied Science Degree
Certificate
Professional Upgrade*

The Water & Environmental Technology program provides career technical classes combined with field experience. Classes are offered in day/evening combinations and have enrollment limits to enhance instructional quality and job placement.

Course work emphasizes fundamental aspects of drinking water distribution, drinking water treatment, wastewater collection and wastewater treatment. Course work includes 240 hours of industry cooperative work experience, laboratory methods in environmental chemistry, aquatic microbiology and preparation for the provisional operator certification exams.

Program prerequisite

MTH-065 Algebra II must be completed prior to fall term entry.

PROGRAM OUTCOMES

Program outcomes should include the skills necessary for entry-level employment in a variety of water-management industries; cities, counties and state agencies; and businesses, including wastewater treatment plants, drinking water treatment plants, environmental laboratories, source control programs, engineering firms, surface water management agencies, environmental agencies and organizations.

CAREERS

Career opportunities may include water and/or liquid waste treatment plant and system operator, environmental science technician and environmental engineering technician.

Careers may also include environmental lab technician, source control technician, surface water specialist and environmental regulator.

For information contact John Lewis, 503-594-3149 or jlewis@clackamas.edu



WATER & ENVIRONMENTAL TECHNOLOGY CERTIFICATE

FALL TERM	CREDITS
CH-104 Introductory Chemistry or CH-221 General Chemistry	5
MTH-082A Wastewater Math I	1
MTH-082B Waterworks Math I	1
WQT-110 Wastewater Operations I	3
WQT-111 Waterworks Operations I	3
WR-101 Communication Skills: Occupational Writing or WR-121 English Composition	3-4
— — Human Relations requirement (see page 21) (Recommended: PSY-101)	3

WINTER TERM

BI-204 Elementary Microbiology	4
MTH-082C Wastewater Math II	1
MTH-082D Waterworks Math II	1
WQT-120 Wastewater Operations II	3
WQT-121 Waterworks Operations II	3
WQT-122 Water Distribution/Wastewater Collection Systems	3
WQT-123 Environmental Chemistry I	3

SPRING TERM

CS-120 Survey of Computing	4
WQT-130 Wastewater Operations III	4
WQT-131 Water Treatment	4
WQT-132 Collection & Distribution Lab	1
WQT-134 Environmental Chemistry II	2
WQT-180 Water & Environmental Projects I	5

Minimum credits required for certificate 57-58

WATER & ENVIRONMENTAL TECHNOLOGY

Associate of Applied Science Degree: 1ST YEAR

Complete certificate program.

WATER & ENVIRONMENTAL TECHNOLOGY

Associate of Applied Science Degree: 2ND YEAR

FALL TERM	CREDITS
WQT-241 Aquatic Microbiology	4
WQT-242 Hydraulics/Water & Wastewater	3
WQT-245 Instrumentation & Control	4
WQT-280 Water & Environmental Projects II	5



WINTER TERM	CREDITS
MTH-095 Algebra III or MTH-111 College Algebra	4-5
— — Geography elective (Recommended: GEO-130)	4
— — Speech elective (Recommended: SP-111)	3-4

SPRING TERM	CREDITS
CS-121 Computer Applications or BA-131 Introduction to Business Computing	3-4
HE-252 First Aid/CPR	3
— — General elective (any college-level course)	3-4

Minimum credits required for degree 93-98

WATER & ENVIRONMENTAL TECHNOLOGY

SUGGESTED GENERAL ELECTIVES

COURSE	CREDITS
BA-101 Introduction to Business	4
PS-203 U.S. Government: State & Local Institutions	4
PSY-240 Interpersonal Awareness & Growth	4
SOC-206 Institutions & Social Change	4
SP-111 Public Speaking	4

PROFESSIONAL UPGRADE COURSES

The following courses are designed to upgrade professional skills and in some cases assist in preparation for state certification examinations.

COURSE	CEU/CREDITS
WQT-009 Certification Review/Wastewater Operators	(CEU)
WQT-009 Certification Review/Waterworks Operators	(CEU)
WQT-009 Cross Connect. Backflow Assembly Tester	(4.0 CEU)
WQT-009 Cross Connection Specialist Course	(3.2 CEU)
WQT-009 Equipment Maintenance & Repair	(CEU)
WQT-009 Pretreatment	(CEU)
WQT-009 Water & Wastewater Short Schools	(2.1 & 2.3 CEU)
WQT-010 Wastewater Operations I	3 credits
WQT-011 Waterworks Operations I	3 credits
WQT-020 Wastewater Operations II	3 credits
WQT-021 Waterworks Operations II	3 credits
WQT-030 Wastewater Operation III	3 credits
WQT-031 Water Treatment	3 credits



High Purity Water
Certificate
Professional Upgrade

A less-than-one-year program. The High Purity Water certificate program provides classes and hands-on experience with advanced water treatment methods used in the high-tech industry. The certificate program has been developed in cooperation with Intel Corporation. Based on student demand WQT-125 and WQT-135 may be offered biannually.

PROGRAM PREREQUISITE

MTH-065 Algebra II must be completed prior to fall term entry.

PROGRAM OUTCOMES

Program outcomes for the High Purity Water Certificate should include skills for entry-level employment in the water production technology field of the high-tech industry.

CAREERS

Career opportunities may include high-purity lab technician and high-purity production technician.

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HIGH PURITY WATER CERTIFICATE

FALL TERM	CREDITS
WQT-245 Instrumentation & Control	4
WINTER TERM	
MTH-082E Math for High Purity Water	1
WQT-125 High Purity Water Production I	3
SPRING TERM	
WQT-135 High Purity Water Production II	4
WQT-180 Water & Environmental Projects I	5
<i>Minimum credits required for certificate</i>	<i>17</i>



COURSE DESCRIPTIONS

MTH-082A Wastewater Math I

1 credit, Fall/Winter

Quantitative component to understanding wastewater operations. Simple unit conversions, fraction to decimal conversions and more complicated problem solving as applied to wastewater preliminary and primary treatment. Prerequisite: Pass MTH-065 with a "C" or better or placement in MTH-080 or MTH-095. Corequisite: WQT-110. This course may not be waived.

MTH-082B Waterworks Math I

1 credit, Fall

Problem solving for waterworks applications. Introduction to basic algebra and math concepts, conversions and calculations encountered in the waterworks industry. Prerequisite: Pass MTH-065 with a "C" or better or placement in MTH-080 or MTH-095. Corequisite: WQT-111. This course may not be waived.

MTH-082C Wastewater Math II

1 credit, Fall/Winter

Quantitative component to understanding analysis and operations of secondary wastewater systems. Flow rate, chemical dosage, treatment plant loading, treatment process efficiency, unit conversion and process control. Prerequisite: Pass MTH-065 with a "C" or better or placement in MTH-080 or MTH-095. Corequisite: WQT-120. This course may not be waived.

MTH-082D Waterworks Math II

1 credit, Winter

Problem solving for waterworks applications. Introduction to C.T. calculations, chemical concentrations, Pounds formula, and basic hydraulics. Prerequisite: Pass MTH-065 with a "C" or better or placement in MTH-080 or MTH-095. Corequisite: WQT-121. This course may not be waived.

MTH-082E Math for High Purity

Water

1 credit, not offered every year

Basic math for high purity water concepts. Measurements accuracy, rounding rules and errors, significant figures, scientific notation, metric prefixes, simple statistics—average and standard deviation of a population. Prerequisite: Pass MTH-065 with a "C" or better or placement in MTH-080 or MTH-095. Corequisite: WQT-125. This course may not be waived.



WQT

Courses with this prefix may not transfer with credit to a four-year institution unless applied as part of the 12 allowable career technical credits for the AAOT or ASOT Business.

Water & Environmental Technology

WQT-010 Wastewater Operations I

3 credits, Fall

For professional upgrade only. Does not meet the requirements for the certificate or degree. Introduction to the fundamentals of wastewater treatment plant operation. Includes collections systems, preliminary and primary treatment, waste characteristics including organic removals, and solids profiles.

WQT-011 Waterworks Operations I

3 credits, Fall

For professional upgrade only. Does not meet the requirements for the certificate or degree. Introduction to municipal drinking water treatment and distribution systems. Basic waterworks hydraulics, drinking water regulations, waterworks math, waterworks bacteriology, and introduction to water disinfection.

WQT-020 Wastewater Operations II

3 credits, Winter

For professional upgrade only. Does not meet the requirements for the certificate or degree. Secondary wastewater treatment alternatives with municipal application. Fixed and suspended film systems and clarification process. Includes biological sludge treatment. Prerequisite: Pass WQT-010.

WQT-021 Waterworks Operations II

3 credits, Winter

For professional upgrade only. Does not meet the requirements for the certificate or degree. Basic hydrology, ground water and surface water sources, well construction and operation, introduction to water chemistry, waterworks hydraulics, and fundamentals of pumps and pumping. Prerequisite: Pass WQT-011.

WQT-030 Wastewater Operations II

3 credits, Spring

For professional upgrade only. Does not meet the requirements for the certificate or degree. Design, operation, process control, and maintenance of treatment facilities. Current treatment processes discussed in detail with particular attention given to biological sludge handling process. No lab requirement for this course. Prerequisite: Pass WQT-020.



WQT-031 Water Treatment

3 credits, Spring

For professional upgrade only. Does not meet the requirements for the certificate or degree. Design, operation, and process control of water treatment plants. Includes water chemistry, related math, coagulation, sedimentation, filtration, and disinfection. Review for Oregon Operator certification exams. No lab requirement for this course. Prerequisite: Pass WQT-021.

WQT-110 Wastewater Operations I

3 credits, Fall

Introduction to the fundamentals of wastewater operations. Includes collections systems, preliminary and primary treatment, waste characteristics including organic removals, and solids profiles. Prerequisite: Pass MTH-065 or placement in MTH-080. Corequisite: MTH-082A.

WQT-111 Waterworks Operations I

3 credits, Fall

Introduction to municipal drinking water treatment and distribution systems. Basic waterworks hydraulics, drinking water regulations, waterworks math, waterworks bacteriology, and introduction to water disinfection. Prerequisite: Pass MTH-065 or placement in MTH-080. Corequisite: MTH-082B.

WQT-120 Wastewater Operations II

3 credits, Winter

Secondary wastewater treatment alternatives with municipal application. Fixed and suspended film systems and clarification process. Prerequisite: Pass WQT-110. Corequisite: MTH-082C.

WQT-121 Waterworks Operations II

3 credits, Winter

Basic hydrology, ground water and surface water sources, well construction and operation, introduction to water chemistry, waterworks hydraulics, and fundamentals of pumps and pumping. Prerequisite: Pass WQT-111. Corequisite: MTH-082D.

WQT-122 Water Distribution/Wastewater Collection Systems

3 credits, Winter

Elementary engineering aspects of water distribution and wastewater collection systems. System components, construction materials, pump station design, and related topics. Prerequisite: Pass WQT-110. Corequisite: WQT-120.

WQT-123 Environmental Chemistry I

3 credits, Winter

Theory and applied laboratory techniques for testing water and wastewater. Students will test wastewater for NPDES required tests. Prerequisite: Pass CH-104.



WQT-125 High Purity Water Production I

3 credits, not offered every year

Introduction to the production of high purity water for the semiconductor, pharmaceutical, and electric power generating industries. Fundamentals of high purity water chemistry, reverse osmosis treatment, ion exchange treatment, electrodeionization treatment, UV, ozonation, degasification, and microfiltration. Prerequisite: Pass CH-104. Corequisite: MTH-082E.

WQT-130 Wastewater Operations II

4 credits, Spring

Design, operation, process control, and maintenance of treatment facilities. Current treatment processes discussed in detail with particular attention to biological sludge handling and processing. Lab includes field trips to local wastewater facilities. Prerequisite: Pass WQT-120.

WQT-131 Water Treatment

4 credits, Spring

Design, operation, and process control of water treatment plants. Includes water chemistry, coagulation, sedimentation, filtration, and disinfection procedures. Review for Oregon Operator certification exams. Lab includes field trips to local water treatment facilities. Prerequisite: Pass WQT-121.

WQT-132 Collection & Distribution Lab

1 credit, Spring

Provides student with field exposure to water distribution systems and wastewater collection systems. Weekly field visits include cross-connection inspection, distribution valving, reservoirs, water metering/repair, pumping station operations, smoke testing, and CCTV.

WQT-134 Environmental Chemistry II

2 credits, Spring

A lab course providing experience in test procedures required for wastewater treatment NPDES discharge permits and the drinking water industry. Prerequisite: Pass WQT-123.

WQT-135 High Purity Water Production II

4 credits, not offered every year

A lab course focusing on the operation of equipment and unit processes in the production of high purity water. Emphasis on process equipment sizing and design, process control and troubleshooting. Prerequisite: Pass WQT-125.

WQT-180 Water & Environmental Projects I

5 credits, Spring

Practical work experience in a municipal, industrial treatment, distribution, or collection system. Placement in consulting firms, federal and state regulatory agencies, BLM, BPA, and other regulated governmental organizations. Corequisite: Inclusive CWE Seminar.



WQT-199 Hydraulics of Centrifugal Pumps

1 credit, Summer

Basic pump hydraulics, maintenance, troubleshooting and software training. Pumping systems and its mechanical components will be discussed. Hydraulic laws of pump flow, affinity, and NPSH will be demonstrated. This class is a combination of lecture and lab demonstrations.

WQT-241 Aquatic Microbiology

4 credits, Fall

A lab course with topics in applied microbiology. Methods to detect coliform group in water and wastewater, identification of filamentous bacteria in activated sludge, and identification of indicator protozoa in activated sludge. A bacteriological stream survey project is included. Prerequisite: Pass BI-204.

WQT-242 Hydraulics/Water & Wastewater

3 credits, Fall

Study of closed conduit and open channel flow. Includes hydrostatics, head-loss, pump characteristics, Bernoulli's and the energy equations, and basic characteristics of water. Prerequisite: Pass MTH-065 or placement in MTH-080.

WQT-245 Instrumentation and Control

4 credits, Fall

A lab course introducing methods used to monitor and control treatment processes in wastewater, water and high purity water facilities. Advanced water analysis to include typical monitoring of HPW treatment. Fundamentals of control loops, control systems and data management.

WQT-280 Water & Environmental Projects II

5 credits, Fall

Practical experience in a municipal, public or private wastewater treatment plant of specific activated sludge design. Process loading criteria, data acquisition, trend charting, and relevant process strategies will be addressed. Corequisite: Inclusive CWE Seminar.