Wisconsin Technical College System
Curriculum Standards Model & Program Design Summary

50-527-1 WASTEWATER PLANT OPERATOR

Program Information

Program Description

Wastewater treatment plant operators (WWTPO) monitor, maintain, and adjust a wide variety of systems used in the treatment of wastewater. They control plant processes to ensure the plant operates effectively. They monitor laboratory data, charts, and computer control systems, which indicate the performance status of a wide variety of biological nutrient and chemical removal. WWTPO may operate activated sludge treatment systems; biological nutrient removal systems, digester gas system pressures and gas compressor operations; digester operating temperatures; heat exchangers; digester circulation pumps, pressures, and flows; boilers and engine generators; influent rate and pumps; sludge and primary sedimentation levels and pumps; and sewage de-gritting systems. Personnel employed in these positions monitor and adjust sludge thickness on flotation thickeners; and monitor and adjust the quantity of sludge in the thickener hopper and rate of pumping to digesters. Operators will back flush, clear, and purge pumps, and monitor and adjust flow rates. Plant operators operate and control sludge dewatering centrifuge and all associated systems. WWTPO collect various samples and plant process information, including composite samples; disinfection system samples; effluent samples, bay samples; and daily major industrial user samples. Personnel collect, record, and maintain records as necessary for state and federal regulations. Advanced certifications exist in the industry.

External Requirements

- US EPA
- Wisconsin DNR
- Local Municipal Codes, Regulations and Plant Permits
- Approximately 5,568 hours of on-the-job training and a minimum of 432 hours of related instruction
- The Wisconsin Bureau of Apprenticeship Standards administers apprenticeship programs in Wisconsin, and monitors employer provided on-the-job learning. In addition, BAS coordinates with the Wisconsin Technical College System or other educational providers for the evaluation of Related Instruction.

Entry Requirements

- Registered Apprentice
- Physical abilities - walking, climbing and working at heights up to 15 feet, lifting 50 lbs., ability to communicate
- Works outside in various weather conditions including noise, chemicals, electrical energy or radiant energy and odors

Program Outcomes

1 Operate pre-treatment and collection systems
2 Manage wastewater treatment plant processes
3 Operate wastewater treatment plant facilities and equipment
4 Maintain wastewater treatment plant equipment and technology
5 Manage wastewater treatment plant bio-solids programs
6 Communicate plant and wastewater treatment specific information effectively
7 Promote a safe work environment for self and others
8 Perform management related duties based on need
9 Manage laboratory testing, equipment, and reporting
10 Utilize computers and wastewater treatment technologies
11 Comply with wastewater treatment regulations

Program Configuration: Related Instruction

This program configuration outlines the courses required for related instruction. The model includes 7 courses and the minimum 432 hours of related instruction. In addition, two optional elective courses are shown that employers may use to meet local needs. The model includes the BAS Transition to Trainer course intended for the last year of the apprenticeship at 8 hours. This program configuration model assumes a maximum of 18 hours per credit based on WTCS course approvals at the Associate of Applied Science degree level. Credits will transfer to the AAS degree at MPTC, and apprentices will have the option of continuing coursework towards the AAS degree with advanced standing for credits earned during their apprenticeship.

Credits

Total Credits = 30.00

Total Hours = 548 (includes 432 hours plus two elective courses and the Transition to Trainer course)

Term 1

Course #	Course Title	Credits & Hours	Course Description	Prerequisites
10-527-100	Introduction to Wastewater Treatment	3.00 54 hours	Provides an overview of the different processes used in wastewater treatment plants, as well as the collection system and sludge disposal procedures. Covers calculations used to determine plant loadings, detention times and percent removal efficiencies. Environmental regulations, preventive maintenance practices and basic safety precautions are covered.	
10-804-107	College Mathematics	3.00 54 hours	This course is designed to review and develop fundamental concepts of mathematics pertinent to the areas of: 1) arithmetic and algebra; 2) geometry and trigonometry; and 3) probability and statistics. Special emphasis is placed on problem solving, critical thinking and logical reasoning, making connections, and using calculators. Topics include performing arithmetic operations and simplifying algebraic expressions, solving linear equations and inequalities in one variable, solving proportions and incorporating percent applications, manipulating formulas, solving and graphing systems of linear equations and inequalities in two variables, finding areas and volumes of geometric figures, applying similar and congruent triangles, converting measurements within and between U.S. and metric systems, applying Pythagorean Theorem, solving right	Each Wisconsin Technical College determines the General Education course prerequisites used by their academic institution.

			and oblique triangles, calculating probabilities, organizing data and interpreting charts, calculating central and spread measures, and summarizing and analyzing data.	

Term 2

Course #	Course Title	Credits & Hours	Course Description	Prerequisites
10-527-103	Conventional Wastewater Treatment	3.00 54 hours	Covers the basic biology, chemistry and operational controls of wastewater treatment processes: pre- and primary treatment of wastewater, activated sludge, trickling filters and RBCs (Rotating Biological Contactors). The structure and function of major equipment is explained. Various lab tests and the calculations associated with them are presented.	527-100 Intro to Wastewater Treatment & 527-111 Water Chemistry
10-527-111	Water Chemistry	4.00 72 hours	Explores basic chemical concepts and principles such as elements, compounds, states of matter, and reactions that are applicable to evaluating and regulating water quality and applies them to water and wastewater treatment. Learners also examine laboratory techniques, equipment, quality assurance, and record keeping and reporting.	804-174 Survey of Mathematics

Term 3

Course #	Course Title	Credits & Hours	Course Description	Prerequisites
10-527-105	Advanced Wastewater Treatment	4.00 72 hours	Develops competence in management of wastewater treatment processes including disinfection treatment of wastewater, basic and advanced phosphorus removal, tertiary filtration, mechanical sludge handling, sludge dewatering, and sludge disposal. Use the Internet to locate resources useful in managing wastewater treatment processes.	10-527-100 Introduction to Wastewater Treatment & 10-527-111 Water Chemistry & 10-527-103 Conventional Wastewater Treatment

Term 4

Course #	Course Title	Credits & Hours	Course Description	Prerequisites
10-527-136	Equipment Maintenance and	4.00	Develops skills in the identification and application of tools, correcting facility	527-100, Introduction to

	Instrumentation	72 hours	and system mechanical problems, and understanding the complete concept of preventative and predictive maintenance. Students will research preventative and predictive maintenance systems. Skills will be developed using instrumentation for process control. Supervisory Control and Data Acquisition (SCADA), including control diagrams, designs and applications will be studied.	Wastewater Treatment & 527-111, Water Chemistry & 527-130, Groundwater Supply and Distribution

Term 5

Course #	Course Title	Credits & Hours	Course Description	Prerequisites
10-527-120	Hydraulics of Water and Wastewater	3.00 54 hours	Provides information and procedures necessary to predict and manipulate the hydraulics of water transmission and collection. The primary work assignments involve the reading and use of hydraulic principles and then applying them in a real-life case analysis as a laboratory project.	527-130, Groundwater Supply and Distribution & 804-107, College Mathematics or equivalent

Term 6: Optional Employer Requirements (Electives)

Course #	Course Title	Credits & Hours	Course Description	Prerequisites
10-527-125	Industrial Wastes	3.00 54 hours	Focuses on the control of wastewater resulting from the processing of a variety of industrial materials. Methods of waste initiation; impact; minimization; and the treatment of waste process streams of metal, pulp and paper, and food and beverage industry operations are emphasized and analyzed.	527-100 Introduction to Wastewater Treatment & 527-103 Conventional Wastewater Treatment
10-527-130	Groundwater Supply and Distribution	3.00 54 hours	Provides environmental and treatment information necessary to operate a potable groundwater well system. Basic distribution system design and component use will also be detailed. Students examine a groundwater treatment plant and make operational assessments based on established industry criteria.	None

Term 7

Course #	Course Title	Credits & Hours	Course Description	Prerequisites

47-455-455	Transition to Trainer: Your Role as a Journey Worker	0.00 8 hours	Apprenticeship training is a collaborative partnership: employer and employee associations, government, and educational institutions each play a part. In reality, most learning takes place through the daily interaction between an apprentice and his/her co-workers. Surveys have shown that the apprentices are least satisfied with the on-the-job portion of their training--particularly the ability of journey level workers and supervisors to pass on their knowledge of the trade. You have already learned to use the tools of your chosen trade. In this workshop you will be introduced to a new set of basic tools--the tools of a jobsite trainer. You will explore the skills that are necessary to be an effective trainer, discover how to deliver hands-on training, and examine the process for giving useful feedback. During the workshop you will build a Training Toolkit to take back to your work on the job.	Last year of related the apprenticeship.

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10-527-100 Introduction to Wastewater Treatment

Course Outcome Summary

Course Information

Description Provides an overview of the different processes used in wastewater treatment plants, as well as the collection system and sludge disposal procedures. Covers calculations used to determine plant loadings, detention times and percent removal efficiencies. Environmental regulations, preventive maintenance practices and basic safety precautions are covered.

Total Credits 3.00

Course Competencies

1 Examine the reasons for wastewater treatment.
2 Investigate the common problems in a collection system.
3 Summarize the basic treatment processes.
4 Calculate lbs/day and percent removal efficiencies.
5 Explain the importance of monitoring wastewater.
6 Summarize the BOD and TSS tests.
7 Investigate sludge stabilization techniques.
8 Investigate sludge handling and disposal options.
9 Calculate tank volume and detention times.
10 Explain the importance of performing preventive maintenance.
11 Explain the reasons for a wastewater treatment plant safety program.

Wisconsin Technical College System

10-527-103 Conventional Wastewater Treatment

Course Outcome Summary

Course Information

Description Covers the basic biology, chemistry and operational controls of wastewater treatment processes: pre- and primary treatment of wastewater, activated sludge, trickling filters and RBCs (Rotating Biological Contactors). The structure and function of major equipment is explained. Various lab tests and the calculations associated with them are presented.

Total Credits 3.00

Prerequisites

527-100 Intro to Wastewater Treatment
527-111 Water Chemistry

Course Competencies

1 Summarize Preliminary Treatment processes.
2 Summarize Primary Treatment processes.
3 Determine lab and operational data for Preliminary and Primary treatment.
4 Explain the Activated Sludge process.
5 Examine Activated Sludge process control mechanisms.
6 Examine troubleshooting procedures for solving operational problems in an Activated Sludge plant.
7 Summarize the Trickling Filter process.
8 Compare the Trickling Filter process to the Activated Sludge process.
9 Summarize Rotating Biological Contactors.
10 Compare the Rotating Biological Contactor process to the Activated Sludge process.
11 Explain the Pond and Lagoon treatment process.
12 Investigate the advantages and disadvantages of the Pond and Lagoon treatment process.
13 Summarize safety hazards encountered in a wastewater treatment plant.
14 Explain the Safety procedures necessary to deal with each hazard.

Wisconsin Technical College System

10-527-105 Advanced Wastewater Treatment

Course Outcome Summary

Course Information

Description Develops competence in management of wastewater treatment processes including disinfection treatment of wastewater, basic and advanced phosphorus removal, tertiary filtration, mechanical sludge handling, sludge dewatering, and sludge disposal. Use the Internet to locate resources useful in managing wastewater treatment processes.

Total Credits 4.00

Prerequisites

10-527-100 Introduction to Wastewater Treatment
10-527-111 Water Chemistry
10-527-103 Conventional Wastewater Treatment

Course Competencies

1 Explain the purpose of wastewater disinfection.
2 Summarize the process of chlorine disinfection.
3 Summarize the process of ultra violet disinfection.
4 Explain the monitoring tests required for wastewater disinfection.
5 Explain why phosphorus is limited in wastewater discharges.
6 Summarize phosphorus removal processes.
7 Explain the monitoring tests used for phosphorus removal.
8 Compute phosphorus removal math problems.
9 Summarize the tertiary filtration process.
10 Explain the operation of tertiary sand filters.
11 Explain why sludge is stabilized.
12 Examine anaerobic digestion of sludge.
13 Examine aerobic digestion of sludge.
14 Examine alternate methods of sludge stabilization.
15 Summarize the dissolved air flotation sludge thickening process.
16 Summarize the gravity belt sludge thickening process.
17 Summarize the belt filter press sludge dewatering process.
18 Summarize the centrifuge sludge dewatering process.
19 Summarize the pressure filter sludge dewatering process.
20 Examine the 3 main sludge disposal options.

Wisconsin Technical College System

10-527-111 Water Chemistry

Course Outcome Summary

Course Information

Description Explores basic chemical concepts and principles such as elements, compounds, states of matter, and reactions that are applicable to evaluating and regulating water quality and applies them to water and wastewater treatment. Learners also examine laboratory techniques, equipment, quality assurance, and record keeping and reporting.

Total Credits 4.00

Prerequisites

804-174 Survey of Mathematics

Course Competencies

1 Use measurements.
2 Analyze matter.
3 Relate electronic structure to the periodic table.
4 Investigate chemical bonds.
5 Outline the naming of chemicals.
6 Summarize solutions.
7 Differentiate among acids, bases, and salts.
8 Characterize oxidation-reduction.
9 Maximize lab safety.
10 Outline lab data recording and reporting.
11 Examine water treatment analysis.
12 Relate quality assurance methods to standards as they apply to water chemistry.

Wisconsin Technical College System

10-527-120 Hydraulics of Water and Wastewater

Course Outcome Summary

Course Information

Description Provides information and procedures necessary to predict and manipulate the hydraulics of water transmission and collection. The primary work assignments involve the reading and use of hydraulic principles and then applying them in a real-life case analysis as a laboratory project.

Total Credits 3.00

Prerequisites

527-130, Groundwater Supply and Distribution
804-107, College Mathematics or equivalent

Course Competencies

1 Explore density and specific gravity as it relates to water and wastewater system operations.
2 Examine pressure and force in water and wastewater systems.
3 Evaluate piezometric surface and hydraulic grade line in water and wastewater system operations.
4 Analyze hydraulic head measurements in water and wastewater systems.
5 Examine head loss in water and wastewater systems.
6 Explore pumping problems in water and wastewater systems.
7 Assess flow rate problems in water and wastewater systems.
8 Analyze thrust control in water and wastewater systems.
9 Explore a hydraulic issue that has impacted a water or wastewater system.

Wisconsin Technical College System

10-527-125 Industrial Wastes

Course Outcome Summary

Course Information

Description Focuses on the control of wastewater resulting from the processing of a variety of industrial materials. Methods of waste initiation; impact; minimization; and the treatment of waste process streams of metal, pulp and paper, and food and beverage industry operations are emphasized and analyzed.

Total Credits 3.00

Prerequisites

527-100 Introduction to Wastewater Treatment
527-103 Conventional Wastewater Treatment

Course Competencies

1 Assess the toxicity of industrial waste streams and methods of control.
2 Compare the scope and impact of industrial waste regulations of various countries from around the world.
3 Assess the methods used to minimize the amount and pollution potential of waste streams by industries from around the world.
4 Examine the use of life cycle design in general manufacturing.
5 Describe the use of physical, chemical, and biological treatment technologies in the control of industrial waste streams.
6 Analyze metal industry waste streams and treatment technologies.
7 Analyze how and why pulp and paper waste treatment operating strategies vary around the world.
8 Analyze food and beverage processing waste streams and treatment technologies.
9 Explore a technology or trend that significantly impacts the environment as it relates to proper industrial waste treatment.

Wisconsin Technical College System

10-527-130 Groundwater Supply and Distribution

Course Outcome Summary

Course Information

Description Provides environmental and treatment information necessary to operate a potable groundwater well system. Basic distribution system design and component use will also be detailed. Students examine a groundwater treatment plant and make operational assessments based on established industry criteria.

Total Credits 3.00

Prerequisites

None

Course Competencies

1 Summarize the various components of the hydrologic cycle.
2 Explore types of water sources.
3 Examine types of wells and their components that lead to efficient performance of the water source.
4 Analyze how regulations impact groundwater use and treatment.
5 Analyze how water quality characteristics impact groundwater use and treatment.
6 Transform the results of laboratory analysis and math calculations into operational modifications.
7 Evaluate water system design characteristics.
8 Evaluate how water distribution system layout and use, and related maintenance affect customer service.
9 Explore issues that impact regional and global water consumers.

Wisconsin Technical College System

10-527-136 Equipment Maintenance and Instrumentation

Course Outcome Summary

Course Information

Description Develops skills in the identification and application of tools, correcting facility and system mechanical problems, and understanding the complete concept of preventative and predictive maintenance. Students will research preventative and predictive maintenance systems. Skills will be developed using instrumentation for process control. Supervisory Control and Data Acquisition (SCADA), including control diagrams, designs and applications will be studied.

Total Credits 4.00

Prerequisites

527-100, Introduction to Wastewater Treatment
527-111, Water Chemistry
527-130, Groundwater Supply and Distribution

Course Competencies

1 Explore the purpose of maintenance in water and wastewater facilities and systems.
2 Examine corrective and preventative maintenance in water and wastewater facilities and systems.
3 Summarize maintenance activities and programs in water and wastewater facilities and systems.
4 Identify maintenance tools used in water and wastewater facilities and systems.
5 Evaluate computerized maintenance management systems used in water and wastewater facilities and systems.
6 Determine maintenance safety in water and wastewater facilities and systems.
7 Explore maintenance applications used in water and wastewater facilities and systems.
8 Explore instrumentation and automation in water and wastewater facilities and systems.
9 Examine process and instrumentation diagrams used in water and wastewater facilities and systems.
10 Identify instruments and controls in water and wastewater facilities and systems.
11 Summarize control panels and displays in water and wastewater facilities and systems.
12 Examine supervisory control and data acquisition used in water and wastewater facilities and systems.
13 Explore the application of instrumentation and automation used in water and wastewater facilities and systems.

Wisconsin Technical College System

47-455-455 Transition to Trainer: Your Role as a Journey Worker

Course Outcome Summary

Course Information

Description Apprenticeship training is a collaborative partnership: employer and employee associations, government, and educational institutions each play a part. In reality, most learning takes place through the daily interaction between an apprentice and his/her co-workers. Surveys have shown that the apprentices are least satisfied with the on-the-job portion of their training--particularly the ability of journey level workers and supervisors to pass on their knowledge of the trade.

You have already learned to use the tools of your chosen trade. In this workshop you will be introduced to a new set of basic tools--the tools of a jobsite trainer. You will explore the skills that are necessary to be an effective trainer, discover how to deliver hands-on training, and examine the process for giving useful feedback. During the workshop you will build a Training Toolkit to take back to your work on the job.

Course Competencies

1 Value your role as a journey worker trainer

2 Serve as a mentor and job coach

3 Foster a positive work environment by acting as an ally/advocate

4 Provide hands-on skills training

5 Provide feedback on apprentice performance