

## CWS SLO ASSESSMENT SCHEDULE Fall '19 through Spring '23

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COURSE	TITLE	SLO	Planned Assessment			
			Fall 19	Spring 20	Fall 22	Spring 23
CWS		"C"= Completed "P"= Planned "NA"= Not Assessed				
100	Careers in Water & Wastewater	1) Apply and prepare for a State of California certification exam	C		P	
		2) Write and format a resume for a job in water and wastewater utilities	C		P	
		3) Apply for and take the ACT National Career Readiness Certification (NCRC) Exam	C		P	
		4) Develop an action plan to alleviate weaknesses identified by the NCRC Exam	C		P	
101	Fundamentals of Water/Wastewater Technology	1) Describe the essential uses of water, the infrastructure which has been developed to meet demand, and the problems, constraints, and issues facing the water industry.	C		P	
		2) List the major agencies involved in providing water and wastewater services in the greater San Diego region.	C		P	
		3) Identify the major regulatory agencies that monitor and regulate the water/wastewater industry.	C		P	
		4) Compare and contrast the sources of water and wastewater, the major collection and transportation networks, and the major water and wastewater treatment and reclamation facilities operating in San Diego County.	C		P	
102	Calculations in Water/Wastewater Technology	1) Perform mathematical calculations to solve problems common to water/wastewater distribution, collection, and treatment systems.	C		P	
		2) Determine the appropriate methods and formulas necessary to solve problems relating to pressure, volume, flow rate, velocities, dilution rates, and chemical dosages.	C		P	
		3) Use charts, tables, and formulas to solve unknowns relating to pressure, volume, flow rates, velocities, dilution rates, and chemical dosage.	C		P	
		4) Perform conversions and dimensional analysis necessary to solve problems relating to pressure, volume, flow rates, velocities, dilution rates, and chemical dosages.	C		P	
103	Introduction to Water Resources Management	1) Describe the essential uses of water and the developed water supply infrastructure involved in providing drinking water to the San Diego region and the state of California.		C		P
		2) Describe the various issues facing the water industry, and the political and organizational structures and agencies involved in providing water to the San Diego region and the state of California.		C		P
		3) Compare and contrast the sources of wastewater, the major collection and transportation networks, and the major wastewater treatment and reclamation facilities operating in San Diego County.		C		P
		4) Explain how the carbon footprint of the existing water and wastewater infrastructure significantly impacts California's energy supply and power demands, and describe the alternative resource recovery and treatment methods available to mitigate that impact.		C		P

204	Applied Hydraulics	1) Use hydraulic knowledge and terminology to describe the relationships between volume, velocity, flow, head loss, and pressure as they relate to water and wastewater systems.		C		P
		2) Solve complex problems commonly encountered in water and wastewater systems using formulas and equations for volume, pressure, head loss, velocity, flow rate, hydrostatic force, pump horsepower, and efficiency.		C		P
		3) Demonstrate knowledge of hydraulic principles that explain the behavior of water in closed conduit pressure systems, open channel flow systems, pumping and storage operations, and hydrology.		C		P
		4) Demonstrate the ability to utilize math skills and hydraulics knowledge to analyze complex hydraulic systems and calculate solutions to problems.		C		P
105	Principles and Practices of Water Conservation	1) Identify the major issues confronting the California water supply industry, the key stakeholders in the issues, and discuss the range of solutions that have been proposed to solve the problems.	C		P	
		2) Describe the regulatory framework that guides water conservation practices, and the key elements related to the design and management of successful conservation programs.	C		P	
		3) List the key elements of xeriscape and natural landscape design and describe its use with water conservation programs.	C		P	
		4) Demonstrate knowledge in water conservation principles and practices sufficient to pass the California/Nevada Section American Water Works Association Water Efficiency Use Grade 1 Certification exam.	C		P	
106	Introduction to Electrical and Instrumentation Processes	1) Label common electrical/electronic components both physically and through schematic interpretation.		C		P
		2) Describe basic electronic theory and electrical principles and explain how motors, transformers, relays and test equipment are used in the electrical, electronic, and instrumentation field.		C		P
		3) Identify instruments and control systems both physically and through schematic interpretation.		C		P
		4) List and describe the operation of electrical motors, control systems, and PID loops.		C		P
		5) List and describe in detail the three main components of a SCADA system and how each system operates.		C		P
107	Safety in Water & Wastewater	1) Describe the evolution of the occupational safety and health regulations in California.	C		P	
		2) Analyze the top health and safety issues in the water and wastewater industry and discuss potential solutions to those problems.	C		P	
		3) Demonstrate the proper use of personal protective equipment typically used in the water and wastewater industry.	C		P	
		4) Demonstrate the ability to extract specific safety requirements from the California Title 8 Code of Regulations.	C		P	
		5) Identify the proper steps required to safely evaluate a possible confined space entry.	C		P	
110	Introduction to Laboratory Analysis for Water/Wastewater	1) Identify and utilize commonly used laboratory equipment for the analysis of water and wastewater quality.	C		P	
		2) Define in writing pertinent terminology used for the chemical, physical, and bacterial characteristics of ground water and surface water supplies.	C		P	
		3) Perform basic physical and analytical procedures common in water and wastewater laboratory analysis.	C		P	

		4) Demonstrate knowledge of Analysis Quality Control techniques.	C		P	
112	Basic Plant Operations: Water Treatment	1) Identify in detail characteristics and sources of ground water and surface water supplies including the chemical, physical and bacterial characteristics, and explain the effects on quality of geological formations, stratifications, and watershed management.	C		P	
		2) Demonstrate knowledge of the five main processes found in conventional treatment plants.	C		P	
		3) Demonstrate understanding of drinking water quality standards and public health issues.	C		P	
		4) Explain the use of chlorine, the characteristics of and methods for storing, feeding and measuring chlorine, the effects of moisture, pH and temperature on feed rate, as well as the health and safety effects, procedures and personal protective requirements when using chlorine.	C		P	
		5) Determine the methods used for coagulation, flocculation and sedimentation including common chemicals used, feed systems, effects of time temperature, turbidity and pH, and the measurement of turbidity and color.	C		P	
		6) Demonstrate through testing basic knowledge of the regulations for monitoring water quality and performing water treatment.	C		P	
		7) Perform basic mathematical calculations and conversions relating to water flow, pressure, volume, velocity, chemical dosage, and CT (Concentration x Time) compliance.	C		P	
114	Basic Plant Operations: Wastewater Treatment	1) Describe the importance of collection, treatment, and disposal of municipal wastewater.	C		P	
		2) Define and properly use wastewater treatment plant terminology.	C		P	
		3) Demonstrate a basic comprehension of the principles of operating conventional wastewater treatment plants.	C		P	
		4) Perform basic mathematical calculations and conversions relating to water flow, pressure, volume, velocity, chemical dosage, and hydraulic and organic loading as related to wastewater treatment plant operations.	C		P	
115	Wastewater Reclamation and Reuse	1) Explain the process of total resource recovery and beneficial reuse as it relates to wastewater reclamation and potable water augmentation.	C			P
		2) List the multi-barrier processes of a Wastewater Recovery Treatment system using Primary, Secondary, Advanced Tertiary, and indirect potable reuse.	C			P
		3) Describe how installation of reclaimed wastewater facilities and residential grey water recovery systems can reduce water and wastewater flows.	C			P
		4) Explain the primary regulations that govern reclaimed water uses in San Diego County based on health and safety guidelines.	C			P
206	ADVANCED	1) Discuss how PLC's are used in automated control systems.		N/A		P

	<b>ELECTRICAL &amp; INSTRUMENTATION PROCESSES</b>	2) Perform basic troubleshooting of PLC hardware.		N/A		P
		3) Describe the functions of a Supervisory Control and Data Acquisition (SCADA) central computer system.		N/A		P
		4) Describe the four building blocks of a SCADA control system.		N/A		P
<b>207</b>	<b>PRACTICAL SKILLS IN WATER &amp; WASTEWATER SYSTEMS</b>	1) Select the proper tools and set up and perform a wet-tap.		N/A		P
		2) Describe the requirement and demonstrate the proper procedure for de-chlorinating a water main for repairs.		N/A		P
		3) Demonstrate the proper procedure for using a Cal/OSHA approved fall protection system.		N/A		P
		4) Demonstrate the proper procedures for testing and entering a non-permit confined space.		N/A		P
<b>210</b>	<b>Advanced Laboratory Analysis for Water/Wastewater</b>	1) Identify and properly set up equipment used in the analysis of water/wastewater quality.		N/A		P
		2) Perform calculations commonly associated with a water/wastewater laboratory.		N/A		P
		3) Demonstrate competence of the physical and analytical techniques commonly used in a water/wastewater laboratory.		N/A		P
		4) Demonstrate knowledge of Analysis Quality Control techniques.		N/A		P
		5) Properly document analytical results using EPA protocols.		N/A		P
<b>212</b>	<b>Advanced Plant Operations: Water Treatment</b>	1) Explain in detail how water is treated for iron and manganese, excessive hardness, and fluoride compliance.		C		P
		2) Describe the operation of the four types of membranes and how membrane processes are used in water treatment systems.		C		P
		3) Describe optimization techniques and best available technologies for water treatment systems.		C		P
		4) Describe the chemical and bacteriological standards of water quality, calculate quantities of specific constituents in water and discuss how variations in these constituents affect treatment processes and water quality.		C		P
		5) Interpret federal and state laws and regulations and explain how they relate to water treatment processes.		C		P
		6) Perform mathematical calculations and conversions relating to volume, flow, hydraulic computations, water softening, hardness, and chemical precipitation.		C		P
<b>214</b>	<b>Advanced Plant Operations: Wastewater Treatment</b>	1) Explain in detail, the purpose of each advanced wastewater treatment plant process.		C		P
		2) Compare normal and abnormal operational procedures including the application of laboratory results to process control and equipment and facilities maintenance.		C		P
		3) Describe federal and state laws and regulations as they apply to wastewater treatment processes.		C		P
		4) Describe how SCADA systems are used to monitor and control wastewater treatment plant processes and performance.		C		P
		5) Explain how wastewater treatment plant operations are achieving improved sustainability through water reclamation, bio-gas and bio-solids harvesting, and power co-generation.		C		P
<b>130</b>	<b>Water Distribution Systems</b>	1) Identify the various sources of water available for use in water distribution systems and the characteristics that determine suitability for use in a potable water supply system.	C			P
		2) Perform calculations and solve problems commonly encountered in water distribution systems, such as volumes, flow rates, velocities, pressures, and chemical dosage.	C			P
		3) Demonstrate knowledge of safety hazards and safety measures related to working in water distribution systems.	C			P

		4) Identify and describe the use and selection of common water distribution system components including pumps, motors, tanks, pipe, laterals, meters, valves, and control systems.	C		P	
		5) Take and pass California State certification exams for Distribution Operator D1 and D2.	C		P	
132	Wastewater Collection Systems	1) Explain the operation and design of a Collection System and describe the work performed by a wastewater Collection Systems Operator.	C		P	
		2) Explain the practice of working safely with vehicles, Confined Spaces, around traffic construction, and the methods used to inspect and test Collections System piping and appurtenances for maintenance problems.	C		P	
		3) Identify types and causes of sewer stoppages, select the proper methods for clearing the stoppage and cleaning the sewer line, and describe the component testing of the system.	C		P	
134	Mechanical Maintenance	1) Identify major components of common pumping equipment used in the water/wastewater industry.	C		P	
		2) Define preventative maintenance and explain the how it benefits each major class of equipment.	C		P	
		3) Identify steps involved in identifying and diagnosing equipment malfunctions.	C		P	
		4) Compare and contrast the function of a variety of sensing devices (e.g., heat sensor, machine alignment, vibration monitors and pressure gauges).	C		P	
230	Water Distribution Systems II	1) Interpret public health standards applicable to water supply including drinking water standards, cross connection control and back-flow prevention.	C		P	
		2) Perform complex mathematical calculations and conversions relating to volumes, flow rates, velocities, pressure, hydrostatic force, chlorine dosage and meter accuracy.	C		P	
		3) Identify the proper methods to select, handle, install, repair, maintain and disinfect pipe, understand the different types of meters and their applications, explain pumping operations and assess common pump problems, knowledge of control systems and SCADA systems, comprehension of chlorine delivery systems and safe handling of chlorine.	C		P	
		4) Demonstrate familiarity with safety hazards, safety regulations and safe work practices.	C		P	
		5) Demonstrate understanding of the principals of management, organization and leadership techniques, knowledge of the principals of emergency response planning and operations and hazard and vulnerability assessment of water distributions systems and facilities.	C		P	
232	Wastewater Collection Systems II	1) Identify the types and functions of major sewer lift station components.		C		P
		2) List the common types of lift stations and describe how their design, operation and maintenance differ from one another.		C		P
		3) Identify the need for effective monitoring and administration of wastewater collection systems.		C		P
		4) Identify the major safety hazards associated with operating and maintaining a wastewater collection system and the procedures necessary to mitigate these hazards.		C		P

268	Membrane Plant Operation	1) Describe the variety of membranes used in potable water treatment plants and explain the basic function of each.	C		P	
		2) Explain the how the physical and chemical characteristics of water affect membrane function and finished water quality.	C		P	
		3) Explain the purpose of pre and post treatment chemicals and demonstrate through testing the ability to accurately perform mathematical calculations and conversions.	C		P	
		4) Demonstrate through testing knowledge of the typical equipment and control processes found in membrane treatment plants.	C		P	
270	Public Works Supervision	1) Articulate the role of the supervisor in today's modern public works organizations.	NA	NA	P	P
		2) Compare and contrast how the role of worker, supervisor, administrator, manager and leader is evolving.	NA	NA	P	P
		3) Describe the management and leadership skills required of a modern public works supervisor and how these management and leadership skills are applied to administering within the general principles of organizational structure, problem solving, and decision making.	NA	NA	P	P
		4) Describe in detail how public works managers effectively delegate responsibility, maintain accountability, insure regulatory compliance, and interact with the public.	NA	NA	P	P
		5) Clarify the key components and importance of facilitating effective performance feedback processes for staff.	NA	NA	P	P
280	Backflow Tester Training	1) Differentiate between different backflow devices and methods.	C		P	
		2) Compare and contrast the effective use of backflow prevention devices and their limitations.	C		P	
		3) Describe proper instillation specifications for commonly used backflow prevention assemblies.	C		P	
		4) Troubleshoot and perform an accurate backflow prevention test.	C		P	
282	Cross Connection Control Specialist	1) Explain the need for backflow protection and cross-connection control including identifying approved uses of reclaimed water and the restrictions on its use.	C		P	
		2) Explain health and safety issues and concerns relative to both the processing and distribution of reclaimed water.	C		P	
		3) Identify all backflow prevention devices and be able to explain with how each of the devices function.	C		P	
		4) Describe reclaimed water systems from production to distribution, the current status of gray water systems, and the laws governing both.	C		P	
		5) Describe the key components of a reclaimed water cross-connection control inspection as specified in section 6002 et al, of Title 22, California Code of Regulation; includes shut down tests, coverage and signage.	C		P	
284	Cross Connection Control Specialist Recycled Water	1) Explain the need for recycled water from a current and historical perspective including backflow protection issues.		C		P
		2) Discuss the legal aspects of recycled water and how the various local, state and federal codes interrelate.		C		P
		3) Describe the roles of the water agencies, regulatory agencies, and end users involved in recycled water.		C		P

		4) List the permitting and regulatory requirements for the production and use of recycled water.		C		P
		5) Describe shut down test methodology and discuss how to identify and resolve problems encountered during the shutdown test.		C		P
290	Cooperative Work Experience	1) Establish career goals and determine intermediate objectives that lead to long-range goals.	NA	NA		P
		2) Participate in work directly related to career objectives.	NA	NA		P
		3) Correlate academic theory and principle with actual work experience.	NA	NA		P
		4) Demonstrate effective job seeking skills.	NA	NA		P