

# 702E SMALL WATER SYSTEMS: LABORATORY PROCEDURES

Office of Water Programs  
California State University, Sacramento  
(1.8 Continuing Education Units)

## Course Description

Upon completion of this course, operators should understand the diverse responsibilities of a water system operator, know the requirements for certification and how to prepare for obtaining and maintaining certification, be able to perform basic laboratory procedures, utilize laboratory equipment and techniques, collect representative samples using proper sampling techniques and various sampling devices, and conduct water laboratory tests including alkalinity, chlorine residual, coliform bacteria counts, hardness, jar tests, pH, temperature, and turbidity. In addition, operators should be able to solve water laboratory math problems. Also included: laboratory safety. 1.8 CEUs (18 contact hours).

## Course Topic Outline

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Water as a Limited Resource	<b>Basic Laboratory Concepts</b>
The Water Supply System	Laboratory Equipment and Techniques
Selection of a Water Source	Laboratory Safety
The Safe Drinking Water Act	Water Quality Tests
Small Water System Operators	Sampling
Math Assignment	

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**Average word count:** 520 words per screen

**Average reading speed:** 130 words per minute; 4 minutes per screen

The course is based on Chapter 1, "Introduction to Small Water Systems," Chapter 6, "Laboratory Procedures" and other sections from the related training manual. The course contains text, tables, graphs, illustrations, math example problems, and chapter review questions to enhance the presentation of information and the student learning experience. The course is designed for students to spend the same amount of time reading the tables, graphs, and illustrations as they spend reading the equivalent amount of related course text presented on screen.

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**Number of Moodle screens (internal):** The course contains 43 Moodle learning management system screens.

Moodle screens consist of 1 home screen, 1 course instruction and help screen, 23 content screens, 8 glossary screens, 9 quiz screens, and 1 final exam screen.

**Average reading speed:** 1 minute per screen

The Moodle screens function as the "instructor" for the course, providing topic introduction, reading assignments, links to external web page resources, interactive student exercises, video clips, quizzes, a glossary and final exam. In this time assignment analysis, Moodle screens are distinguished from web page resource links for quantification purposes only. Students utilize internal Moodle screens and external web pages resource links seamlessly as they progress through the course.

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**Number of web page resource links (external):** The course contains 198 web page resource links that students use extensively as an integral part of their training course. Examples of websites include the US EPA Public Drinking Water Systems Programs, the Groundwater Foundation, and

the Nebraska Health and Human Services System. Each site contains a large number of internal and external web links that provide additional resources for students

**Average reading time per web page resource link:** 1 minute per link

**Number of Interactive exercises:** The course contains a total of 14 interactive exercises, including 5 general course content interactive exercises and 3 interactive math exercises. Each interactive math exercise can present an unlimited number of unique problems so students can attempt each exercise multiple times. For the purpose of this time assignment, it is assumed that students will attempt each of the 3 interactive math exercises three times, counting as 9 math exercises.

**Average interactive exercise answer speed:** 2 minutes per interactive exercise

**Number of math example exercises:** The course contains 31 small water system in-text math example exercises that support and expand the concepts presented in the online course text.

**Average math example exercise answer speed:** 3 minutes per math exercise

**Number of chapter review questions:** The course contains 55 review questions in the “Check your understanding” section at the end of each topic. Question types include fill-in and multiple choice.

**Average chapter review question/answer speed:** 2 minutes per question

**Number of minutes of video:** The course contains 56 minutes of video. Students are projected to watch one viewing.

**Average video viewing time:** 56 minutes

**Final exam:** The course contains 82 final exam questions. Question types include true/false; best answer (one correct answer); multiple choice (one or more correct answers); and math (requiring students to work through equations to find solutions).

**Average final exam question/answer speed:** 2 minutes per final exam question

The table summarizes the course components outlined above and shows the calculations for the total time assignment values in minutes and hours.

**Time Assignment**

Course component	Number of component units	Minutes required to complete component unit	Total time assignment for component
Text pages	144 ×	4 =	576
Web screens (internal)	43 ×	1 =	43
Web screens (external)	198 ×	1 =	198
Interactive exercises	14 ×	2 =	28
Math example exercises	31 ×	3 =	93
Chapter review questions	55 ×	2 =	110
Videos (minutes)	56 ×	1 =	56
Final exam questions	82 ×	2 =	164
			<b>1,268 minutes</b>
			<b>21.1 hours</b>