

**702C SMALL WATER SYSTEMS: DISINFECTION**  
**Office of Water Programs**  
**California State University, Sacramento**  
(1.8 Continuing Education Units)

**Course Description**

Upon completion of this course, operators should understand the components of a water supply system from source to customer, understand the purpose for disinfection and the applicable regulations, the factors influencing disinfection effectiveness, the physical and chemical means of disinfection and the critical factors affecting each. Operators should also be able to disinfect wells, pumps, mains, and tanks, to operate various types of chlorination equipment, to determine and set chlorination rates, to measure chlorine residual, to handle chlorine and chlorine equipment safely, and to solve disinfection math problems. 1.8 CEUs (18 contact hours).

**Course Topic Outline**

Water as a Limited Resource	Disinfection Process
The Water Supply System	Points of Chlorine Application
Selection of a Water Source	Operation of Chlorination Equipment
The Safe Drinking Water Act	Maintenance
Small Water System Operators	Chlorine Dioxide Facilities
Drinking Water Safety	Measurement of Chlorine Residual
Factors Influencing Disinfection	Chlorine Safety Program
Ultraviolet Systems	Ozone Systems
Mixed-Oxidants (MIOX) Systems	Typical Chlorination Math Problems
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 4, “Disinfection” 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 42 Moodle learning management system screens.

Moodle screens consist of 1 home screen, 1 course instruction and help screen, 18 content screens, 8 glossary screens, 13 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.

**Number of web page resource links (external):** The course contains 114 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 24 interactive exercises, including 6 general course content interactive exercises and 6 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 6 interactive math exercises three times, counting as 18 math exercises.

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

**Number of math example exercises:** The course contains 13 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 52 minutes of video. Students are projected to watch one viewing.

**Average video viewing time:** 52 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	158 ×	4 =	632
Web screens (internal)	42 ×	1 =	42
Web screens (external)	114 ×	1 =	114
Interactive exercises	24 ×	2 =	48
Math example exercises	13 ×	3 =	39
Chapter review questions	55 ×	2 =	110
Videos (minutes)	52 ×	1 =	52
Final exam questions	82 ×	2 =	164
			<b>1,201 minutes</b>
			<b>20 hours</b>