

**Industrial Waste Treatment, Volume 1**  
**C—Instrumentation and Control and Facility Maintenance**  
**California State University, Sacramento**  
**(3.3 Continuing Education Units)**

**COURSE DESCRIPTION**

This course is designed to train operators in the practical aspects of using instrumentation and control equipment, including variable frequency drives, sensors, and meters, for process automation and measurement in disinfection systems, compressed air systems, and regulatory compliance, and in the safe and effective maintenance of treatment facilities and equipment, including general facility maintenance, electricity, motors, pumps pneumatic systems, and unplugging pipes, pumps and valves.

**COURSE OUTLINE**

This course trains industrial waste treatment operators in the use of instrumentation and control equipment to monitor and treat wastes and to maintain regulatory compliance and in safe and effective procedures and practices for maintaining industrial treatment facilities and equipment.

**Chapter 7, Instrumentation and Control**

*Learning Objectives*

1. Describe and explain the uses of automation and control systems within a wastewater treatment facility.
2. Understand and explain how measured values are taken and used by sensors and instruments.
3. Explain how sensors and instruments convert physical conditions into electrical outputs.
4. Read instruments and make proper adjustments in the operation of wastewater treatment facilities.
5. Identify symptoms of automated measurement and control system problems.

The main purpose of this chapter is to train operators in the safe and effective operation and maintenance of physical–chemical treatment processes, filtration systems, air stripping, and activated carbon adsorption.

**Chapter 8, Facility Maintenance**

*Learning Objectives*

1. Explain the possible consequences of an inexperienced, unqualified, or unauthorized operator attempting to troubleshoot or repair electrical equipment.
2. Understand the terms, nature of, and safety procedures for electricity.
3. Properly select and use meters.
4. Discuss the types of and maintenance for different motor and pump varieties.

The main purpose of this chapter is to train operators in the safe and effective maintenance of industrial waste treatment facilities, equipment, and systems.

**TIME ASSIGNMENT**

**Text pages:** The content from the training manual used in this course, *Industrial Waste Treatment*, Volume 1, includes 328 pages. The average word count on a page from the training manual is 525

words. The training manual used for this course contains text, tables, graphs, illustrations, math example problems, section questions, 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 chapter text. Therefore, each page is assumed to contain the equivalent of 525 words. The average reading speed is 130 words per minute; therefore, each page is projected to require four minutes of student time for each reading.

**Math example problems:** The course contains 35 math example problems. The projected average time to solve each math problem is 3 minutes.

**Section questions:** The course contains 139 section questions, located in the “Check Your Understanding” sections integrated throughout the chapter text. These questions enable students to self-assess their understanding of a section’s material before proceeding to the next section. The projected average response time is 2 minutes per question.

**Chapter review questions:** The course contains 75 review questions, located in the “Chapter Review” at the end of each chapter. Question types include fill-in, multiple choice, and matching. The projected average response time is 2 minutes per question.

**Objective test questions:** The course contains 65 test questions. There is 1 objective test per chapter. The projected average response time is 2 minutes per question.

Course component	Number of component units	Minutes required to complete component unit	Total time assignment for component
Text pages	328 ×	4 =	1,312
Math example problems	35 ×	3 =	105
Section questions	139 ×	2 =	278
Chapter review questions	75 ×	2 =	150
Objective test questions	65 ×	2 =	130
			<b>1,975 minutes</b>
			<b>32.9 hours</b>