

COURSE OUTLINE

**Environmental Technology 105
Science for Water and Wastewater Operators**

I. Catalog Statement

Environmental Technology 105 will cover three topic areas, Biology, Chemistry, and Physics as they apply to operation, maintenance, and management of water and wastewater facilities. The course is intended to provide the student with a fundamental understanding of the sciences underlying studies of water and wastewater conveyance and treatment.

Units – 4.0

Lecture Hours – 3.0

Lab hours – 3.0

(Faculty Laboratory Hours 3.0 + Student Laboratory Hours 0.0 = 3.0 Total Laboratory Hours)

Prerequisite: None.

II. Course Entry Expectations

Skill Level Ranges: Reading 5; Writing 5; Listening/Speaking 5; Math 3.

III. Course Exit Standards

Upon successful completion of the required coursework, the student will be able to:

1. formulate an understanding of the structure of microbial cells and the purpose and function of the structural components;
2. identify cell structural components using a light microscope;
3. analyze the life-sustaining mechanisms of microbes;
4. demonstrate understanding of the structure of matter;
5. apply mathematics to the solution of chemistry problems;
6. identify the components of solution chemistry, solvents and solutes, and methods for quantifying solution chemistry;
7. define the chemistry of treatment processes and calculate chemical dosages for treatment processes.

IV. Course Content

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| A. | Examination of Cells | 3 hours |
| | 1. Cell structure | |

	2. Function of cells	
B.	How Cells Work	3 hours
	1. Metabolic pathways	
	2. DNA replication	
	3. Enzymes	
	4. Metabolic regulation	
C.	Cell Growth	3 hours
	1. Structure and classification of matter	
	2. Solids analysis	
	3. Total suspended solids	
	4. Volatile solids percentage	
	5. Total dissolved solids	
D.	Mathematics in Waste Water Management	3 hours
E.	Overview of Solution Chemistry	6 hours
F.	Determination of Acids, Bases, and Salts	3 hours
G.	Chemistry of Treatment Processes	6 hours
	1. Nitrogen	
	2. Ammonia	
	3. Nitrite	
	4. Nitrate	
H.	Chemical Dosage	3 hours
I.	Coagulation Jar Test	3 hours
J.	Density and Specific Gravity	3 hours
K.	Pressure and Force Information	6 hours
	1. Piezoelectric surface	
	2. Hydraulic grade line use	
L.	Head and Head Loss	3 hours
M.	Pumping Stations	3 hours
N.	Laboratory	48 hours

V. Methods of Presentation

The following instructional methodologies may be used in the course:

1. lecture/discussion;
2. multimedia presentations;
3. demonstration;
4. field trips.

VI. Assignments and Methods of Evaluation

1. Midterm examination.
2. Final examination.
3. Manipulation Skills Evaluation.

VII. Textbook

AWWA. *Basic Science Concepts and Applications*. 3rd ed.
Denver: American Water Works Association, 2003.
10th Grade Textbook Reading Level ISBN: 1-58321-233-7

Sarai, D. *Basic Chemistry for Water and Wastewater Operators*. Current Edition.
Denver: American Water Works Association, 2005.
10th Grade Textbook Reading Level ISBN: 1-58321-148-9

McCall, D., D. Stock and P.Achey. *11th Hour: Introduction to Microbiology*. Current Edition.
Hoboken: Wiley-Blackwell, 2001.
10th Grade Textbook Reading Level ISBN: 978-0-632-04418-4

Glymph, T. *Wastewater Microbiology: A Handbook for Operators*. Current Edition.
Denver: American Water Works Association, 2005.
10th Grade Textbook Reading Level ISBN: 1-58321-343-0

VIII. Student Learning Outcomes

1. Students will be able to explain the structure of a microbial cell and the function of the components.
2. Students will identify cell structure components.
3. Students will apply mathematics for the solution of chemistry problems.
4. Students will identify the components of solution chemistry, solvents and solutes, and methods for quantifying solution chemistry
5. Students will define the chemistry of and calculate chemical dosages for various treatment processes.