



## **Illinois Wastewater Treatment Exam Preparation Class 4 Course Syllabus**

### **Purpose**

This course is designed to prepare you for your manager level wastewater treatment operator exams.

### **Topics**

#### Basic Water Math

Unit Conversions  
Working with Formulas  
Understanding Percentages  
Calculating Area  
Calculating Volume  
Weight Volume Relationships  
Force-Pressure-Head  
Velocity and Flow Rate  
Pumps  
The Metric System  
Problem Solving

#### Math and Treatment Review

Wastewater Flow Problems  
Characterization of Wastewater  
Sampling Wastewater  
Preliminary Treatment  
Grit Channel Problems  
Primary Treatment  
Clarifier Problems  
Pond Treatment  
Pond Problems  
Activated Sludge Review  
Activated Sludge Problems  
Trickling Filter Review  
Trickling Filter Problems  
Rotating Biological Contactors  
Wastewater Disinfection Review  
Wastewater Disinfection Problems  
Sludge Thickening Review  
Anaerobic Sludge Digestion  
Anaerobic Sludge Problems  
Sludge Dewatering Review  
Advanced Activated Sludge Review  
Advanced Activated Sludge Problems  
Nutrient Removal  
Odor Control  
Pumps and Motors  
Safety  
Management Concepts  
Advanced Wastewater Math

### **CEUs (Contact Hours)**

Upon completion of this course, you will receive a certificate for 6.2 CEUs (62 contact hours).

## **Completion Requirements**

In order to receive [IACET CEU](#) credit for this course, you must complete the following:

- Complete each individual lesson module by watching the video lecture, completing the lesson handout, and passing the lesson quiz.

Once you have completed all of these elements, your course completion certificate will be automatically placed into your learning account for printing/downloading. It will remain in your learning account even after your course access has expired.

## **Learning Objectives**

### Unit Conversions

Upon completion of this lesson the student will be able to:

- Define what a unit is
- Define what an equivalent is
- Demonstrate how units and equivalents are used to solve math problems

### Working with Formulas

Upon completion of this lesson the student will be able to:

- Define what a formula is
- Demonstrate how a formula is used
- Demonstrate how formulas are rearranged
- Demonstrate how to solve math problems using formulas

### Understanding Percentages

Upon completion of this lesson the student will be able to:

- Demonstrate how to convert between fractions and percentages
- Demonstrate how to convert between decimals and percentages

### Calculating Area

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve for the area of a square
- Demonstrate how to solve for the area of a rectangle
- Demonstrate how to solve for the area of a circle
- Demonstrate how to solve for the area of a triangle

### Calculating Volume

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve for the volume of a cube
- Demonstrate how to solve for the volume of a cylinder
- Demonstrate how to solve for the volume of a cone
- Demonstrate how to solve for the volume of a sphere

### Weight/Volume Relationships

Upon completion of this lesson the student will be able to:

- Recall how many pounds one gallon of water weighs
- Recall how many gallons are in one cubic foot
- Recall how many pounds one cubic foot of water weighs

- Recall how many liters are in one gallon
- Recall how many pounds are in one kilogram
- Discuss and demonstrate how these weight and volume relationships are used to solve math problems

#### Force-Pressure-Head

Upon completion of this lesson the student will be able to:

- Define force
- Define pressure
- Define water head
- Recall how many psi (pounds per square inch) is one foot of water head
- Discuss and demonstrate how to solve math problems involving force-pressure-head calculations

#### Velocity and Flow Rate

Upon completion of this lesson the student will be able to:

- Define velocity
- Demonstrate how velocity is calculated
- Define flow rate
- Demonstrate how flow rate is calculated

#### Pumps

Upon completion of this lesson the student will be able to:

- Define horsepower
- Define water horsepower
- Define break horsepower
- Define motor horsepower
- Discuss and demonstrate how to solve pump math problems involving horsepower

#### The Metric System

Upon completion of this lesson the student will be able to:

- Define what metric system units
- Demonstrate how to convert between weight and volume measurements in the metric system
- Demonstrate how to convert between metric units and standard units

#### Problem Solving

Upon completion of this lesson the student will be able to:

- Define the five steps to problem solving
- Determine if all five steps are needed to solve a specific problem
- Explain how the five steps work
- Apply the five step problem solving method to water math problems

#### Wastewater Flow Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to convert between MGD and gpm
- Demonstrate how to convert between MGD and CFS

### Characterization of Wastewater

Upon completion of this lesson the student will be able to:

- Define wastewater characterization key vocabulary words
- Recall the three main classifications used to describe the source of wastewater
- Describe the key details about Physical Characteristics of wastewater
- Describe the key details about Chemical Characteristics of wastewater
- Describe the key details about Biological Characteristics of wastewater

### Sampling Wastewater

Upon completion of this lesson the student will be able to:

- Define wastewater sampling vocabulary words
- Explain the reasons for sampling
- Discuss the Equipment used for sampling

### Preliminary Treatment

Upon completion of this lesson the student will be able to:

- Define preliminary treatment vocabulary words
- Discuss what the purpose of preliminary treatment is
- Express preliminary treatment components
- Discuss the benefits of pre-aeration of wastewater

### Grit Channel Problems

Upon completion of this lesson the student will be able to:

- Define what a grit channel is
- Explain what a grit channel does
- Demonstrate how to solve velocity problems
- Demonstrate how to solve removal problems
- Define the units used in grit channel problems

### Primary Treatment

Upon completion of this lesson the student will be able to:

- Define primary treatment vocabulary words
- Discuss the purpose of primary treatment
- Discuss the components of primary treatment and how they operate
- Recall safety associated with the primary treatment

### Clarifier Problems

Upon completion of this lesson the student will be able to:

- Define what a clarifier is
- Explain what a clarifier does
- Demonstrate how solve detention time problems
- Demonstrate how to solve surfacing loading problems
- Demonstrate how to solve weir overflow problems
- Demonstrate how to solve solids loading problems
- Define what units are used in each of the above listed problem types

### Pond Treatment

Upon completion of this lesson the student will be able to:

- Define pond treatment vocabulary words
- Discuss the purpose of pond treatment
- Express what is involved in the pond treatment process
- Discuss the classification of waste treatment ponds
- Recall the advantages and disadvantages of pond treatment

### Pond Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve detention time problems
- Demonstrate how to solve population loading problems
- Demonstrate how to solve hydraulic loading problems
- Demonstrate how to solve organic loading problems
- Define what units are used in solving pond problems

### Activated Sludge

Upon completion of this lesson the student will be able to:

- Define activated sludge vocabulary words
- Discuss the Activated Sludge Process
- Recall the System Components

### Activated Sludge Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve common activated sludge problems

### Trickling Filter Review

Upon completion of this lesson the student will be able to:

- Define activated sludge vocabulary words
- Discuss trickling filter designs
- Describe the process and equipment

### Trickling Filter Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve common trickling filter math problems

### Rotating Biological Contactors

Upon completion of this lesson the student will be able to:

- Define Rotating Biological Contactors vocabulary words.
- Describe the Rotating Biological Contactors equipment and process control
- Recall common troubleshooting situations

### Wastewater Disinfection Review

Upon completion of this lesson the student will be able to:

- Define disinfection vocabulary words
- Discuss the purpose of disinfection
- Discuss breakpoint chlorination

- Identify the hazards of chlorin
- Discuss safe handling practices of chlorine

#### Wastewater Disinfection Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve residual problems
- Demonstrate how to solve chlorinator setting problems

#### Sludge Thickening Review

Upon completion of this lesson the student will be able to:

- Define Sludge Thickening vocabulary words
- Define the principle of operation and main components of gravity thickeners
- Define the principle of operation and main components of gravity belt thickening
- Define the principle of operation and main components of dissolved air floatation

#### Anaerobic Sludge Digestion

Upon completion of this lesson the student will be able to:

- Define anaerobic sludge digestion vocabulary words
- Discuss how to control the sludge digestion process
- Recall the normal operating parameters of a healthy digester
- Discuss how to identify and correct an “upset” or “sour” digester

#### Anaerobic Sludge Digestion Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve digester seeding problems
- Demonstrate how to solve sour digester neutralizing problems
- Demonstrate how to solve sludge pumping and handling problems
- Demonstrate how to solve digester loading problems
- Demonstrate how to solve solids reduction problems
- Demonstrate how to solve digester gas production problems
- Define the units used in each of the above problem types

#### Sludge Dewatering Review

Upon completion of this lesson the student will be able to:

- Define Sludge Dewatering vocabulary words
- Define the principles of operation and factors affecting belt press operation
- Define the principles of operation and factors affecting centrifuge operation

#### Advanced Activated Sludge Review

Upon completion of this lesson the student will be able to:

- Define activated sludge vocabulary words
- Discuss the operational strategies covered in this lesson that may reduce the power consumed by activated sludge treatment plants

#### Advanced Activated Sludge Problems

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve Advanced Activated Sludge Problems

### Nutrient Removal

Upon completion of this lesson the student will be able to:

- Define nutrient removal vocabulary words
- Recall key info related to Biological Phosphorus Removal
- Recall key info related to Chemical Phosphorus Removal
- Recall key info related to Chemical Nitrogen Removal
- Recall key info related to Biological Nitrogen Removal

### Odor Control

Upon completion of this lesson the student will be able to:

- Define odor control vocabulary words
- Discuss odor control methods

### Pumps and Motors

Upon completion of this lesson the student will be able to:

- Define pumps and motors vocabulary words
- Recall pump types covered in the lesson
- Discuss proper pump operation

### Safety

Upon completion of this lesson the student will be able to:

- Define safety vocabulary words
- Discuss safe work practices
- Discuss the importance of having safeguards and training
- Discuss personal protective equipment
- Discuss the key principles when working with chlorine
- Discuss key safety practices related to confined space
- Discuss the key principles related to lockout/tagout

### Management Concepts

Upon completion of this lesson the student will be able to:

- Define management vocabulary words
- Discuss the key management principles

### Advanced Wastewater Math

Upon completion of this lesson the student will be able to:

- Demonstrate how to solve advanced wastewater math problems

### **Support**

Students can contact our student support staff with any course-related, content-related or technology-related inquiries.

Our office hours are Monday-Thursday, 9 to 5 CT, and Friday 9-12 CT.

### **Contact Info**

Phone Number: (661) 874-1655

General Course Inquiries: [Info@americanwatercollege.org](mailto:Info@americanwatercollege.org)