

**WWTR 112 Course Outline as of Fall 2023****CATALOG INFORMATION**

Dept and Nbr: WWTR 112 Title: MATH FOR WATER TECH

Full Title: Math for Water and Wastewater Technology

Last Reviewed: 2/13/2023

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	3.00	Lab Scheduled	0	6	Lab Scheduled	0
		Contact DHR	0		Contact DHR	0
		Contact Total	3.00		Contact Total	52.50
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00

Total Student Learning Hours: 157.50

Title 5 Category: AA Degree Applicable

Grading: Grade or P/NP

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly: ENVT 112

**Catalog Description:**

In this course, students will learn the practical application of mathematical calculations for hydraulics, chemicals, and solids used in the design, operation, process control, and maintenance of water and wastewater distribution systems and treatment facilities.

**Prerequisites/Corequisites:****Recommended Preparation:****Limits on Enrollment:****Schedule of Classes Information:**

Description: In this course, students will learn the practical application of mathematical calculations for hydraulics, chemicals, and solids used in the design, operation, process control, and maintenance of water and wastewater distribution systems and treatment facilities. (Grade or P/NP)

Prerequisites/Corequisites:

Recommended:

Limits on Enrollment:

Transfer Credit:

Repeatability: Two Repeats if Grade was D, F, NC, or NP

## **ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:**

<b>AS Degree:</b>	<b>Area</b>	Effective:	Inactive:
<b>CSU GE:</b>	<b>Transfer Area</b>	Effective:	Inactive:
<b>IGETC:</b>	<b>Transfer Area</b>	Effective:	Inactive:
<b>CSU Transfer:</b>		Effective:	Inactive:
<b>UC Transfer:</b>		Effective:	Inactive:

**CID:**

**Certificate/Major Applicable:**

Both Certificate and Major Applicable

## **COURSE CONTENT**

**Student Learning Outcomes:**

At the conclusion of this course, the student should be able to:

1. Perform calculations common to the fields of water distribution technology, water treatment technology, and wastewater treatment technology.
2. Use a spreadsheet program such as Excel to perform calculations.

**Objectives:**

At the conclusion of this course, the student should be able to:

1. Convert between common units of time, mass, length, area, volume, and temperature.
2. Apply general mathematical concepts to calculations common in the water and wastewater industry, such as calculation of: areas, volumes, mass, density, specific gravity, ratios, percentages, median and average values, concentrations, flows, pressures, velocities, percent composition, chemical quantities, dosage, pumping rates, detention times, loading rates, efficiencies, and power usage.
3. Complete representative mathematical portions of the state certification exams for: Water Distribution System Operator (Grade 1 or 2), Water Treatment Operator (Grade 1 or 2), and Wastewater Operator (Grade 1 or 2).

**Topics and Scope:**

- I. Units and Unit Conversion with English and Metric Systems
  - A. Length, areas, and volumes
  - B. Mass, density, and specific gravity
  - C. Time and flow rates
  - D. Temperature
  - E. Velocity and pressure
  - F. Price and unit price
  - G. Power and power cost
  - H. Dimensional analysis

## II. Basic Arithmetic

- A. Fractions, decimals, and percentages
- B. Areas and volumes
- C. Ratios and proportions
- D. Exponents

## III. Intermediate Arithmetic

- A. Mean, median, and mode
- B. Weighted average
- C. Efficiency
- D. Algebraic variable isolation

## IV. Chemistry and Related Calculations

- A. pH
- B. Concentrations
- C. Dosages
- D. Preparation of chemical solutions

## V. Pumping Calculations

- A. Static head
- B. Friction and head loss
- C. Total dynamic head
- D. Brake and motor horsepower

## VI. Collection Calculations

- A. Average and per capita flow
- B. Flow composition and velocity
- C. Wet well capacity and pumping rate
- D. Grit chamber and sand trap flow velocity and detention times
- E. Industrial discharge equivalent population

## VII. Primary Treatment Calculations

- A. Chlorination loading
- B. Biological Oxygen Demand (BOD)
- C. Suspended Solids (SS) and Total Dissolved Solids (TDS)
- D. Clarifier volume, surface loading, detention times, and efficiency
- E. Weir overflow rate

## VIII. Treatment Pond Calculations

- A. Volume and evaporation rates
- B. Hydraulic and organic loading

## IX. Filter Calculations

- A. Capacity, loading, and efficiencies
- B. Recirculation ratio

## X. Activated Sludge Calculations

- A. Food/micro-organism loading ratio
- B. Mean cell residence time
- C. Waste and return pumping rates
- D. Aerator air flow
- E. Volume and volume index
- F. Sludge thickening rate
- G. Digester seeding, loading, and detention time

## XI. Solids Calculations

- A. Centrifuge efficiency
- B. Belt press efficiency
- C. Volatile solids reduction
- D. Volatile acidity/alkalinity ratio
- E. Dissolved air flotation

- F. Solids mass balance and location
- XII. Effluent Treatment Calculations
  - A. Concentration-Time (CT)
  - B. Chlorine dosage, demand, and residual
  - C. Hypochlorite
  - D. Dechlorination
  - E. Ultraviolet (UV) and ozone
  - F. Log removal and disinfection efficiency

**Assignment:**

1. Reading assignments, approximately 20-pages per week
2. In-class exercises (8-10)
3. Homework assignments (10-14)
4. Quiz(zes) and exam(s) (2-10)
5. Final exam

**Methods of Evaluation/Basis of Grade:**

**Writing:** Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments are more appropriate for this course.

Writing  
0 - 0%

**Problem Solving:** Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

In-class exercises and homework assignments

Problem solving  
40 - 60%

**Skill Demonstrations:** All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None

Skill Demonstrations  
0 - 0%

**Exams:** All forms of formal testing, other than skill performance exams.

Quiz(zes) and exams

Exams  
40 - 60%

**Other:** Includes any assessment tools that do not logically fit into the above categories.

Participation

Other Category  
0 - 10%

**Representative Textbooks and Materials:**

Math Text for Water and Wastewater Technicians. 3rd ed. Wright, Grover. Wright's Training.

1997 (classic)

Applied Math for Wastewater. Price, Joanne Kilpatrick. CRC Press. 1991 (classic)

Applied Math for Wastewater Workbook. Price, Joanne Kilpatrick. CRC Press. 1991 (classic)

Instructor prepared materials