

**WWTR 124 Course Outline as of Fall 2012****CATALOG INFORMATION**

Dept and Nbr: WWTR 124 Title: PUMPS

Full Title: Pumps

Last Reviewed: 8/27/2018

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	5	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 124

**Catalog Description:**

Basic theory of hydraulics and pumping systems, including operation, troubleshooting, maintenance and repair of pumps and pumping systems.

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

Description: Basic theory of hydraulics and pumping systems, including operation, troubleshooting, maintenance and repair of pumps and pumping systems. (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>	<b>Effective:</b>	<b>Inactive:</b>
<b>CSU GE:</b>	<b>Transfer Area</b>	<b>Effective:</b>	<b>Inactive:</b>
<b>IGETC:</b>	<b>Transfer Area</b>	<b>Effective:</b>	<b>Inactive:</b>
<b>CSU Transfer:</b>		<b>Effective:</b>	<b>Inactive:</b>
<b>UC Transfer:</b>		<b>Effective:</b>	<b>Inactive:</b>

**CID:**

**Certificate/Major Applicable:**

Both Certificate and Major Applicable

## **COURSE CONTENT**

### **Outcomes and Objectives:**

Upon completion of the course, students will be able to:

1. List main features contained on centrifugal pumps.
2. Explain pump installation, operating procedures and troubleshooting techniques of centrifugal pumps.
3. Explain operating procedures, uses and troubleshooting of other types of pumps used in the wastewater industry.
4. Select pipe, pipe fittings and valves for particular applications.
5. Describe the maintenance requirements of valves and piping systems.
6. Explain an electrical circuit, define electrical terms and use electrical formulas for determining power, voltage, amperage and electrical resistance.
7. Describe sources of electricity; explain the principle by which a generator produces electricity.
8. Describe how batteries are maintained and operated.
9. Explain the need and principle of operation of electrical protective devices.
10. Explain the electrical principle used to design a motor.
11. Describe the different types of motor starters, where each is used and the principle of operation for each.

### **Topics and Scope:**

- I. Introduction to Pumps and Hydraulics
  - A. History
  - B. Theory
  - C. Classification
  - D. Application
- II. Pump Classification and Theory:
  - A. Pump vocabulary
  - B. Dynamic and positive displacement pumps
  - C. Operational differences
- III. Centrifugal Pump Types and Operation
  - A. Types and operation of different types
  - B. Pump packing and mechanical seals

- IV. Centrifugal Pump Troubleshooting and Repair
  - A. Disassembly and replacement of components in suction pumps
  - B. Coupling types
  - C. Drives and alignment
- V. Pump Hydraulics: Part 1
  - A. Hydraulics basics
  - B. Use of pump curves to determine capacity
  - C. Total dynamic head
  - D. Horsepower
  - E. Efficiency
  - F. Required net positive head
- VI. Pump Hydraulics: Part 2
  - A. Definition of NPSH (Net Positive Suction Head)
  - B. Affinity laws
    - 1. effect of speed changes and impeller trim
    - 2. capacity, head and horsepower requirements
- VII. Pump Piping and Valves
  - A. Overview of suction and discharge piping
  - B. Priming and sealing the system
  - C. Pump control valves.
- VIII. Basic Electronics and Types of Power Used in Wastewater Technology
  - A. Electrical terms, formulas and circuits
  - B. Determining power, voltage, amperage and electrical resistance
- IX. Motors and Starters
  - A. Overview of different types of motor starters
  - B. Where each type is used
  - C. Principles of operation
  - D. Energy optimization
- X. Motors and Starters Maintenance and Troubleshooting
  - A. Preventative maintenance
  - B. Planned maintenance
  - C. Troubleshooting
- XI. Meters and Test Equipment
  - A. Metering equipment
  - B. Amp testing
  - C. Megohmmeter testing
  - D. Testing pressure gauges
- XII. Pump Station Maintenance and Safety
  - A. Preventive and planned maintenance
  - B. Appropriate intervals and triggers
  - C. General safety procedures

**Assignment:**

1. Reading assignments averaging 20 pages per week.
2. Weekly problem solving homework assignments related to distribution, collection and pumping systems.
3. Quizzes (10-15).
4. Final exam.
5. Field trip to treatment plant and/or pumping station.
6. Field trip report (3-5 pages)

## 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.

Field trip report

Writing  
5 - 10%

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

Homework problems

Problem solving  
30 - 55%

**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.

Quizzes; final exam (objective questions)

Exams  
30 - 55%

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

Attendance and class participation

Other Category  
5 - 10%

## Representative Textbooks and Materials:

1. Pumps and Pumping, ACR Publication, Skeet Arasmith, 8th edition, 2000, (classic)
2. Instructor prepared materials