Lecture Contact Hours: 48-54; Homework Hours: 96-108; Total Student Learning Hours: 144-162

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

CENTER FOR WATER STUDIES 232 – ADVANCED WASTEWATER COLLECTION SYSTEMS

3 hours lecture, 3 units

Catalog Description
Provides an in-depth understanding of the operation and maintenance of wastewater collection systems. Includes the design, operation, monitoring, maintenance and repair of collection systems and pump stations; equipment maintenance; safety and survival systems; and administration and organizational principles.

Prerequisite
"C" grade or higher or "Pass" in CWS 132 or equivalent

Entrance Skills
Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed:
1) Define common terminology used in the wastewater industry.
2) Identify the types and uses of pipes, fittings, and appurtenant structures commonly used in a wastewater collection system.
3) Using a wastewater collection mapping record, identify pipeline dimensions, pipe construction materials, direction of flow, and location of laterals and lift stations.
4) Demonstrate an in-depth understanding of basic underground location and leak detection, trenching and shoring, and backfill and compaction methods of construction used in the field.
5) Describe various cleaning methods and basic principles involved in hydraulic and mechanical cleaning methods.
6) List and describe the operation of common valves used in a wastewater collection system.
7) Perform mathematical computations common to wastewater collection systems.

Course Content
1) Lift Station Design and Operation
    a. Purpose of Lift Stations
        1. Location
        2. Types of Lift Stations
        3. Wet Well Station
        4. Dry Well Station
        5. Lift Station Requirements
    b. Components of a Lift Station
        1. Wet Wells
        2. Bar Racks
        3. Dry Wells
        4. Electrical Systems
        5. Motors
        6. Supervisory Control (SCADA)
        7. Pumps
        8. Lift Station Valves
        9. Ventilation and Auxiliary Equipment
    c. New Constructed Lift Station

1. Examination of Prints
2. Pump Station Calibration
3. Inspection of Lift Station
4. Operation Inspection

d. Operation of Lift Stations
   1. Lift Station Visits
   2. Frequency of Visits
   3. Essential Tasks During Visits

e. Lift Station Maintenance
   1. Scheduling Maintenance
   2. Recordkeeping

2) Equipment Maintenance
   a. Electrical Equipment Maintenance
      1. Volts, Amps, Watts and Power Requirements
      2. Tools, Meters and Testers
      3. Electrical System Equipment
      4. Motor Control/Supervisory Control and Electrical Systems
   b. Motors
      1. Types
      2. Nameplate data
      3. Causes of failures
      4. Insulation
      5. Starters
      6. Safety
      7. Troubleshooting
   c. Pumps: pump types and parts, testing
   d. Pump Components
      1. Impellers
      2. Shafts
      3. Packing
      4. Mechanical Seals
      5. Bearings
      6. Couplings
3) Sewer Rehabilitation
   a. Program Formulation
      1. Historical Background
      2. Program Definition
      3. Implementation
   b. Evaluation of Conditions
      1. Purpose of Sewer System Evaluation
      2. System Problems
      3. Hydraulic Aspects
      4. Structural Aspects
   c. Setting Up A Rehabilitation Program
      1. Data Collection
      2. Preliminary Statement of Needs
      3. Cost Analysis
      4. Setting Priorities
      5. Cost Effective Analysis
   d. Methods of Rehabilitation
      1. Excavate and Replace
      2. Chemical Grouting
      3. Trenchless Technology
      4. Insituform
      5. Polyethylene Pipe Lining

6. Service Connections
7. Manholes

4) Administration
   a. Need For Effective Administration
   b. Principles of Administration
   c. Operating Plan
      1. Mission Statement
      2. Goals
      3. Objectives and Tasks/Procedures
   d. Personnel
      1. Calculating Personnel Requirements
      2. Employment
      3. Compensation
      4. Training, Informing and Certification
      5. Safety
   e. Equipment and Tools
      1. Basis For Requirement
      2. Lease, Purchase or Contract
      3. Equipment and Tool Requirements
      4. Management
   f. Facilities
      1. Yard
      2. Shop
      3. Operator Facility
      4. Offices
   g. Mapping
      1. Importance of Mapping
      2. Information on Maps
      3. Examples of Maps
      4. GIS - Geographical Information System
   h. Uses of Computers in a Wastewater Collection Agency
      1. Management Information System
      2. Application of Computers for System O & M
      3. Recordkeeping
   i. Report Writing
   j. Public Relations
5) Organization For System Operation and Maintenance
   a. Need For Organization
   b. Organizational Principles
   c. Organization of Personnel
   d. Different Repair and Maintenance sections Within the Organization
   e. Safety Considerations
   f. Reorganization
   g. Establishing a Maintenance Program
   h. General Performance Indicators

Course Objectives

Students will be able to:

1) Define common terminology used in the wastewater industry.
2) Identify the primary types of pumps used in a wastewater collection system.
3) Demonstrate understanding of the basics of equipment maintenance.
4) Identify the primary management principles necessary for effective administration of a wastewater collection system.
5) List the steps involved in developing and implementing an effective maintenance program.

Method of Evaluation
A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.
1) Projects and writing assignments
2) Quizzes
3) Exams (objective, essay)
4) Projects and assignments utilizing the Field Operations Skills Yard

Special Materials Required of Student
None

Minimum Instructional Facilities
Smart classroom

Method of Instruction
1) Lecture and discussion
2) Audiovisual
3) Field trips
4) Demonstrations utilizing the Field Operations Skills Yard

Out-of-Class Assignments
1) Reading assignments
2) Writing assignments
3) Projects

Texts and References
1) Required (representative example): Sacramento State Office of Water Programs, *Operation and Maintenance of Wastewater Collection Systems, Vol. II*. 8th edition. CSU Sacramento, 2018.
2) Supplemental: American Water Works Association G520-17 WASTEWATER COLLECTION SYSTEM OPERATION AND MANAGEMENT, ISBN: 9781625762214, 2017.

Student Learning Outcomes
Upon successful completion of this course, students will be able to:
1) List the components that comprise a typical wastewater collection system.
2) Describe the differences between a sewer lift station and a wastewater pump station.
3) Identify the necessary elements required to effectively monitor and administer a wastewater collection system.
4) Identify the safety hazards associated with operating and maintaining a wastewater collection system and the procedures necessary to mitigate these hazards.