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Blackboard https://blackboard.usc.edu/

Course Description

This course is designed to give seniors and first year graduate students in Civil/Environmental Engineering the ability to design the complete/comprehensive water supply and sewer systems (both sanitary sewer and storm drain), including all necessary pump station design.

Course and Learning Objectives

- To study and analyze the design criteria of overall water supply and sewer system.
  
  The student will be able to:
  1. Understand the hydraulics of pressure pipe flow and open channel gravity flow;
  2. Perform the population projection for a water and sewer system of a specified city to be designed for.

- To study and analyze the wells and reservoir and service storage for the water supply system.

  The student will be able to:
  1. Evaluate the capacity of the water wells to be served as the source of the water supply;
  2. Design the size of the storage reservoir based on the design criteria selected for the water supply system;
  3. Design the capacity of the elevated storage reservoir requirement based on the different pumping modes of the day;
  4. Determine the optimum storage capacity for the water supply system @ various unit cost of electricity.

- To layout and design the water distribution system.

  The student will be able to:
1. Perform fire flow testing to ensure firewater requirement is met;
2. Perform the Hardy Cross water network analysis to ensure the flow rate and pressure requirement are met;
3. Selection of the proper piping material for the water distribution system;
4. Analyze the water hammer problem in the water distribution system;
5. Layout the looped water distribution system.

- To layout the gravity sanitary sewer and storm drain system.

The student will be able to:
1. Perform the hydraulic analysis for the partially full pipe system;
2. Estimate the sanitary sewage flow rate based on the water supply requirement;
3. Estimate the surface runoff based on the rational method;
4. Perform layouts of both the sanitary and storm drain systems to eliminate the possible cross contamination with the potable water distribution system;
5. Pipe sizing and pipe material selection based on various pipe trenching and external loadings.

- To layout and design the pump station.

The student will be able to:
1. Estimate the size of the required pump and lift stations both for the water and sewer systems;
2. Estimate the total dynamic head (TDH) and horse power requirements for the pump station;
3. Perform general arrangement of a pump station with multiple pumps and its selection on the number of pumps required for the system design

Prerequisite

CE453 Water Quality Control

Class Day/Time/Location

Tuesday/6:30 to 9:10 P.M./KAP 145

Required Textbook


Computer Usage

EPANET for Hardy Cross Water Distribution Analysis

Weekly Course Schedule

1. General outline of water supply & sewer systems
2. Review of Hydraulics
3. Population projection
4. Water wells as water resource
5. Distribution reservoir and service storage
6. Water distribution network – Hardy Cross method
7. Fire water requirement and flow testing
8. Water Hammer analysis
9. Pump station design & pump selection
10. Wastewater flow estimate and analysis
11. Storm runoff analysis - Rational method
12. Sewer system design - Combined vs. separate system
13. Loads on buried pipe
14. Pipe selection and sewer appurtenances
15. Any additional subjects that students requested
Grading Scheme

15%  Homework Assignments
5%   Class Participation & Discussion
25%  Midterm Exam (1st Exam – Water Supply System)
25%  Final Exam (2nd Exam – Sewer System)
30%  Term Project (Design of a Complete System for a Small Community - Due on the Day of Final Exam)

Attendance

Regular attendance will not be taken. However, examination questions will include items covered in lectures and distributed handouts that are not covered in the textbook. Each student is responsible for all announcements and material covered in class.

Late Work

- Weekly homework is due at 6:30 pm, one week after the assignment date.
- Solutions will be posted on the course Blackboard two weeks after the assignment date.
- Homework may be submitted after due date but before solutions are posted for 50% credit. Later submittals will not be accepted or graded.