



## CE 340 – Water Resources Engineering

**Code and Name:** CE 340 – Water resources engineering

**Credit Hours:** 3 (Lecture: 3, Tutorial: 1)

**Textbook:**

- Water Resources Engineering: Chin, D.A., 3rd Edition, Pearson, 2013

**Other References:**

- Mays, L.W., *Water Resources Engineering*, John Wiley & Sons. 2005

- *Course handouts: distributed on a regular basis to provide more information on the topic.*

**Course Description:**

Introduction to water resources in the globe and in SA. Hydraulic design of transmission lines: gravity and pumping systems, pipeline economics, pipe networks. Introduction to open channel hydraulics: uniform flow, critical flow, specific energy, gradually varied flow, rapidly varied flow, flow measurements in open channels. Introduction to hydrology: rainfall data analysis, Time of concentration, Runoff analysis and Rational method. Hydraulic analysis of gravity sewer flow.

**Pre-requisites:** STAT215 Probability & Statistics, CE241 Fluid Mechanics

**Co-requisites:** None

**Course Learning Outcomes:**

With relation to ABET Student Outcomes (From Fall 2019-SOs: 1-7)

1. Apply mathematical mass conservation, energy equation or momentum equation on water resources system (1).
2. Solve water pipe networks using Nodal and Loop method manually or using Excel solver/software-Calculate water surface profile using step by step method manually or using spreadsheet (1).
3. Design gravity or pressurized transmission lines or free surface flow system (1,2).
4. Develop/propose/analyze different design alternatives and identify the pros and cons of each alternative and select the most relevant alternative (2).
5. Effectively organize and deliver a written report for the course project and prepare YouTube video clip presentation (3).

**Topics to be covered:**

- Water scarcity in the globe and discussion of available sources of water resources in Saudi Arabia.
- Flow in Closed Conduits: Continuity, Momentum and Energy (Bernoulli).
- Pipe Networks: Nodal method, loop method and practical consideration.
- Pump Hydraulics: Types of pumps, Calculation of pump head, Pump economics, Development of design Alternatives, Operating point, Selection of suitable Pumps, Calculation of NPSH and check of cavitation.
- Flow in open channels: Basics of uniform flow, Manning, Chezy and Darcy equations for open channel flow. Design for stable open channels based on uniform flow concepts.
- Surface water hydrology and Design of storm sewer systems: Rainfall and runoff introduction, Time of concentration, Peak runoff models, Storm sewer system design
- Specific energy concept, Rapidly varied flow and gradually varied flow computations.

**Grading Policy:**

The grading for the course is: 60% coursework and 40% Final Exam. The course work consists of two Midterm Exams, where each midterm exam is worth 20%. It also includes quizzes, and projects for the remaining 20% that is modified by the course instructor.

