Texas A&M University-San Antonio
Water Resources Science and Technology

WATR 3332 INTRODUCTION TO HYDRAULICS (3 SCH)
Fall 2024, Monday/Wednesday 2:00 – 3:15 pm

INSTRUCTOR INFORMATION
Dr. Walter Den, Email: walter.den@tamusa.edu, Tel: 210-784-2815

OFFICE HOURS
MW 3:30-4:30 pm

COURSE MATERIALS
Required textbook: Introduction to Fluid Mechanics, Alan T. McDonald, Robert Fox, and Philip J. Pritchard. 6th Edition or later. ISBN 978-0471202318.

COURSE DESCRIPTION
The analysis of the flow and pressure distribution of flowing water and wastewater is critical to many fundamental engineering tasks, such as sizing pipes between tanks and taps, picking pumps, and assuring a good flow distribution in water or wastewater treatment works. This course is designed for those who wish to learn how to solve such problems and how to think practically about the flow of water in engineered systems. The course will cover both pressurized and open-channel flow, and will cover the hydraulics of pipes, pumps, networks and channels.

COURSE OUTCOMES
1. Basic knowledge of hydraulics.
2. Solve a range of hydraulic problems, from sizing pipes, selecting pumps, measuring flow in the field, and calculating open channel hydraulic profiles.
3. Understanding how hydraulic equipment works in principle.

METHOD OF INSTRUCTION
Classroom lectures to present the basic theory (usually Tuesday), problem solving sessions (Thursday) where students put the theory to work in solving practical problems.

METHOD OF ASSESSMENT
- Quizzes (5) (40%) subject quizzes, average once every 3 weeks.
- Midterm (1) (25%)
- Final exam (1) (25%)

SCHEDULE
The course will cover the two major topics: hydraulics of pipes under pressure (water mains and networks) and open channel flow (sewers, drains, and channel sections).

- Week 1-3: The course will begin with a review of hydrostatics (e.g. the calculation of water pressures, and their consequent forces when water is still, e.g. in reservoirs, or against the face of dams.)
- Week 4-6: We will move to the subject of hydrokinetics (water is flowing). The fundamental concepts of energy, momentum and continuity will be introduced and students will learn how to apply them in solving practical design problems for single conduit problems.
- Week 7-8: We will briefly introduce pipe network modeling (EPANET and similar).
- Week 9-11: In the second half of the semester, we will introduce the performance and selection of pumps using system-head curves. Basic analysis of water hammer and cavitation will be presented.
- Week 12-14: The fundamentals of open channel flow will be covered, including the definition and significance of critical, subcritical and supercritical flow. Practical design problems and demonstrations of each.
- Week 15: The course will cap with guided student computational work on a hydraulic profile through a wastewater treatment works.

Week	Week of	Activity
1	8/26	Introduction. Outline of course and review of syllabus. Fluid definition and basic properties.
2	9/2	Hydrostatics, Pascal's principle, pressure and applications
3	9/9	Hydrostatics, Basic concepts of Energy and Head in Flow
4	9/16	Concept of Head, Pressure, and flow measurement
5	9/23	Concept of Head loss & flow computations for single conduits
6	9/30	Head loss calculation for single conduits
7	10/7	Pipelines in Series and parallel
8	10/14	Introduction to network models
9	10/21	Review/Midterm
10	10/28	Introduction to Pumping Systems & System-head curve
11	11/4	Water Hammer and Cavitation
12	11/11	Introduction to Open Channel Flow. Difference from pressure flow
13	11/18	Specific Energy, subcritical, supercritical & critical flow
14	11/25	Thanksgiving Holiday

15	12/2	Calculating simple hydraulic profiles
16	12/9	Final exam week