CE 241 – Fluid Mechanics

Code and Name: CE 241 – Fluid Mechanics
Credit Hours: 3 (Lecture: 3, Tutorial: 1)

Textbook:
- Engineering Fluid Mechanics: Donald F. Elger, Barbara C. William, Clayton T. Crowe & John A. Roberson, 10th Edition, Pearson, 2014

Other References:
- *Introductory Fluid Mechanics by Joseph Katz; Cambridge University Press, 2010*
- *Course handouts: distributed on a regular basis to provide more information on the topic*

Course Description:

Introduction to fluid mechanics; unit conversion and dimensions, introduction to fluid properties, basics of hydrostatics, hydrostatic pressure forces on plain and curved surfaces, buoyancy and stability. Introduction to fluid kinematics and conservation of mass. Fluid dynamics and energy equation, venture effect and stagnation point. Types of head losses in pipes, application of flow in pipes. Introduction to momentum principle.

Pre-requisites: GE201 Statics, MATH235 Differential Equation
Co-requisites: None

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

- Calculate the hydrostatic pressure stress/force at a point, plain surface and curved surface, (1)
- Calculate the dynamic pressure head at a pipe section by applying the energy equation, (1)
- Calculate time of emptying of a tank, (1)
- Apply the momentum equation to identify a relation between the acting forces. (1)
- Determine the size of the gravity transmission pipe between two tanks to convey a required flow demand (2)
- Sketch the total energy and hydraulic grade lines and identify the major/minor sources of losses. (2)
- Identify the stability of a floating platform over water based on Archimedes buoyancy law (2)

Topics to be covered:

- Basic definitions and introduction to fluid mechanics and its importance for engineers
- Fluid properties such as: Fluid density, specific weight, specific gravity, viscosity and surface tension
- Hydrostatic pressure and Pascal law, pressure measurement.
- Hydrostatic forces on plain surfaces
- Hydrostatic forces on curved surfaces
- Buoyancy and Predicting Stability of Immersed and Floating Bodies
- Kinematics of Fluid
- Fluid streamlines and velocity,
- Classification of flow, Rate of flow, control volume approach and Continuity equation
- Applications of Bernoulli Equation in real flow, pipe flow, concept of hydraulic and total energy lines and combined head loss
- The momentum equation and its applications

Grading Policy:
The grading for the course are 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 for the remaining 20%.