Birzeit University
Mechanical & Mechatronics Engineering Department
Fluid Mechanics –ENME335
Second semester 2021-2022
Course Outline
Instructors: Dr. Sameh Abu Awwad, Office Aggad 323/4 ,
snawad@birzeit.edu
Schedule T, R 12:50-2:05

Course Description:
Properties of fluid statics, equilibrium of floating and submerged bodies. Principals and equations of fluid flow, viscosity and compressibility and its effect on flow. Dimensional analysis and dynamic similitude. Fluid measurements. Fluid friction in pipe flow. Pumps and Water Turbines.
(Prerequisites: ENME 232).

Objectives:
Studying fluid properties, basics of fluid statics and fluid in motion and their engineering applications.

Intended Learning Outcomes:
By the end of this course the student should be able to:

- Understand basic fluid notations, definitions and fluid properties.
- Calculate pressure variation, in static fluid in addition to pressure forces on plane and curved surface
- Analyzing buoyancy forces and stability of floating and submerged bodies.
- Apply mass conservation equation on a control volume.
- Apply energy equation to a control volume.
- Apply Bernoulli's equation to frictionless flow.
- Apply Linear and angular momentum principles on control volumes.
- Understand and formulate dimensional analysis and similarity principles on fluid mechanics problems and systems.
- Solve simple pipe problems and design of piping systems for different applications and fluids.
- Describe structure, operating principles, power and efficiency of centrifugal pumps and water turbines.

Textbook: Fluid Mechanics 6^{th} /7^{th}. Frank White, McGraw-Hill 2003/2008.

Topics:

Introduction: (Chapter 1)
Fluids, dimensions & units, thermodynamic properties of fluids, viscosity & shear stress. (2 lectures*).

Pressure Distribution in a Fluid: (Chapter 2)
Pressure gradient, pressure distribution. Manometers. Hydrostatic forces on plane surfaces, Hydrostatic forces on curved surfaces. Buoyancy and stability. Pressure distribution in rigid body motion. Pressure measurements. (7 lectures).

Integral Relations for a Control Volume (Chapter 3)
Basic Physical laws for fluid mechanics. Reynolds transport theorem. Conservation of mass. Linear momentum, equation. Angular momentum equation. Energy equation. Bernoulli equation. Fluid measurements (8 lectures).

Dimensional Analysis and Similarity (Chapter 5)
Dimensional homogeneity. Dimensionless groups. Pi theorem. Modeling and similarity. (3 lectures).

Viscous Flow in Ducts (Chapter 6)
Laminar & turbulent flow regimes. Friction factor. Minor losses. Pipe flow problems. Flow in non- circular ducts. (7 lectures).

Pumps (Chapter 11)
Pumps types. Pumps power and efficiencies. Centrifugal pumps characteristic and performance curves. Pump selection and operating point. (3 lectures).

***Lecture 75 minutes*

Exams:

- Exams are closed book, but formula sheet will be provided by instructor
- University regulation will be applied to exam make- ups.

Grading:

Quizzes	15%
Homework & Participation	10%
Midterm	35%
Final Exam	45%