Al-Hussein Bin Talal University **Faculty of Engineering**

Department of Mechanical Engineering.

Course Syllabus

Course title: Fluid Mechanics (2)	**Course No. /Code:** 0507421
Course pre-requisite: : 0507321	**Course teaching language:** English
Course level: Fourth year	**Credit hours:** 3 hours

Course Description:

Review of basic definitions; system and control volume; Foundations of flow analysis; differential from of the basic laws; general viscous flow; boundary layer theory, Navier – Stokes equation, Blassius equation, Von Karman equation, Irrotational flow; stream function, vorticity and rotationality, Incompressible inviscid frictionless flow, 2-D Flow solutions around bodies, compressible flow; adiabatic and isentropic flow; Normal shock waves; Nozzles; Introduction to turbomachinery, centrifugal pumps.

Course objectives:

1. To review the basic definitions such as density, specific gravity, viscosity, surface tension, viscosity and kinematic viscosity, and the Bernoulli and Euler's equations.
2. Explain the key difference between the Lagrangian and Eulerian descriptions of a flow field.
3. Outline the steps in the derivation of the continuity equation.
4. To describe the steps to derive Navier – Stokes equation.
5. To State the Buckingham theorem, and explain the significance of the common π-groups.
6. To Distinguish between the laminar and turbulent boundary layer.
7. To describe laminar flow, turbulent flow, developing flow, and fully developed flow in a conduit.
8. To describe lift, drag, and friction drag.
9. To explain the significance of the Mach number and a normal shock wave.
10. To size and select a pump for a given job.

Learning outcomes (understanding, knowledge and practical skills):

Upon completing this course, the student is expected to be able to:

1.	Define the basic definitions.
2.	Apply continuity equation to velocity changes in variable-area ducts.
3.	Calculate shear stress in Couette flow, pressure gradient in Hele-Shaw flow, the boundary-layer thickness, and overall resistance for laminar and turbulent boundary layers..
4.	Describe laminar flow, turbulent flow, developing flow, and fully developed flow in a conduit.
5.	Find the coefficient of drag and calculate the drag force and the lift force.
6.	Calculate property change across normal shock wave.
7.	Calculate performance of axial fan, discharge, head, and power for a pump.

Textbook & references:

Book title	Author (s)	Publisher	Edition
Engineering Fluid Mechanics	Roberson / Crowe	Wiley & Sons	09th
Engineering Mechanics Fundamentas	Yunus A / Cengel	McGraw-Hill	07th

Assessment Methods:

Assessment no.	Assessment Method	Week Due	Allocated Mark
1	First exam	6^{th} week	25
2	Second exam	12^{th} week	25
3	Final exam	17^{th} week	50