Isfahan University of Technology (IUT)   Department of Civil Engineering
HYDRODYNAMICS   Term I

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Instructor:
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  Lecture time: Saturdays, Mondays 11:00-12:15
  Office hours: Saturdays   14:30-16:00
                   Mondays   14:30-16:00

Mark Distribution:	Mid-Term I (Ch 1)	2
	Mid-Term II (Chs 2&3)	4
	Final Exam	12
	Assignments	2

References:

      "   " (۱۳۸۸) .   .   .   .

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2. Schlichting, H., and Gersten, K. (2000), "*Boundary-Layer Theory*", 8th Ed., MacGraw-Hill, USA.
3. Vallentine, H. R. (1961), "*Applied Hydrodynamics*", Butterworth, USA.
4. Lamb, H. (1957), "*Hydrodynamics*", Cambridge University Press, UK.
5. Streeter, V. L. (1984), "*Fluid Dynamics*", MacGraw-Hill, USA.
6. Munson, B.R., Young, D.F., and Okiishi, T.H. (2002). *Fundamentals of Fluid Mechanics*. John Wiley & Sons, USA.
7. Shames, I. H. (2000), "*Mechanics of Fluids*", MacGraw Hill, USA.

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Course Outline:

	Topic	Time (weeks)
1.	**Introduction, Basics of Fluid Mechanics**	**4**

        -         Basics
        -         Fluid statics
        -         Fluid dynamics
        -         Dimensional analysis
        -         Pipe flow
        -         External flows

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    2.   **Laminar Flow**   **3**

- Introduction
- Derivation of the Navier-Stokes equations
- Solution of Navier-Stokes equations
  - parallel flows (couette flow, wide rectangular channel, pipe flow)

    3.   **Turbulent Flow**   **3**

- Introduction
- Reynolds equations
- Turbulent flow in pipes
- Turbulent flow in wide rectangular channels

    4.   **Applied Hydrodynamics**   **3**

- Introduction
- Euler and Bernoulli equations
- Stream and velocity potential functions, flow net
- Simple flows and combinations of simple flows

    5.   **Laminar Boundary Layers**   **3**

- Introduction and concept of boundary layer
- Estimates for main properties of laminar boundary layers
- Prandtl boundary layer equations
- The Blasius problem - laminar boundary layer on a flat plate
- Different boundary layer thicknesses
- Integral momentum equation
- Approximate solution of the Blasius problem

Prerequisites:
    1.   Fluid Mechanics
    2.   Use of an equation solver package such as Mathematica, MathCad, TK Solver, Excel, etc. is highly recommended.