Tishk International University
Mechatronics Engineering Department
Fluid Mechanics
Lecture 1: /2 /2024

Introduction to Fluid Mechanics

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Outline

- Students Obligation
- Syllabus
- Assessment
- Introduction

Students Obligation

- **attending classes on time and regularly.**
- **being prepared for classes with all necessary supplies.**
- **Students need to respect the ideas and opinions of their classmates in and outside of the classroom.**
- **If you are more than 10 minutes late, you will be declared absent.**
- **The homework and assignments should be submit it on time .**
- **The students have to participate all quizzes and exams**

Assessment

Quiz	10%
Homework	5 %
Laboratory	10%
Midterm Exam	25%
Practical exam	10%
Final Exam	40%

Objectives and outcomes of this course

- This introductory course on *"Fluid Mechanics"* is prepared,
  - ✓ to develop an intuitive understanding of Fluid Mechanics by supplying better visual aids to reinforce the physics.
  - ✓ to give students a better feel of how Fluid Mechanics is applied in engineering practice by presenting numerous and diverse real world engineering examples.
- After completing this course,
  - ✓ students will develop a good understanding of the concepts behind all of these, and many other applications.
  - ✓ students will make significant progress toward being ready to work on such state-of-the-art fluid mechanics projects.

Fluid

- fluid is a substance that deforms continuously under the action of an applied shear force or stress - A fluid is a substance that can resist shear only when moving.

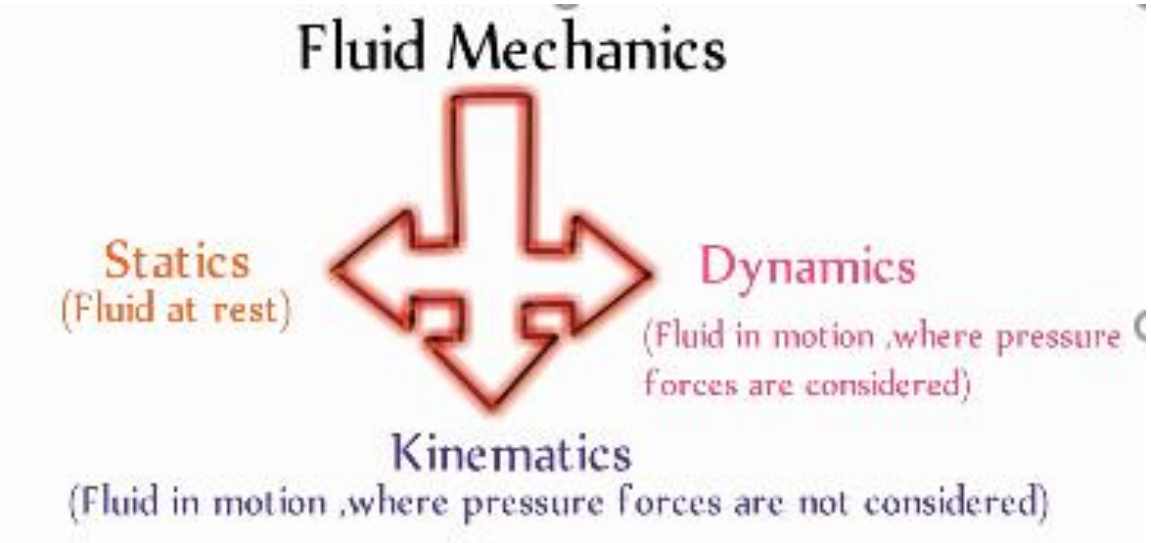
Characteristics of Fluid (Liquid or Gas)

1. It has no definite shape of its own, but conform to the shape of the containing vessel

2. Even a small amount of shear force exerted on a undergo a deformation which continues as long continues to be applied

Fluid Mechanics

Fluid mechanics is that branch of science which deals with the behaviour of the fluids (liquids or gases) at rest as well as in motion. Thus this branch of science deals with the static, kinematics and dynamic aspects of fluids. The study of fluids at rest is called fluid statics. The study of fluids in motion, where pressure forces are not considered, is called fluid kinematics and if the pressure forces are also considered for the fluids in motion, that branch of science is called fluid dynamics.

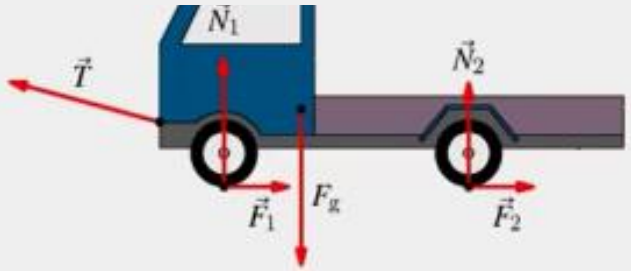


What is FLUID MECHANCIS?

A substance in the Liquid or Gas phase is referred to be a **Fluid**.

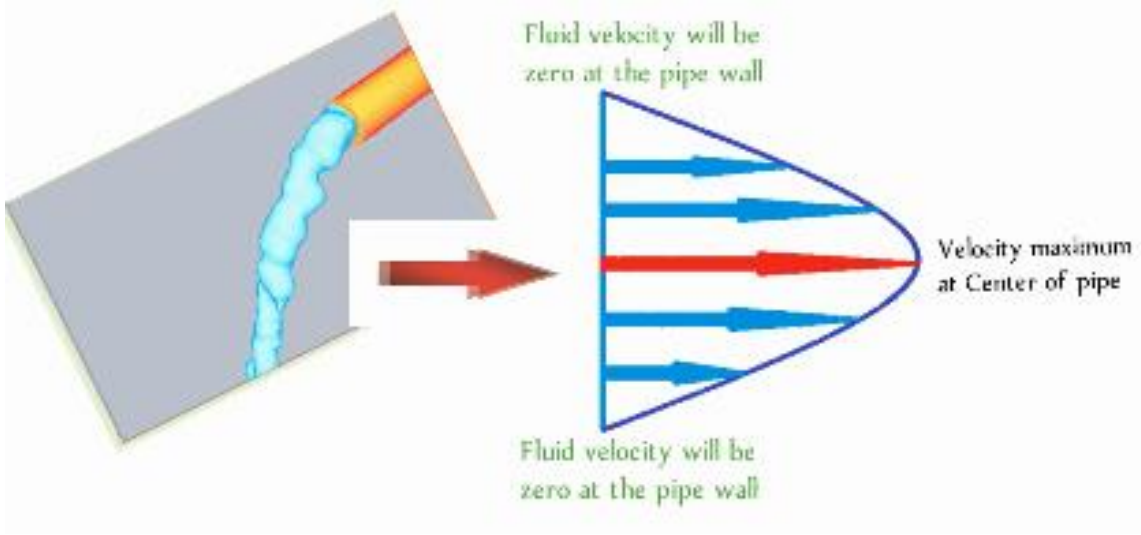
Mechanics is the branch of physical science that deals with the behavior of stationary and moving bodies when subjected to Forces.

Fluid Mechanics is the branch of physical science that deals with the behavior of Fluid at rest or in motion.



What are the common Examples for fluid

- Gases are fluids that do not have a definite volume. A gas has no shape and it assumes the volume of the container that it is confined in. Gases can be compressed. They are affected by temperature and pressure.
- Liquid: It is an incompressible fluid, which means that a given mass of liquid will fill a set volume regardless of container size.

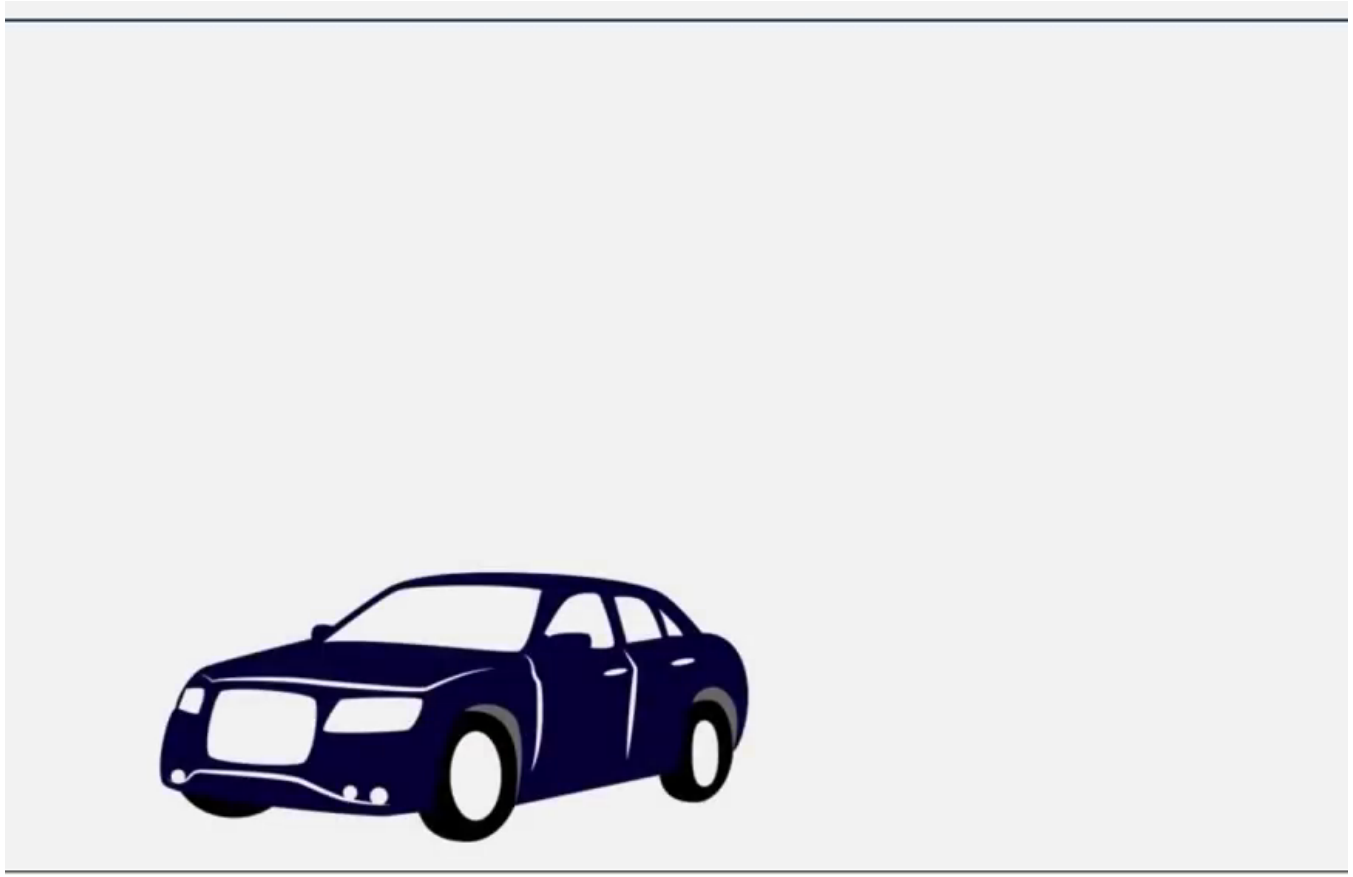


What are the differences between liquid and gases.

Liquid	Gas
Liquids have a fixed volume.	Gas does not have a fixed volume.
The particles of liquids have less kinetic energy than gas.	The particles of gas have more kinetic energy than liquids.
Liquids cannot be compressed much.	Gas can be compressed efficiently.
The space between particles of liquid is less than in a qas. Hence the intermolecular force between the particles is more than the particles in a gas.	The space between particles of gas is more than in a liquid. Hence the intermolecular force is less than that in a liquid.
The density of particles in a liquid is more than that in gas.	The density of particles in a gas is less than that in gas.

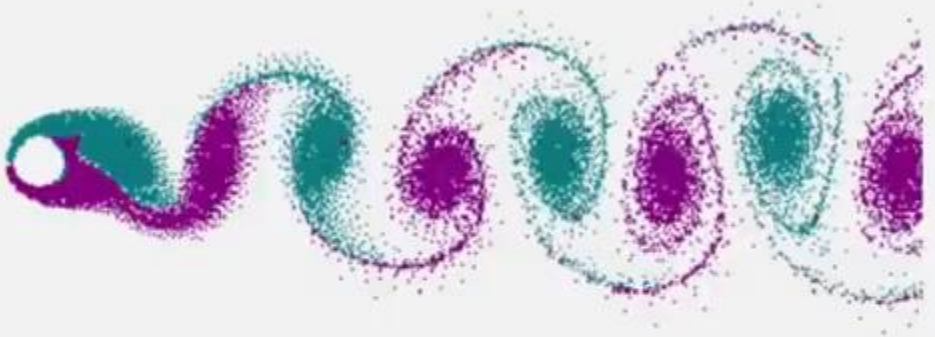
Application of fluid Mechanics

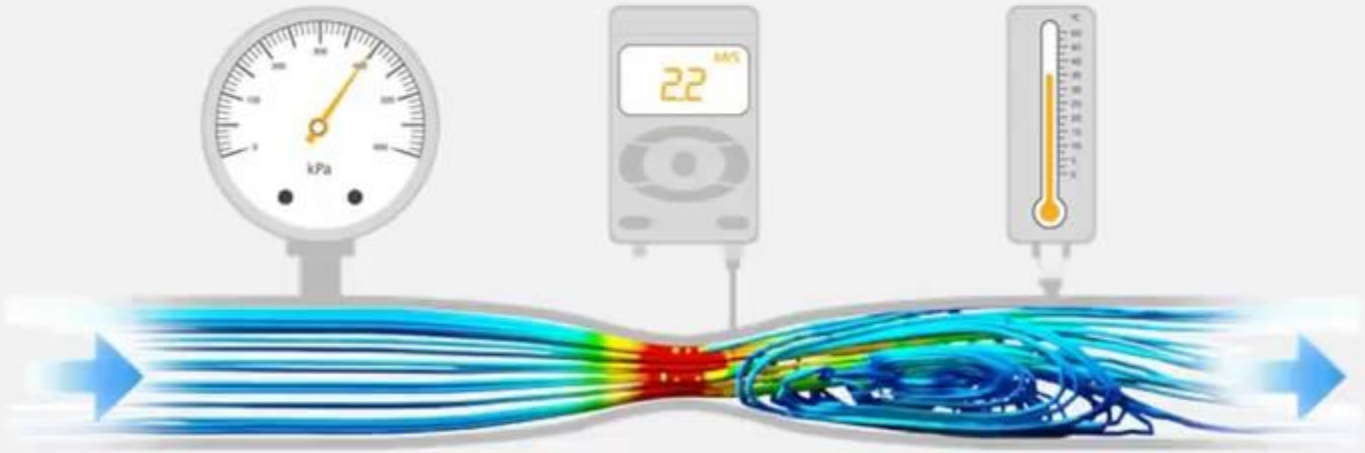
1. Automobiles
2. Medical Science
3. Piping Design
4. Electric Appliances
5. Ships and Boats
6. Aircrafts (Air Vehicles)
7. Power and Process Plants
8. Fire Safety
9. Nature



FLUID MECHANICS

Lecture-1 : Introduction to Fluid Mechanics





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Classification of fluids

- Fluids may be classified by their compressibility:

❖Compressible fluid: A fluid that causes volume reduction or density change when pressure is applied to the fluid or when the fluid becomes supersonic.

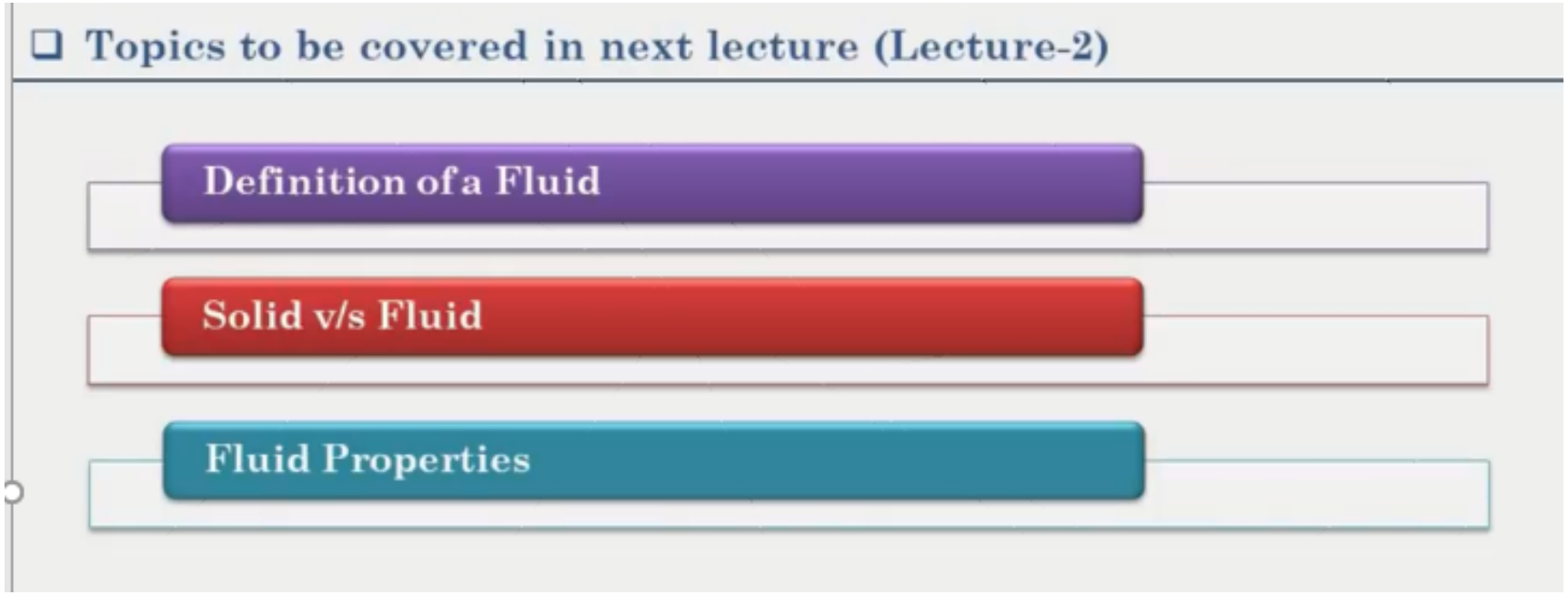
❖Incompressible fluid: A fluid that does not vary in volume with changes in pressure or flow velocity (i.e., ρ=constant) such as water or oil.

Classification of fluids

- Fluids may be classified Depending on the relationship between shear stress and the rate of strain:

1. Newtonian fluids: where stress is directly proportional to rate of strain
2. Non-Newtonian fluids: where stress is not proportional to rate of strain, its higher powers and derivatives.

Next Lecture



Next Lecture

- Types of Fluid
- Property of fluid

References

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- Bansal, R. K. (2005). A textbook of fluid mechanics. Firewall Media.
- https://www.youtube.com/watch?v=7xw7Wvr-zq4