



**Higher Education
Ministry and scientific
Research**



Hydraulic and its Applications

By

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About Fluid Mechanics Course

- ❑ Course Goals: Intends to provide understanding of the statics and dynamic concepts of fluid flows.
- ❑ Course Description: The course provide students with basic information on statics, kinematics, and dynamics of fluids. These include the study of Properties of fluids; Fluid statics; Translation and rotation of fluid masses; Dimensional analysis and similitude; Fundamentals of fluid flow; Fluid resistance; Compressible flow; Ideal fluid flow; Fluid measurements.

Course Assessment Method

1. Home Work 5 %
2. Quizzes approx. 1 per Chapter 5 %
3. Mid Exam 1 on January 10 % Theoretical part
4. Mid Exam 1 on January 10 % Experimental part
5. Mid Exam 2 on April 10 % Theoretical part
6. Mid Exam 2 on April 10 % Experimental part
7. Final Exam on June 40 % Theoretical Part
8. Final Exam on June 10 % Experimental Part

Important Notes

☐ Examination Policy

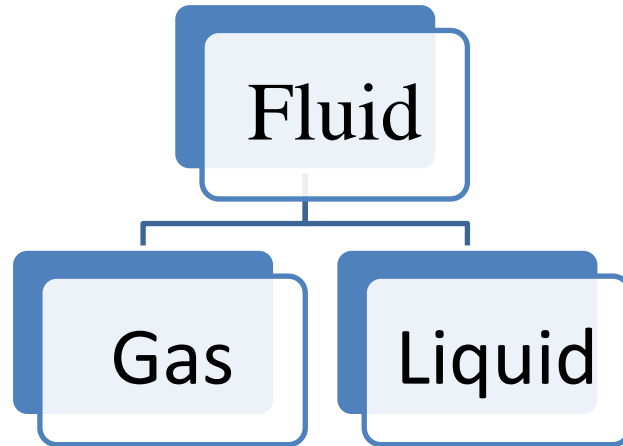
- Examinations will deal with your class work, textbook problems. Nevertheless, due to the difficulties associated with course your textbook will be never enough to get an A in this course. Use the additional references to be better prepared.
- Examinations are closed book and only complex formulas will be provided.

☐ Attendance Policy

- Middle Technical University Attendance Policy applies to this course .
- Classroom doors will be closed 10 minutes after the class start time.

FLUID MECHANICS

Fluid: Fluids are substance which are capable of flowing and conforming the shapes of container.



Fluid Mechanics: Branch of mechanics that deals with the response or behavior of fluid either at rest or in motion.

Hydrodynamics: It deals with the behavior of fluids when they are in motion considering energies and forces in them.

Comparison Between Liquids and Gases

- ▶ Liquids have definite volume at any particular temperature
- ▶ Liquids have free level surface
- ▶ Molecules of liquid are close to each other
- ▶ Liquids have relatively more molecular attraction
- ▶ Liquids are slightly compressible
- ▶ Rate of diffusion of liquid is less
- ▶ Gases do not have any definite volume
- ▶ Gases do not have free level surface
- ▶ Molecules of gases are far apart
- ▶ Gases have less molecular attraction
- ▶ Gases are highly compressible
- ▶ Gases have higher rate of diffusion

Dimension and Units

- ▶ **System of Units**

- ▶ **System International (SI)**

- ▶ Fundamental dimensions: length, mass and time
- ▶ Units: (meter, kilogram and second)

- ▶ **British Gravitation System (BG)**

- ▶ Fundamental dimension: length, force and time
- ▶ Units: (ft, slug and second)

- ▶ **CGS System**

- ▶ Fundamental dimensions: length, mass and time
- ▶ Units: (centimeter, gram and second)

Dimension and Units

► Dimension

► **Fundamental/Primary Dimension**

- length(L), mass (M) and time (T)

► **Derived/Secondary Dimensions**

- e.g., force, velocity, acceleration etc

Fundamental/Primary Dimension

| Dimension | Symbol | Unit (SI) |
|------------------|----------|---------------|
| Length | L | meter (m) |
| Mass | M | kilogram (kg) |
| Time | T | second (s) |
| Temperature | θ | kelvin (K) |
| Electric current | i | ampere (A) |
| Amount of light | C | candela (cd) |
| Amount of matter | N | mole (mol) |

Units of dimensions with different systems

► Fundamental Units

- length(L), mass (M) and time (T)

► Derived Units

- e.g., force(F), velocity(L/T), acceleration (L/T/T) etc

| System | Length | Time | Force | Velocity | Acceleration | Energy | Power | Temperature |
|--------|--------|------|-------|----------|--------------|---------|-----------|-------------|
| SI | m | s | N | m/s | m/s/s | N-m | kg-m/s | °C |
| BG | ft | s | lb | ft/s | ft/s/s | ft-lb | ft-lb/s | °F |
| CGS | cm | s | dyne | cm/s | cm/s/s | dyne-cm | dyne-cm/s | °C |

Unit Conversion

- ▶ It is the process of relating dimensions of a quantity from one system to another. e.g.,
 - ▶ (i) $1\text{ m} = 3.281\text{ ft}$
 - ▶ (ii) $1\text{ kg} = 2.204\text{ lb}$
- ▶ **Exercise: Convert the units of following.**
- ▶ $60\text{ miles/hour} = \underline{\hspace{2cm}}\text{ ft/s} = \underline{\hspace{2cm}}\text{ m/s} = \underline{\hspace{2cm}}\text{ km/hr}$
- ▶ $10\text{ m}^3/\text{s} = \underline{\hspace{2cm}}\text{ liter/min} = \underline{\hspace{2cm}}\text{ ft}^3/\text{s} = \underline{\hspace{2cm}}\text{ in}^3/\text{s}$
- ▶ $15\text{ N/m}^2 = \underline{\hspace{2cm}} = \underline{\hspace{2cm}}\text{ N/cm}^2 = \underline{\hspace{2cm}}\text{ lb/ft}^2$
- ▶ $1000\text{ kg/m}^3 = \underline{\hspace{2cm}}\text{ N/m}^3 = \underline{\hspace{2cm}}\text{ kN/m}^3$

Thank you...Let's
Discuss

Feel Free To Contact anytime:
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