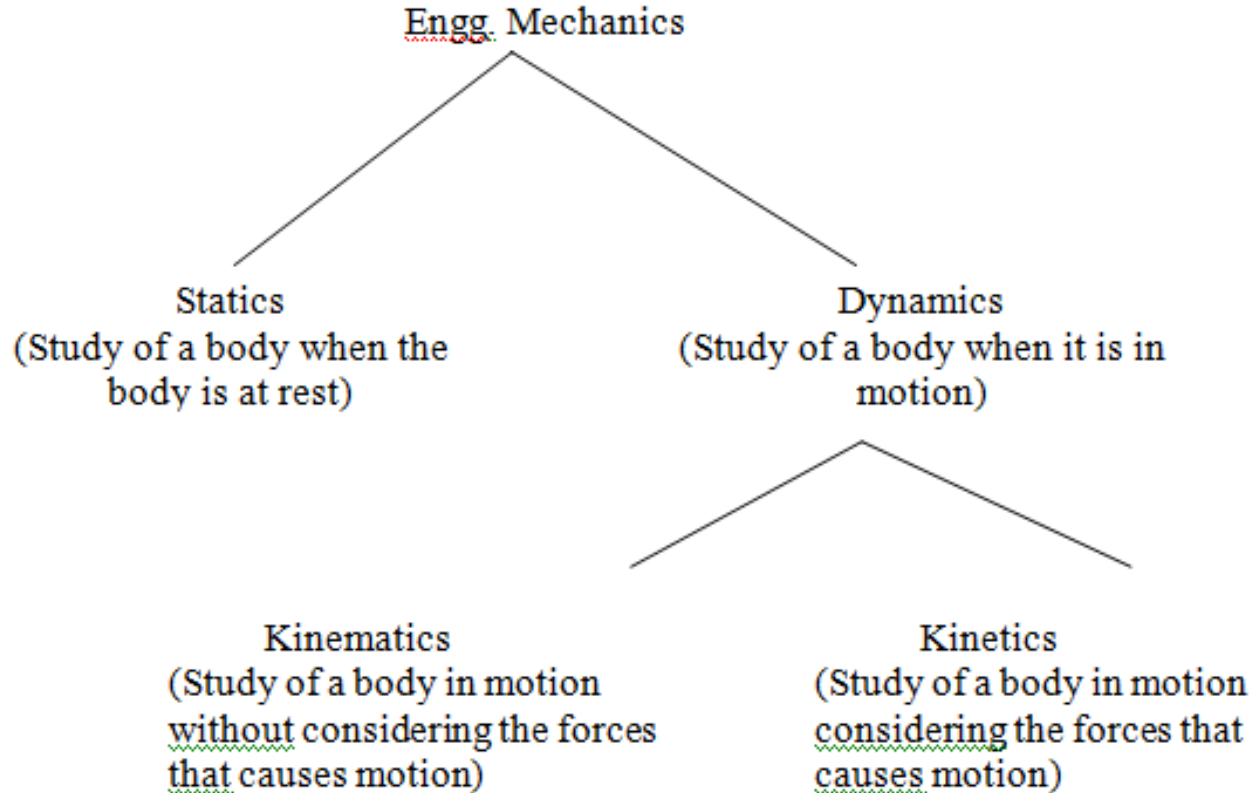# Unit-1
STATICS OF PARTICLES

Topic-1

Introduction – Units and Dimensions – Laws of Mechanics

Introduction

- Engg. Mechanics is a branch of science which deals with the behavior of a body when the body is at rest or motion.

Engg. Mechanics

Statics
(Study of a body when the body is at rest)

Dynamics
(Study of a body when it is in motion)

Kinematics
(Study of a body in motion without considering the forces that causes motion)

Kinetics
(Study of a body in motion considering the forces that causes motion)

Dr.R.Sudhakaran professor/Mechanical

Terms used in Engineering Mechanics

- **Vector quantity:** A quantity which is completely specified by magnitude and direction is known as vector quantity. (Eg.) Velocity, Acceleration, Force & Momentum.
- **Scalar quantity:** A quantity which is completely specified only by magnitude is known as scalar quantity. (Eg) Mass, Time , Length etc.
- **Particle:** A particle is a body of negligible dimensions and the mass of the particle is considered to be concentrated at a point.
- **Rigid body:** A body which dos not deform under the action of applied force.
- **Mass:** The quantity of matter contained in a body is called as mass.
- **Weight:** The force with which a body is attracted towards the centre of the earth.

$$W = mg$$

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Units of Quantities (SI Unit)

Quantity	Unit	Symbol	Formula
Acceleration	Metre /(Second)^2	-	m/s^2
Angle	Radian	rad	Rad
Angular Acceleration	radian/(Second)2	-	Rad/s2
Angular Velocity	Radian/second	-	Rad/s
Area	Square meter	-	m2
Density	Kilogram/(meter)3	-	Kg/m3
Energy	Joule	J	Nm
Force	Newton	N	Kg m/s2
Frequency	Hertz	Hz	(l/s)
Length	Meter	M	M
Mars	Kilogram	Kg	Kg
Moment of force	Newton-metre	-	Nm
Power	Watt	W	J/s
Pressure	Pascal	Pa	N/m^2
Stress	Pascal	Pa	N/m^2
Time	Second	S	S
Velocity	Metre/second	-	m/s

LAWS OF MECHANICS

- **Newton's first law of motion:** A body remains in its state of rest or motion unless a external force acting on it.

- **Newton's second law of motion:** The acceleration of a particle is proportional to the resultant force acting on it and is in the direction of the force applied.

$$F = ma$$

- **Newton's Third law of motion:** To every action there exists an equal and opposite reaction.

Gravitation law of attraction

- States that any two bodies in the universe attract each other with a force that is directly forces proportional to the product of their masses and inversely proportional to the square of the distance between them.

G – Universal Gravitational constant
G = 6.673 x 10^{-11} Nm²/kg²

- G value – Henry Cavendish – After Newton's death
- Earth's standard acceleration due to gravity g = 9.80665 m/s² (32.1740 ft/s²)
- An object falling near the earth's surface increases its velocity by 9.80655 m/s for each second of its descent.

Guess the Dialogues….!!!!

"**Thallu Thallu Thallu Thalllu Thallu Thallu**" is a word

"**Enna Kaiyya Puduichu Iluthiya**" Is an Emotion

Am going to speak about….

Here is the CLUE..!!!!!

FORCE

DEFINITIONS:

- ✓ Force is a **push or pull**.

- ✓ Force is **the capacity to do work or cause Physical Change**.

- ✓ **Physical power or strength possessed** by a living being.

ACTIVITY

D4-BE-D9-8D-46-9A

CHARACTERISTICS OF A FORCE

How Much…..?? – **Magnitude**

Where….????   - **Point of Application**

Path……!!!!   - **Direction (or) Line of Action**

SYSTEM OF FORCES