

# Simple Mechanics

Unit 3  
Session 1

## Introduction

- Machines and mechanisms
- Kinematics of machines
- Dynamics of machines
- Applications of simple mechanics



- 1) How does a machine work in a constraint/controlled motion?
- 2) How to ensure displacements, velocities, and forces are controlled in a machine?
- 3) Why do machines vibrate while working and how to control these vibrations?



## Lesson Aims:

1. Understanding of Machine and Mechanisms
2. Kinematic components of machines
3. Dynamic components of machines



## THOUGHTS AND QUESTIONS

- Human body as a machine and analogy between human body and machines. For example, how many joints are there in your hand?
- Are you able to roll, twist or stretch their hands/shoulders. -
- Surrounding mechanisms such as Fan (Rolling), Doors hinges.
- How less force is required to close the door from a distance far away from a hinge and vice versa.

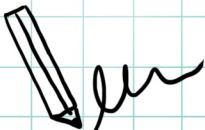


## INTRODUCTION TO MACHINE

A machine is a thing that is created by people to make work easier.

- A mechanism is an interaction of rigid parts which are linked by joints in order to transmit, control, constrain, or translate motion and/or force from one part to another. Mechanisms are used in machines so that they can achieve their required function.

- Dynamics is the study of how moving objects behave. Dynamics is the part of mechanics that studies movement and its causes. The study of the causes of motion and changes in motion is known as dynamics. It is a tool or invention which multiplies the effect of human effort.

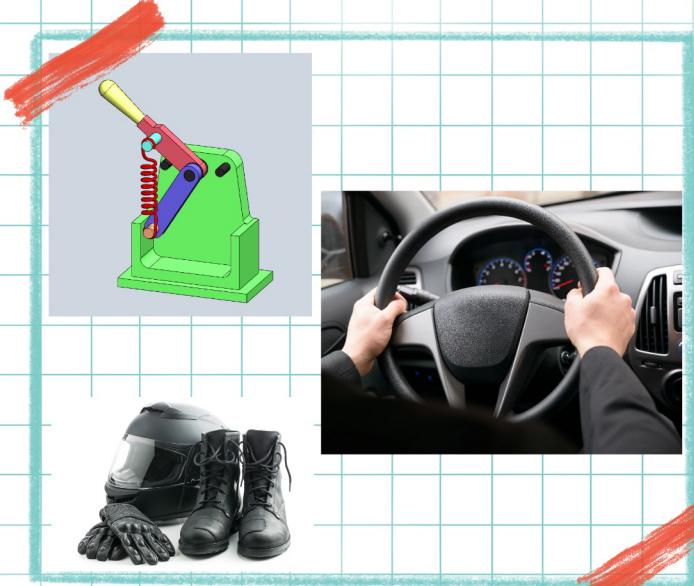


## How machines lead to smart work?

### How do we apply machine laws and formulas?

### What do you think about the control of machines?

**How to ensure safety while using the machines? (For using a motorbike what are the safety devices you use?)**



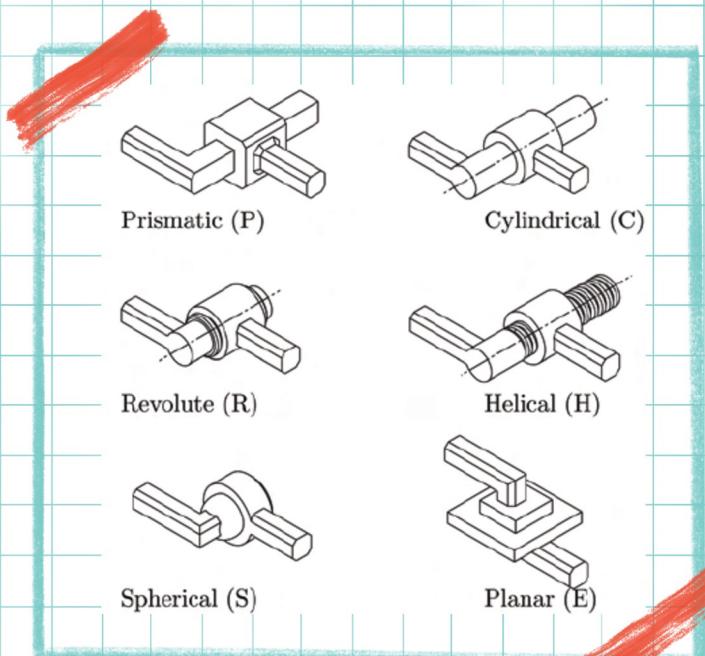
## KINEMATIC PAIR

There are different types of Kinematic Pairs. They are classified as -

**Types of Motion Kinematics:** Sliding Pair, Turning Pair, Rolling Pair, Screw Pair, and Spherical Pair.  
**According to the Type of Contact:** Kinematics are Lower Pair and Higher Pair (Cam and follower).

**The Type of Closure:** Kinematics is Self-Closed Pair and Force-Closed Pair.

**Examples:** Cam follower, Nut and bolt, Fan, Door.



## KINEMATIC CHAIN

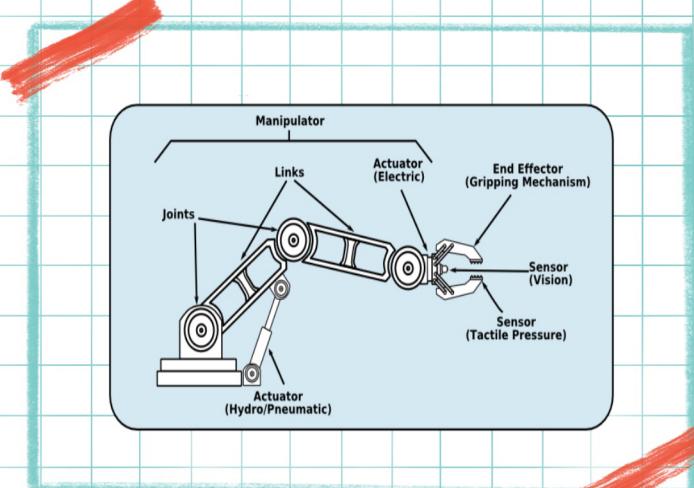
It is the combination of the Kinematic Pairs, and the relative motion between them should be completely constrained.

**Example:** Sewing machine, Crankshaft with bearings, Connecting rod with a crank, etc.

**Inversions:**

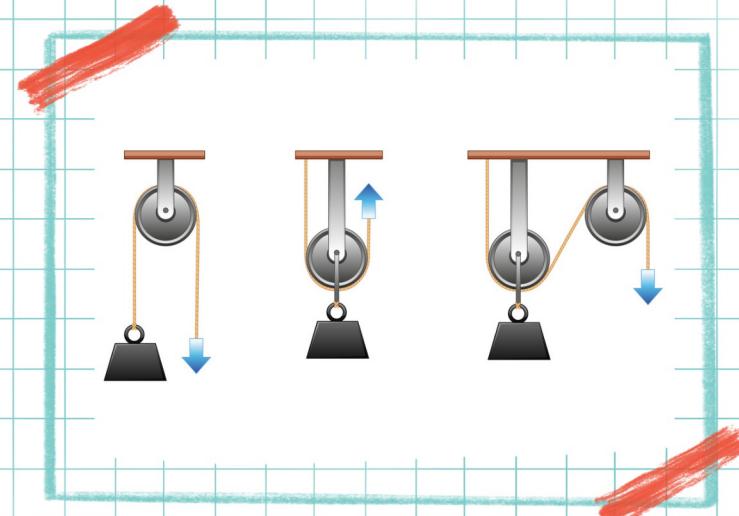
It is defined as the method of obtaining different types of mechanisms by fixing the link ends.

**Example:** Hand Pump, Injection, Engine.



# DYNAMICS OF MACHINE

The concept of force and motion in the machine's perspective. For example, how much force is required to move a car. What will happen if reduced/excess force is applied. Engine is one of the most fascinating examples. The Force required to overcome the friction and provide motion to a car can be elaborated.

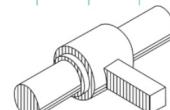


## ACTIVITY

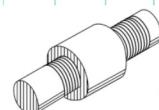
- 1) Divide the class into pairs.
- 2) Each pair gives a different kinematic pair
- 3) Identify the simple machines element and watch demo in Reference [1] by scanning the QR code given at the last.
- 4) List two examples of each type of simple machine as provided in Reference [2] by scanning the QR code given at the last.
- 5) List different PPEs as identified in Reference [3] by scanning the QR code given at the last.



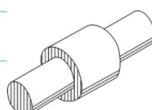
i) Prismatic pair



ii) Revolute pair



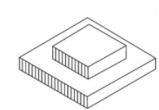
iii) Screw pair



iv) Cylindrical pair



v) Spherical pair



vi) Planar pair



## REFLECTION

FOR MORE  
INFORMATION -

- 1) What mechanisms are typically used in homes?**
- 2) What are the different components (gears, screw etc) required to make these mechanisms?**
- 3) What kinematic pairs are found in your home?**

