

Physics for Computer Science

Lecture 1

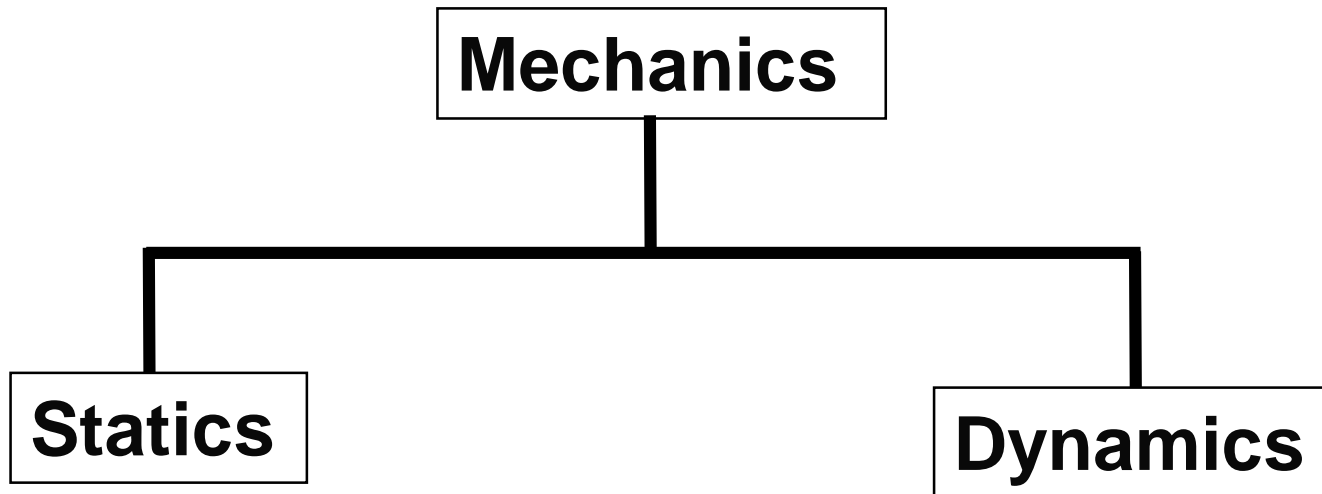
Introduction to Mechanics

Today's Contents

- **Introduction to Dynamics**
- **Basic concepts related to study of Mechanics**
- **Dimensions & Units**

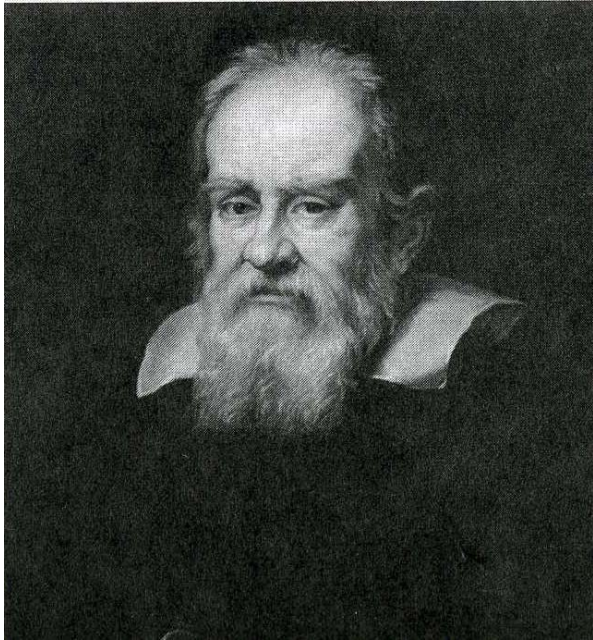
What is Mechanics

Mechanics is the branch of the physical sciences concerned with the behavior of bodies subjected to the action of forces

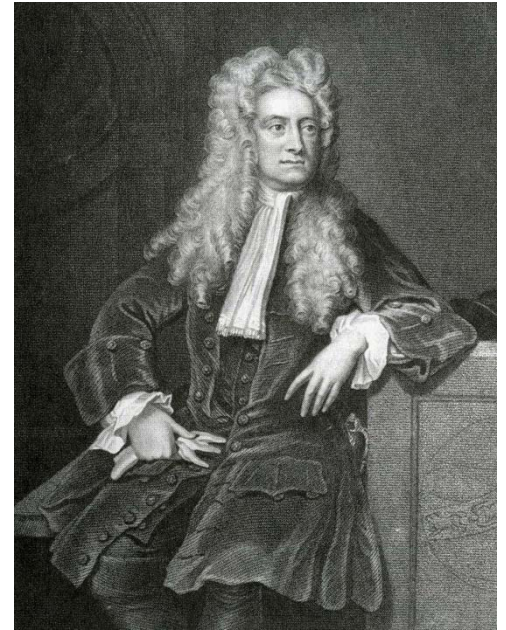


What is Dynamics

Study of the motion of objects or bodies using the principles established by Newton and Euler.



**Galileo Galilei
(1564-1642)**



**Sir Isaac Newton
(1643-1727)**

Application of Dynamics

- **Analysis & design of moving structures**
- **Robotic devices (manipulators)**
- **Control system**
- **Rockets, Spacecraft (aerial robots)**
- **Vehicles (mobile robots)**
- **Machinery of all types**

Basic Concepts of Mechanics(1)

Space

Geometric region occupied by bodies

Time

Measure of the succession of events

Mass

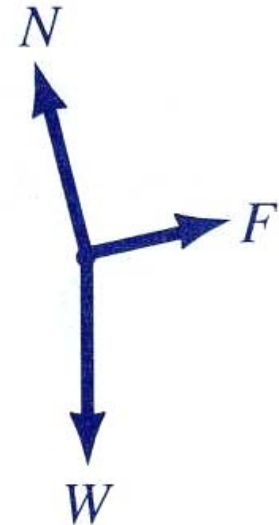
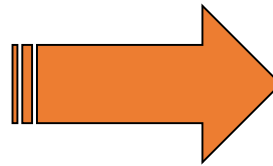
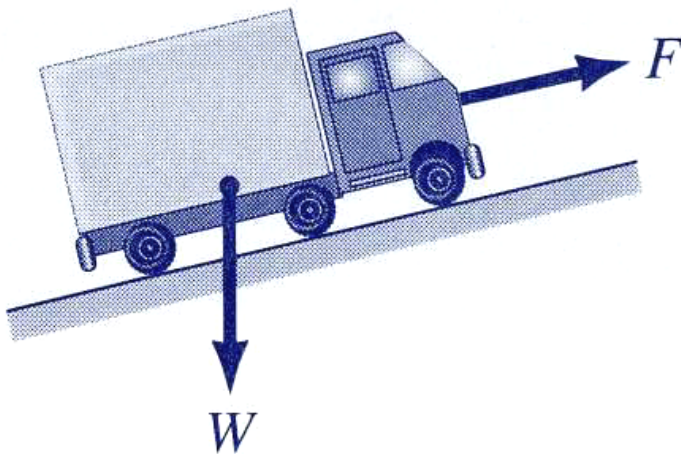
Quantitative measure of the inertia of a body, which is its resistance to a change in motion

Force

Action of one body on another

Basic Concepts of Mechanics(2)

Particle Body of negligible dimensions (mass point)



Basic Concepts of Mechanics(3)

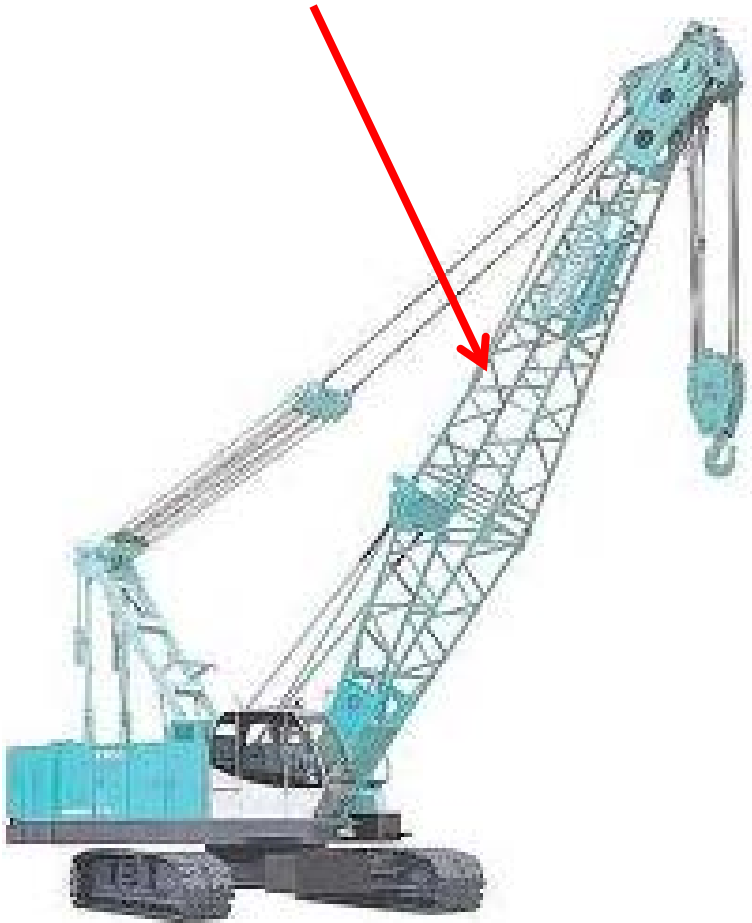
Rigid body

A body is considered to be rigid when the change in distance between any of its points is negligible for the purpose in hand

- ✓ **Boom of a mobile crane can be treated as a rigid body**
- ✓ **An airplane along its flight path can be treated as a rigid body**

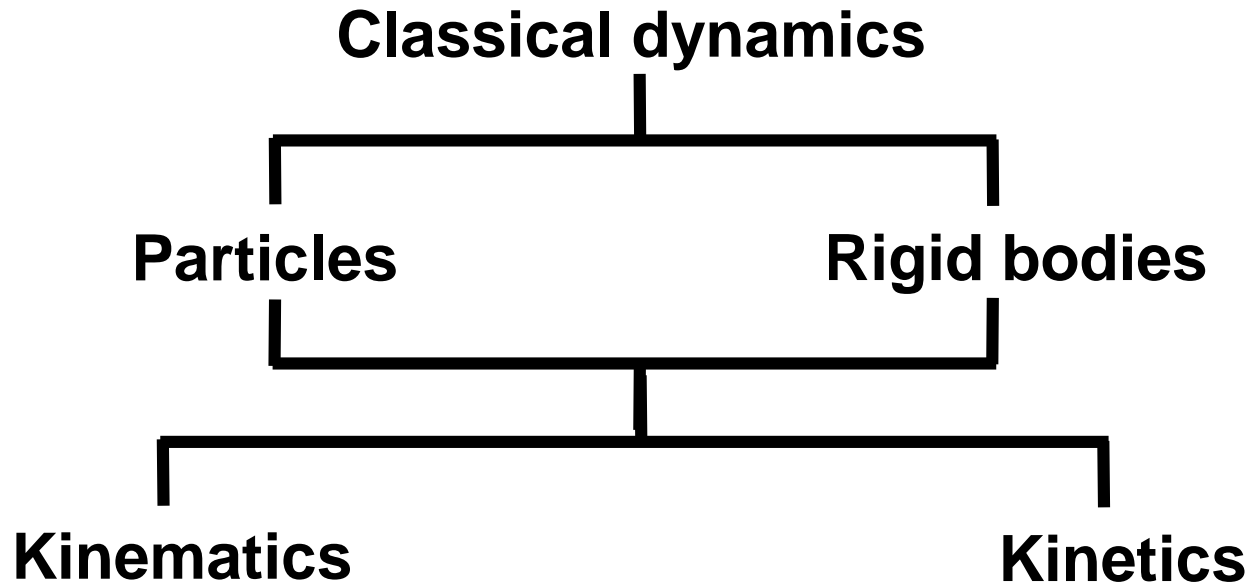
Basic Concepts of Mechanics(4)

Boom of Crane



Wing of Airplane

Subdivision of Dynamics



Division of Kinematics

Classical dynamics

Particles

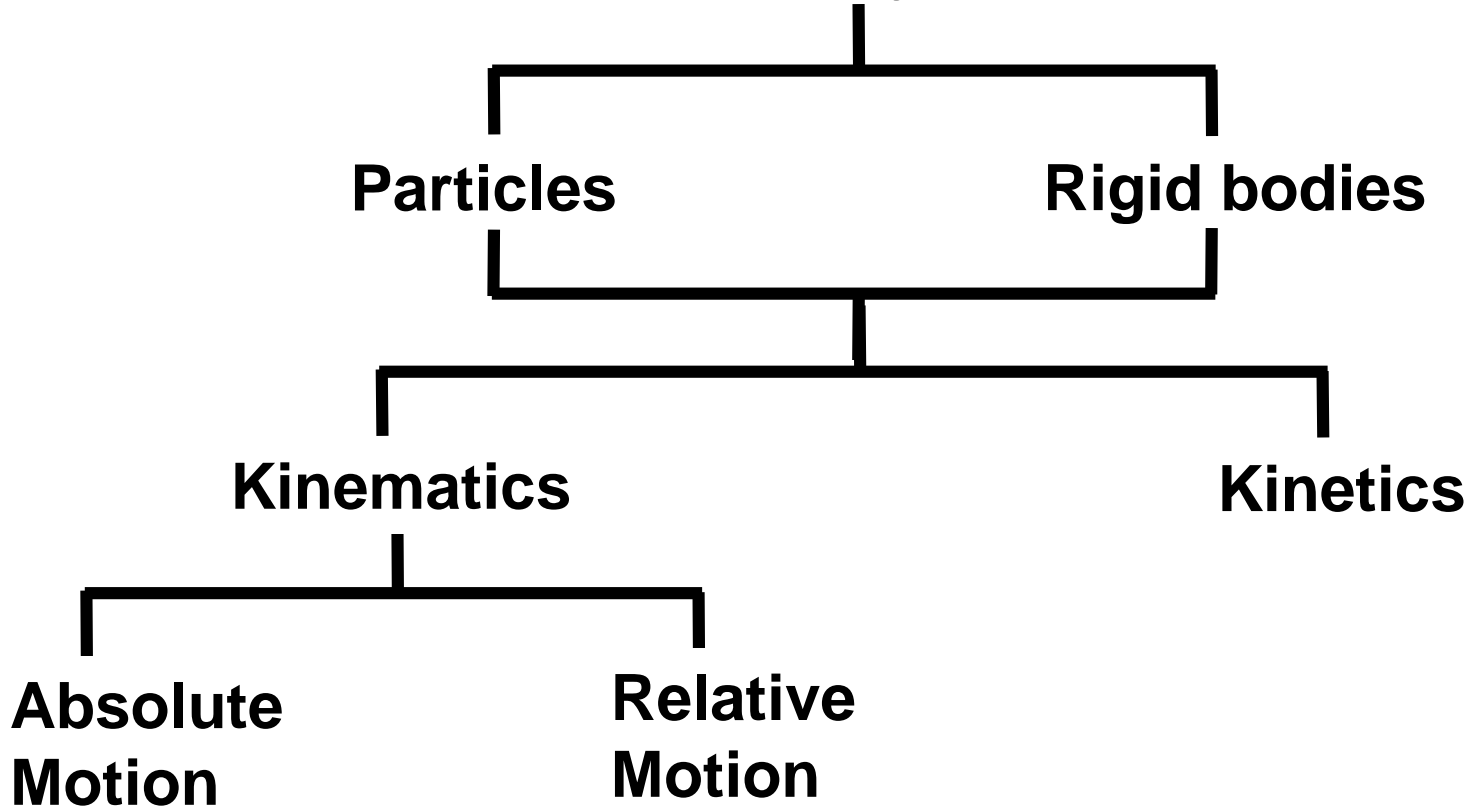
Rigid bodies

Kinematics

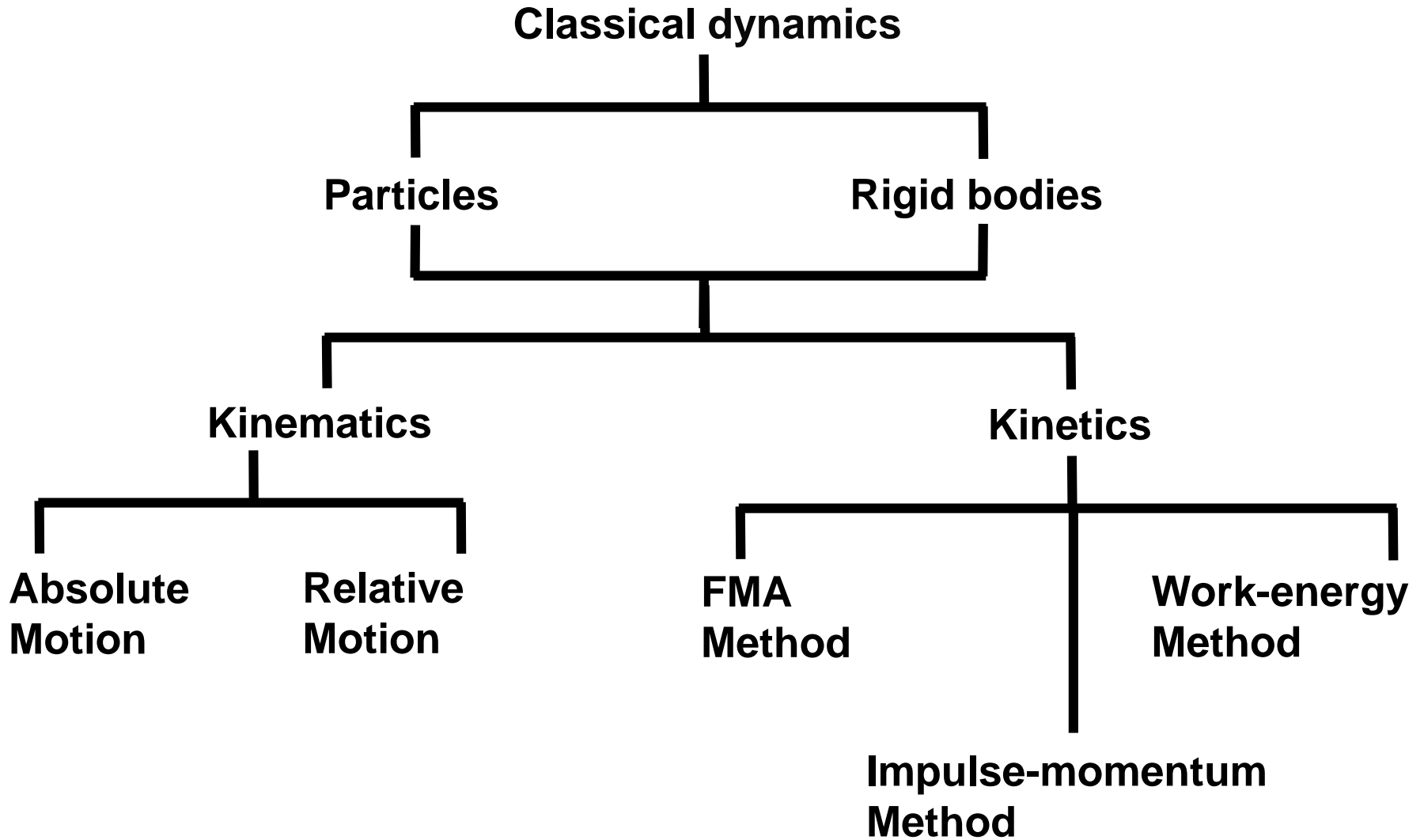
Kinetics

**Absolute
Motion**

**Relative
Motion**



Analysis Method of Kinetics



Dimensions and Units

Characteristics of a body and its motion can be described by a set of fundamental quantities called Dimensions:

- Mass
- Length
- Time

Absolute System of Units

✓ Base quantity mass is independent of its environment

- Force
- Length
- Time

Gravitational System of Units

✓ Base quantity force is the gravitational attraction acting on a standard mass under specific conditions

The International System of Units (SI units)

The name SI comes from the French, *Système International d'Unités*, which is an Absolute System

SI Units and US Units

