

WHAT IS MECHANICS?

Mechanics may be defined as that science which describes and predicts the conditions of rest or motion of bodies under the action of forces. It is divided into three parts: mechanics of rigid bodies, mechanics of deformable bodies and mechanics of fluids.

The mechanics of rigid bodies is subdivided into statics and dynamics, statics dealing with bodies at rest, dynamics with bodies in motion.

FUNDAMENTAL CONCEPTS AND PRINCIPLES

The basic concepts used in mechanics are: space, time, mass, and force. The concept of space is associated with the notion of the position of a point P. Three lengths measured from a certain reference planes having a common point called origin (o in figure 1) in three given directions may define the position of P. These lengths are known as the coordinates of P. The space is assumed to be uniform.

Example



O : origin $\vec{i}, \vec{j}, \vec{k}$: unit vectors m, n, l: the coordinate of A

To define an event, it is not sufficient to indicate its position in space. The time of event should also be given.

The concept of mass is used to characterize and compare bodies on the basis of certain fundamental mechanical experiments. Suppose an object has inertial and gravitational masses

Université de Relizane Faculté des Sciences et Technologie Département de Génie Mécanique -2021/2022-



m and M, respectively. If the only force acting on the object comes from a gravitational field g, the force on the object is:

$$F = Mg$$

Given the force, the acceleration of the object can be determined by Newton's second low:

$$F = ma$$

Putting these together, the gravitational acceleration is given by:

$$a = \frac{M}{m}g$$

A force represents the action of one body in another. It may be exerted by actual contact or at a distance, as in the case of gravitational forces and magnetic forces. A force is characterized by its point of application, its magnitude, and its direction; a force is represented by a vector.

Gravitational force



$$F = F_1 = F_2 = G \frac{m_1 \times m_2}{d^2}$$

Where,

F= gravitational force

G= universal gravitational constant

 $m_1, m_2 = masses of the object 1 and 2$

d= Distance of separation between object 1 and2

Université de Relizane Faculté des Sciences et Technologie Département de Génie Mécanique -2021/2022-



Magnetic forces



$$\overrightarrow{F} = q \overrightarrow{v} \times \overrightarrow{B}$$

Where,

q: Charge

 \vec{v} : Velocity

 \vec{B} : Magnetic field

 \vec{F} : Magnetic force