Engineering Mechanics

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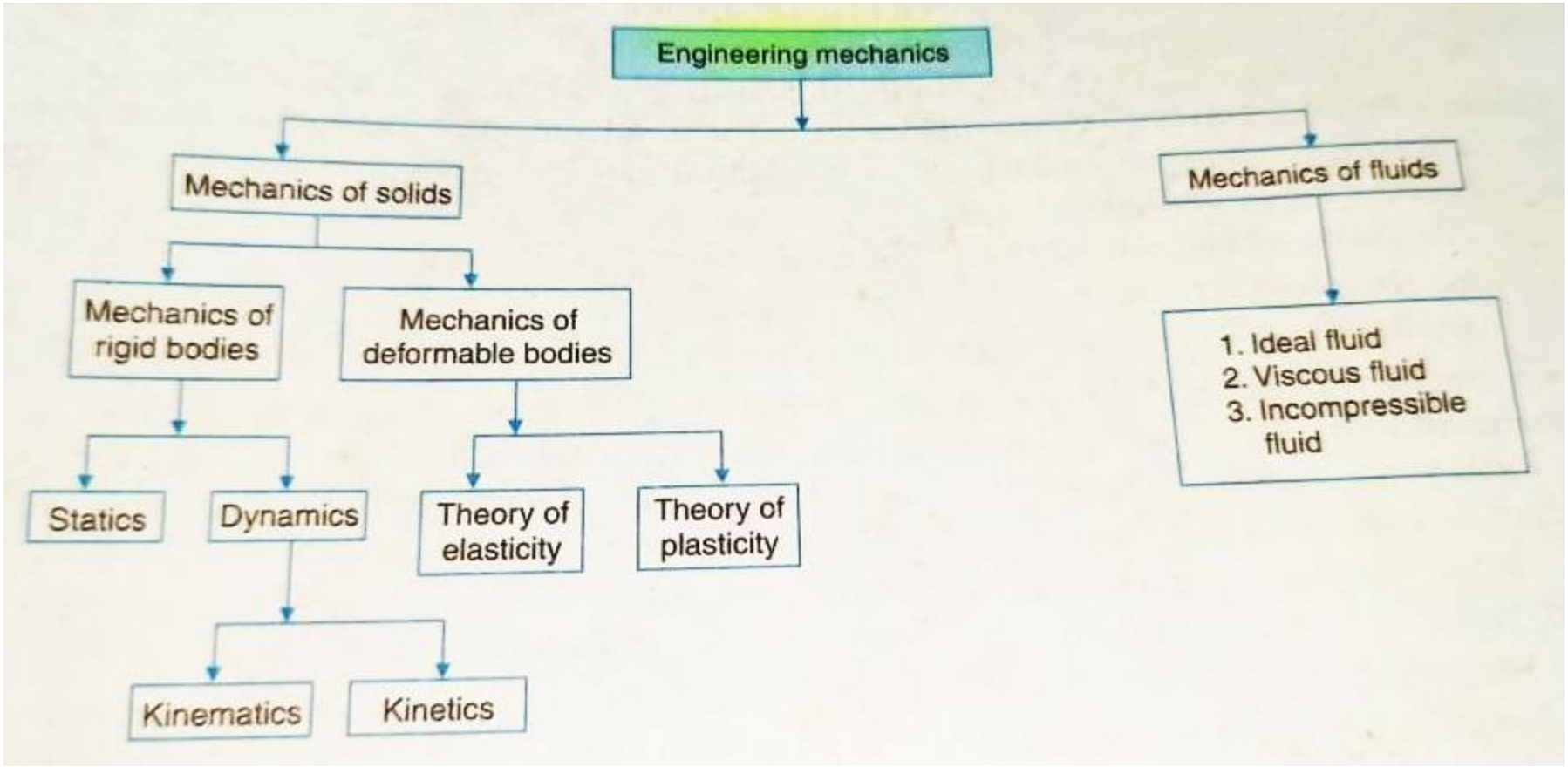
Introduction

- Engineering mechanics is the branch of science which deals with the behavior of a body when the body is at rest or in motion.

- It also deals with the laws and principles of Mechanics, along with their applications to engineering problems. As a matter of fact, knowledge of Engineering Mechanics is very essential for an engineer in planning, designing and construction of his various types of structures and machines

Classification of Engineering mechanics



Laws of mechanics

- Newton’s first law
- Newton’s second law
- Newton’s third law
- Newton’s law of gravitation
- Law of parallelogram
- Principle of Transmissibility

Newton’s first law: A body continues in its state of rest, or in uniform motion in a straight line, unless acted upon by a external force.

Newton’s second law : A body acted upon by a force moves in such a manner that the time rate of change of momentum equals the force.

Newton’s third law : If two bodies exert forces on each other, these forces are equal in magnitude and opposite in direction.

Newton's law of gravitation

- Force of attraction between any two bodies is directly proportional to the product of their masses and inversely proportional to the square of the distance between them .

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

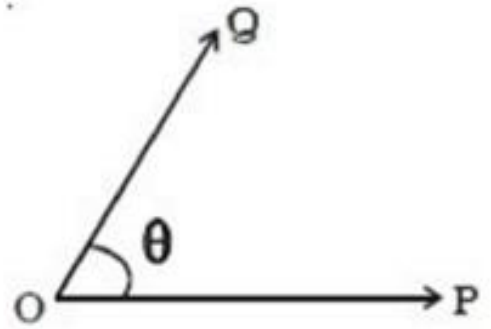
G is constant of gravitation

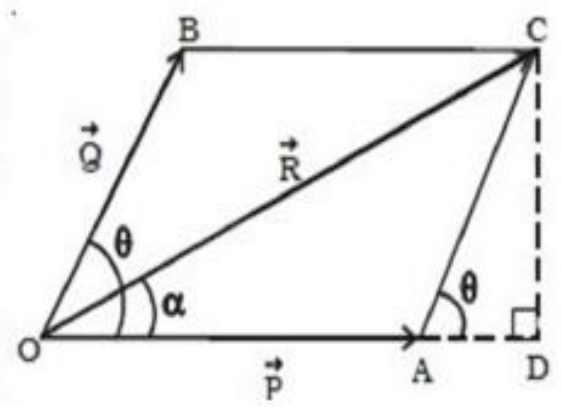
$m_1\ and\ \ m_2$ mass of bodies

PARALLELOGRAM LAW OF FORCES

"If two forces, acting simultaneously on a particle, be represented in magnitude and direction by the two adjacent sides of a parallelogram ; their resultant may be represented in magnitude and direction by the diagonal of the parallelogram, which passes through their

point of intersection."





Mathematically, resultant force,

$$R = \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos\theta}$$

and

$$\tan\alpha = \frac{F_2\sin\theta}{F_1 + F_2\cos\theta}$$

where F_1 and F_2 = Forces whose resultant is required to be found out,

θ = Angle between the forces F_1 and F_2, and

α = Angle which the resultant force makes with one of the forces (say F_1).