

# Physics - Gravitation

Topics : [Computer engineering](#)

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## 1. Gravitation:

- Gravitation is the natural force by which objects with mass attract one another.

## 2. Newton's Law of Universal Gravitation:

- Every particle in the universe attracts every other particle with a force directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.
- Mathematically expressed as  $F = G * (m_1 * m_2) / r^2$ , where  $F$  is the gravitational force,  $G$  is the gravitational constant,  $m_1$  and  $m_2$  are the masses of the objects, and  $r$  is the distance between their centers.

## 3. Gravitational Field:

- A region around a massive object where another object with mass experiences a gravitational force.
- Gravitational field strength ( $g$ ) at a point is the force per unit mass experienced by a small test mass placed at that point.

## 4. Kepler's Laws of Planetary Motion:

- Three laws describing the motion of planets around the Sun, including laws of orbits, areas, and periods, defining the shape, speed, and timing of planetary orbits.

## 5. Gravitational Potential Energy:

- Energy stored in an object due to its position in a gravitational field.
- Given by  $U = - (G * m_1 * m_2) / r$ , where  $U$  is the gravitational potential energy,  $G$  is the gravitational constant,  $m_1$  and  $m_2$  are the masses of the objects, and  $r$  is the distance between their centers.

## 6. Escape Velocity:

- Minimum velocity required for an object to escape the gravitational pull of a massive body without additional propulsion.
- Calculated as  $v_e = \sqrt{2GM / r}$ , where  $v_e$  is the escape velocity,  $G$  is the gravitational constant,  $M$  is the mass of the body, and  $r$  is the distance from its center.

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