## Physics - Gravitation

## Topics: Computer engineering <br> Written on March 18, 2024

## 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 $\mathrm{F}=\mathrm{G} *(\mathrm{~m} 1 * \mathrm{~m} 2) / \mathrm{r} \wedge 2$, 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 $(\mathrm{g})$ 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 $\mathrm{U}=-(\mathrm{G} * \mathrm{~m} 1 * \mathrm{~m} 2) / \mathrm{r}$, 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 $=\operatorname{sqrt}(2 \mathrm{GM} / \mathrm{r})$, 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.

