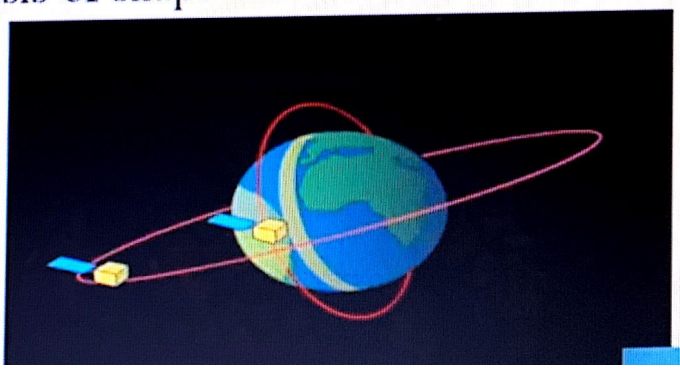
Types of satellite orbit

Orbit and its type ?

- An orbit is a regular, repeating path that an object in space takes around another one.
- Obits are classified on the basis of shape are
  - Equatorial orbits
  - Polar orbits
  - Inclined orbits



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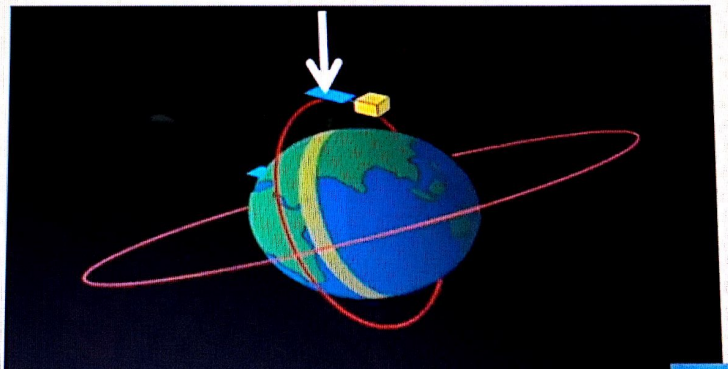
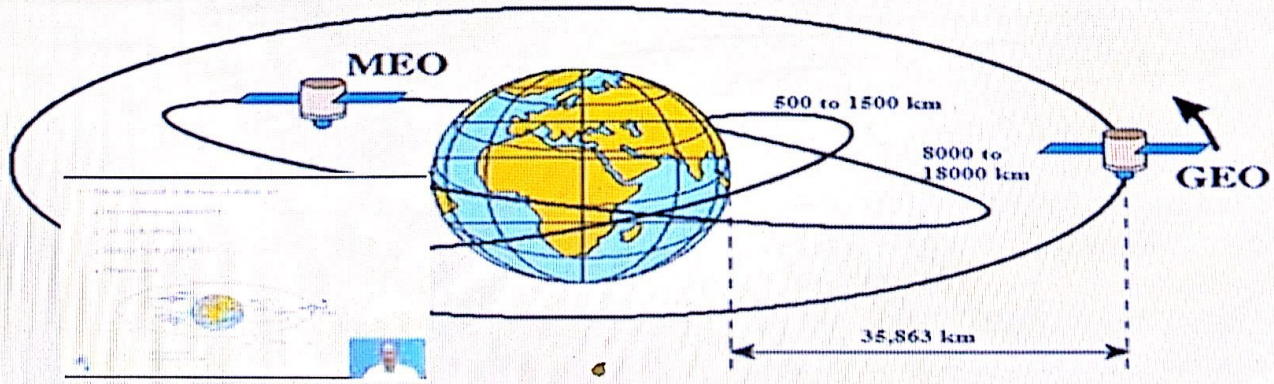


Types of satellite orbit

➢ Obits are classified on the basis of altitude are

- Geo-synchronous orbit(GEO)
- Low Earth orbit(LEO)
- Medium Earth orbit(MEO)
- Molniya orbit



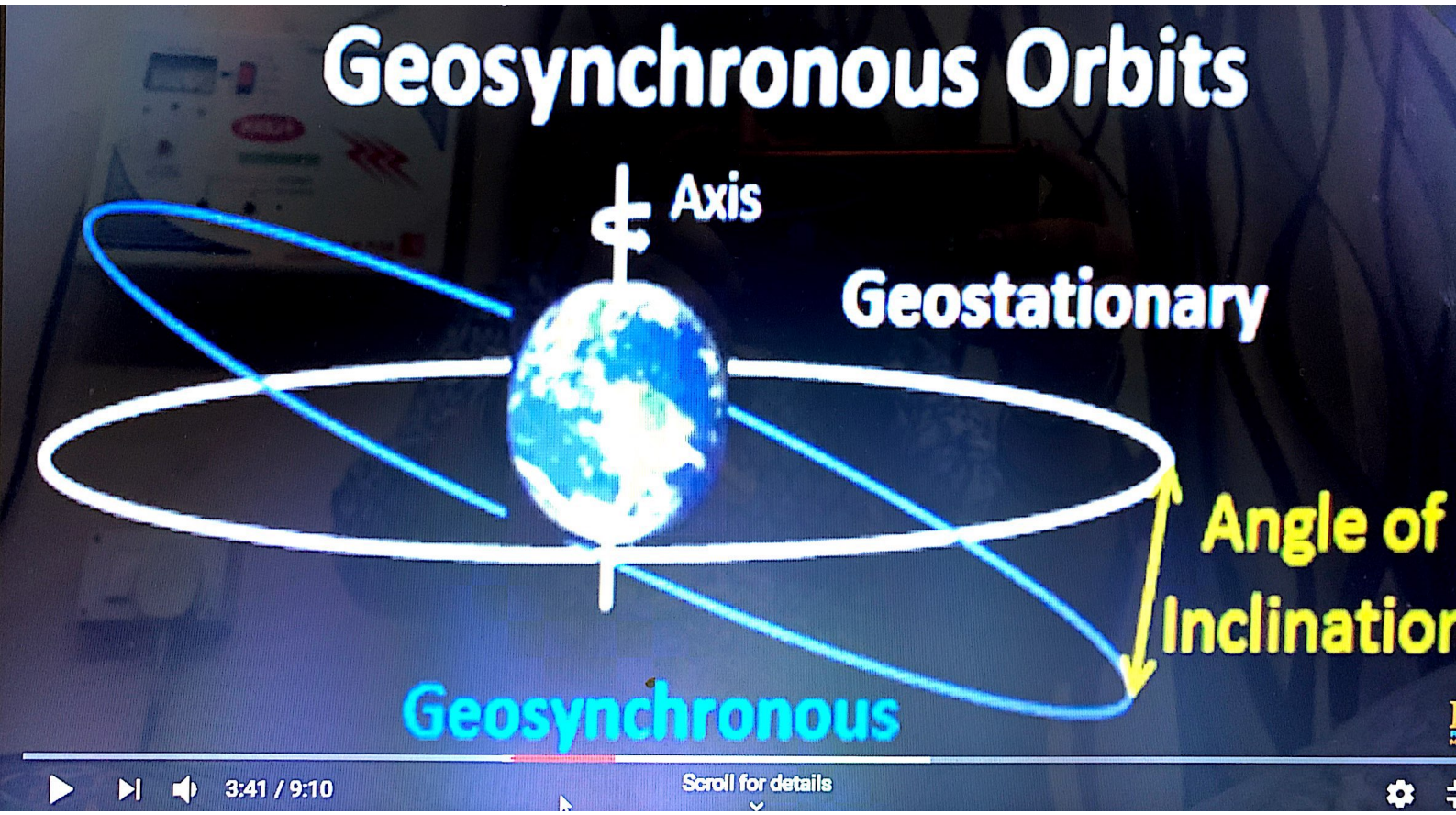
http://tinyurl.com/y4w5b54s

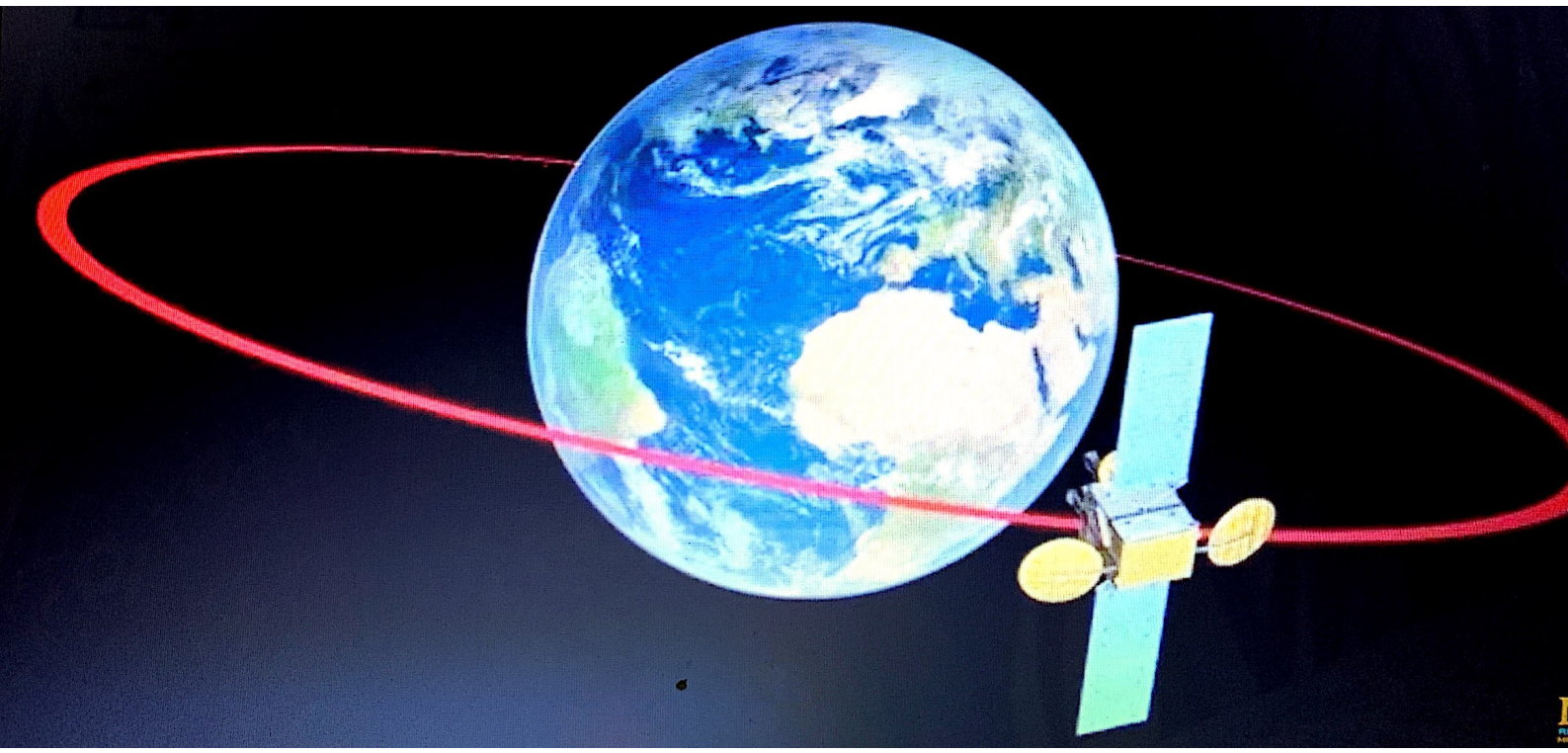
Figure 2: GEO, MEO and LEO orbits

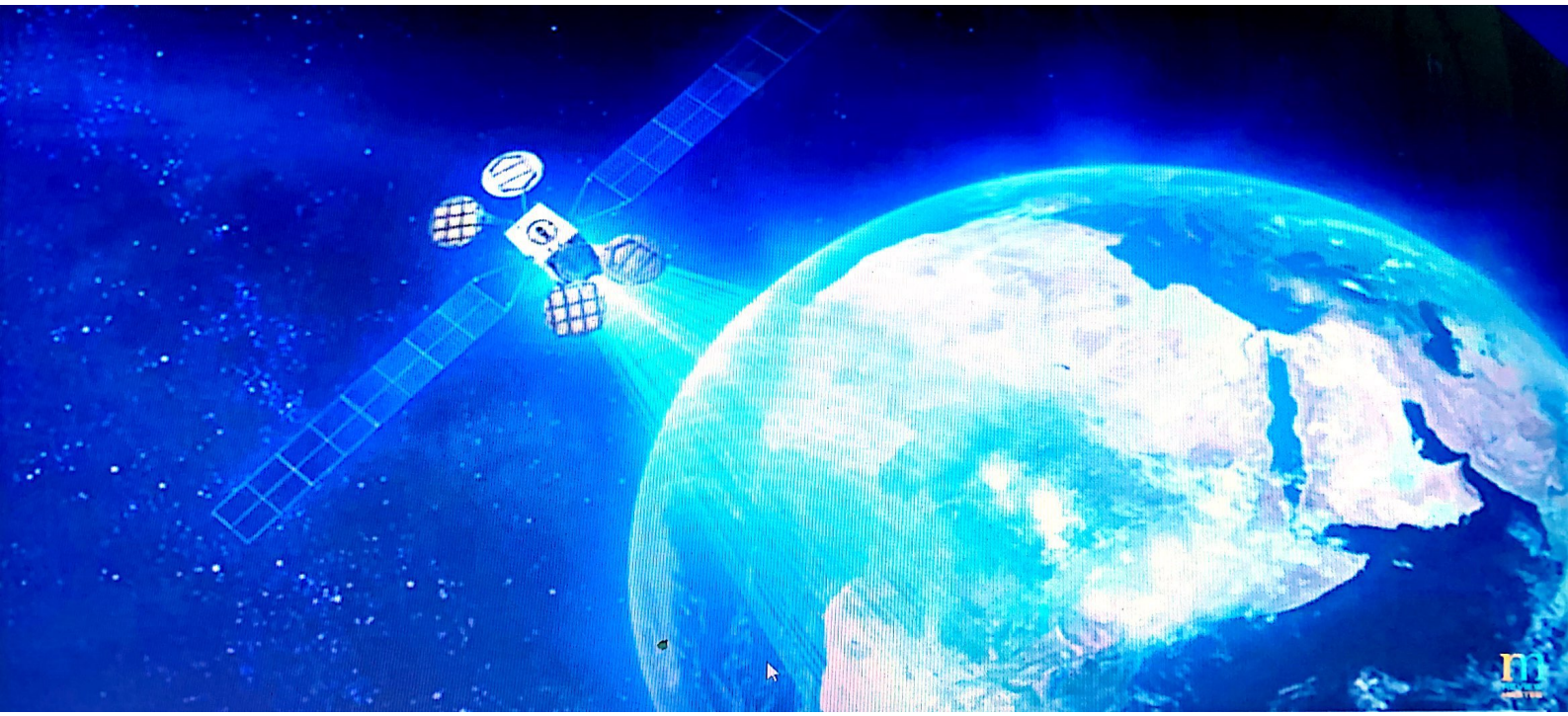
Types of satellite orbit

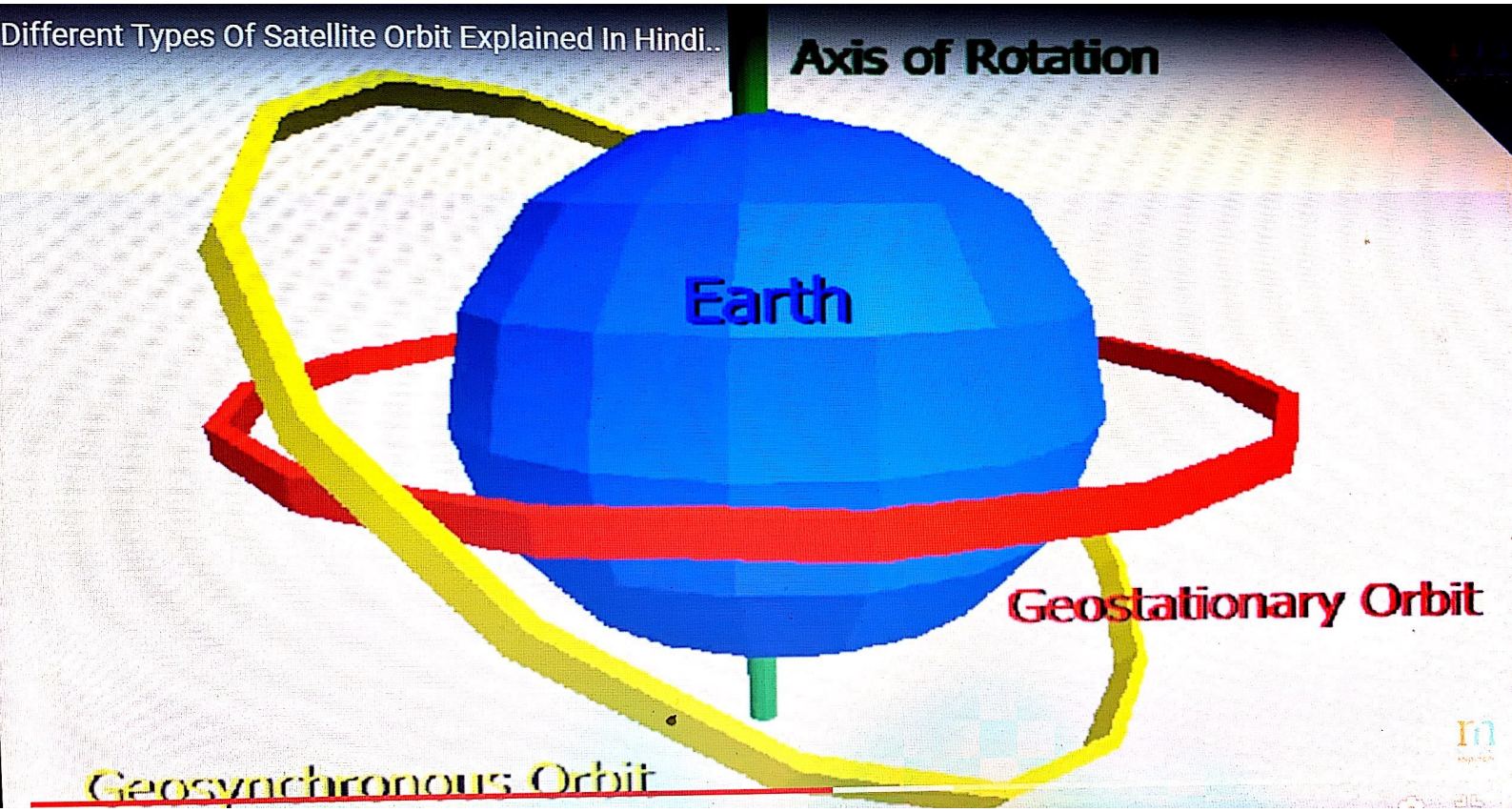
Geostationary Earth Orbit (GEO)

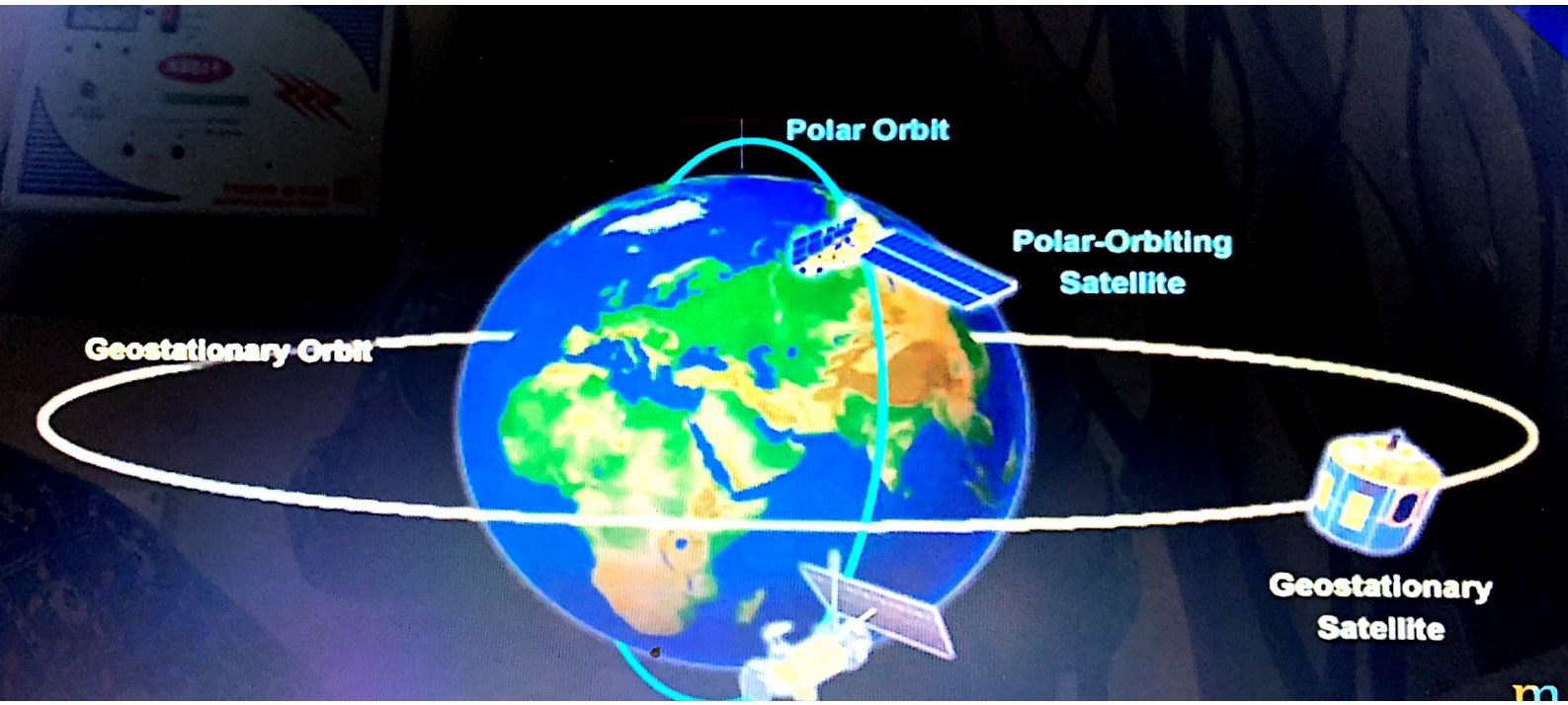
- GEO satellites are placed at an altitude of 35,000 km above the earth's surface along the equator.
- Revolve around the earth at the same speed as the earth rotates.
- Remain in the same position relative to the surface of earth.

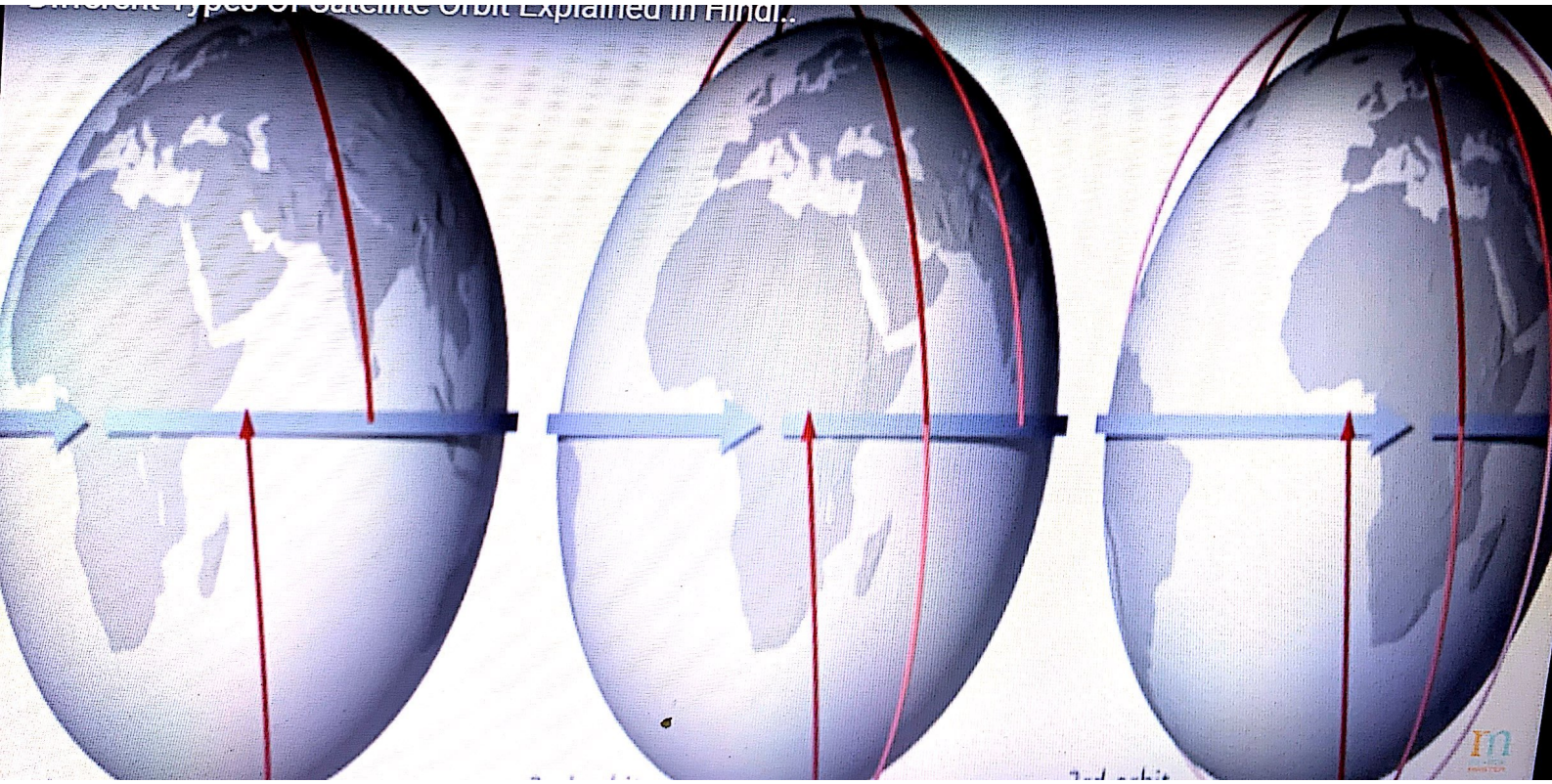


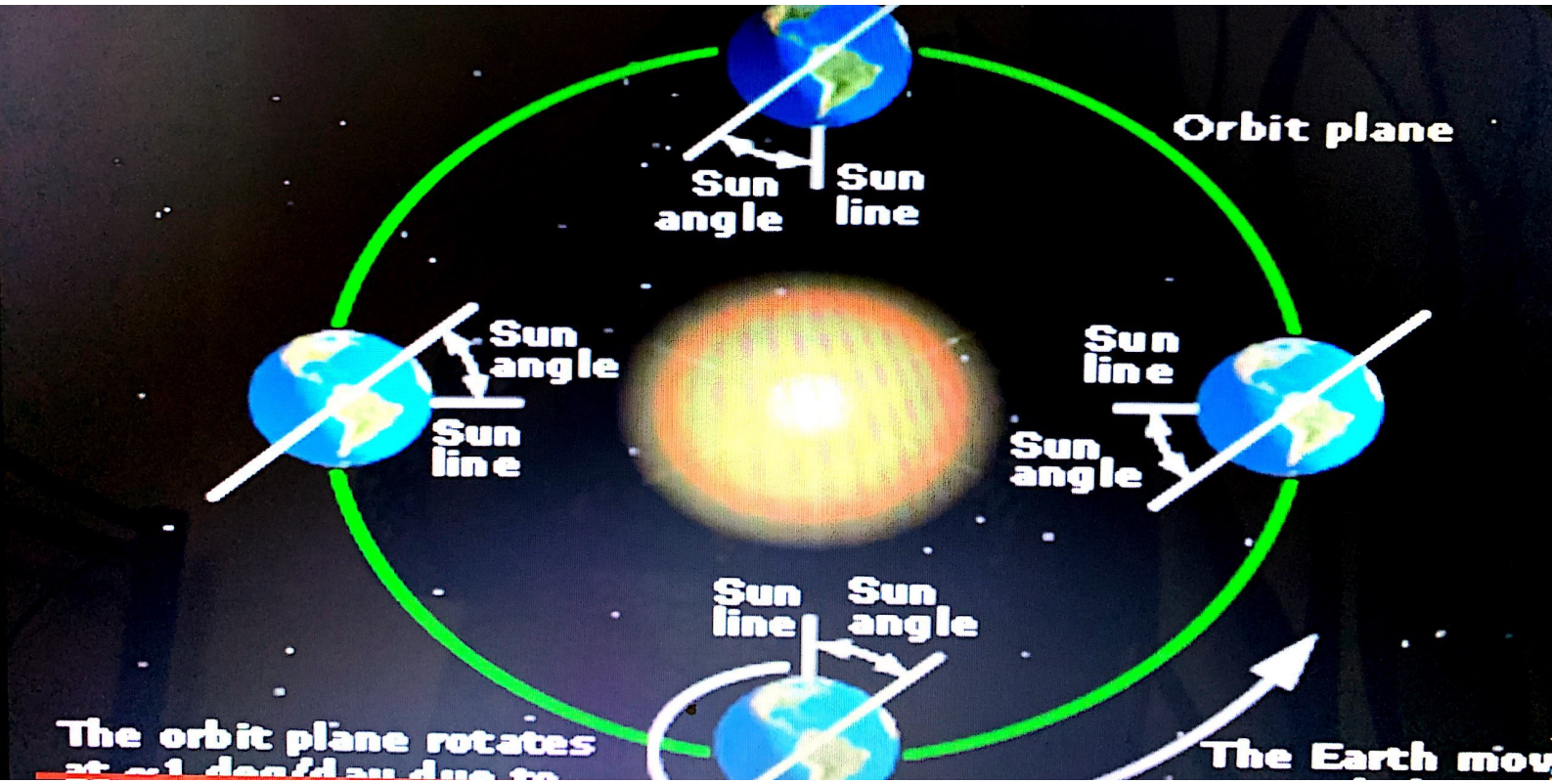






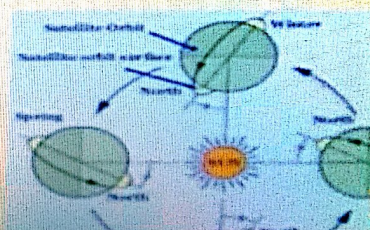


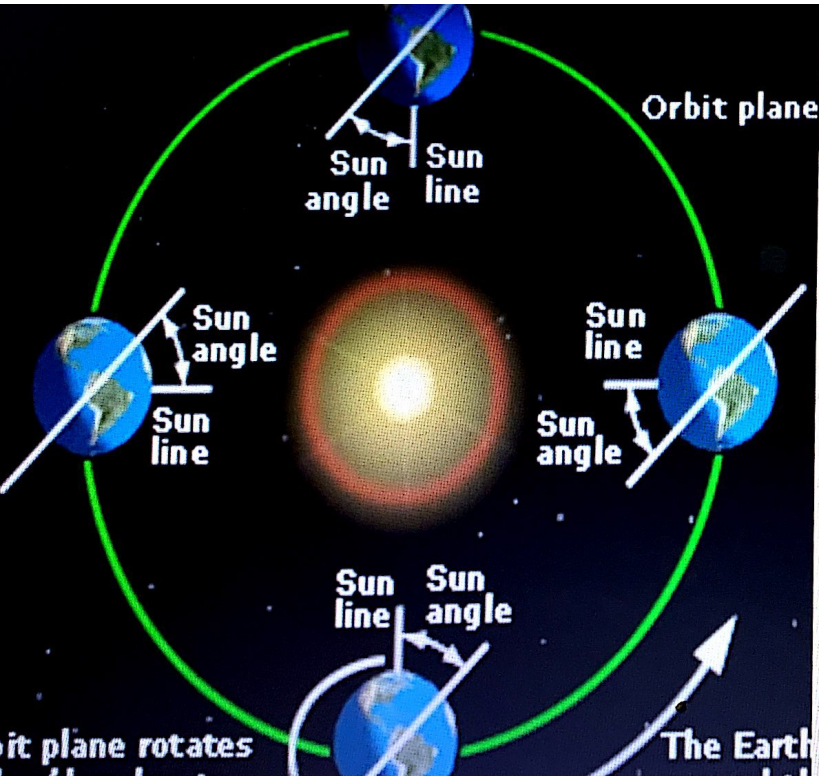


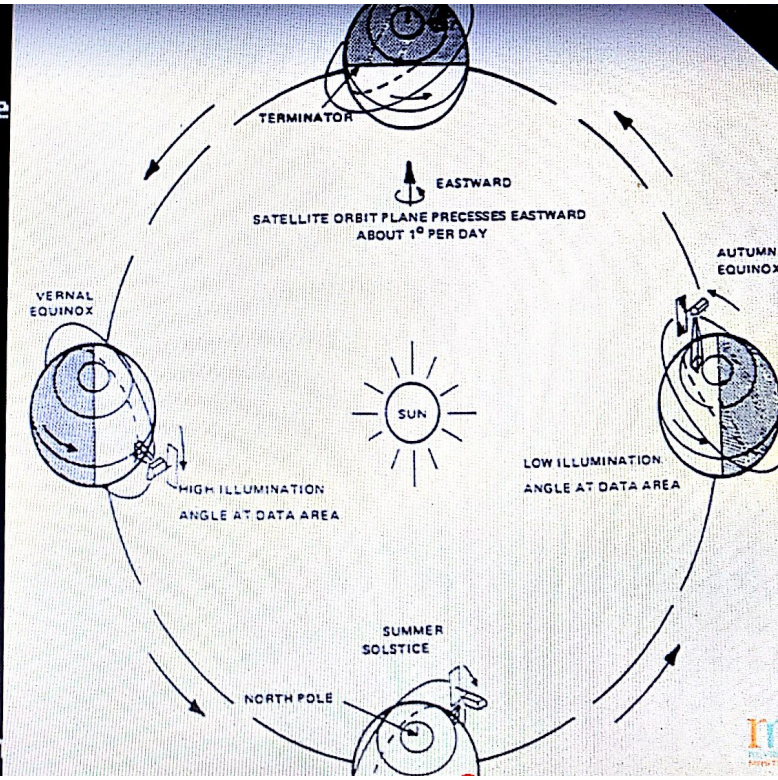


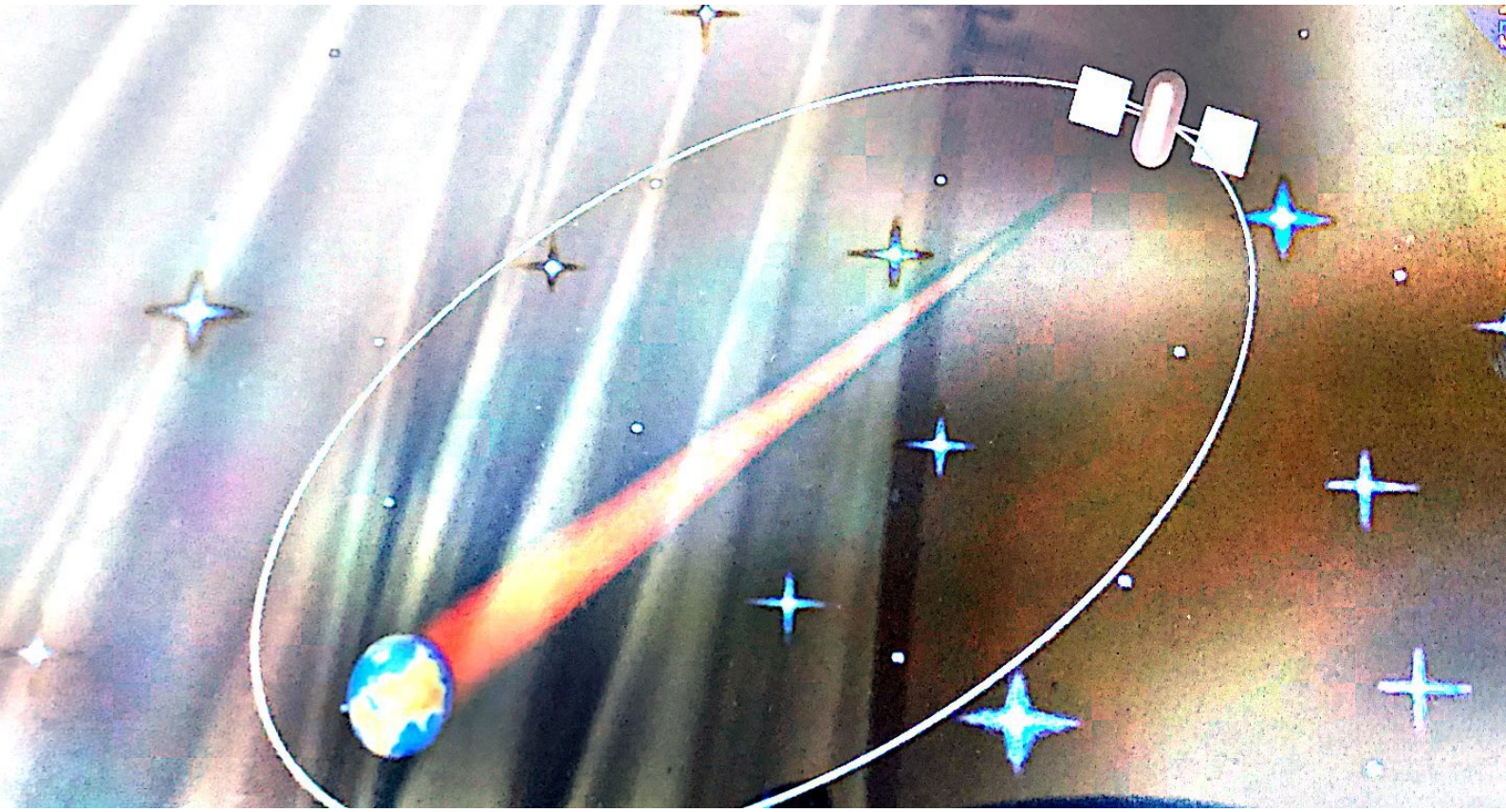
SUN SYNCHRONOUS ORBIT

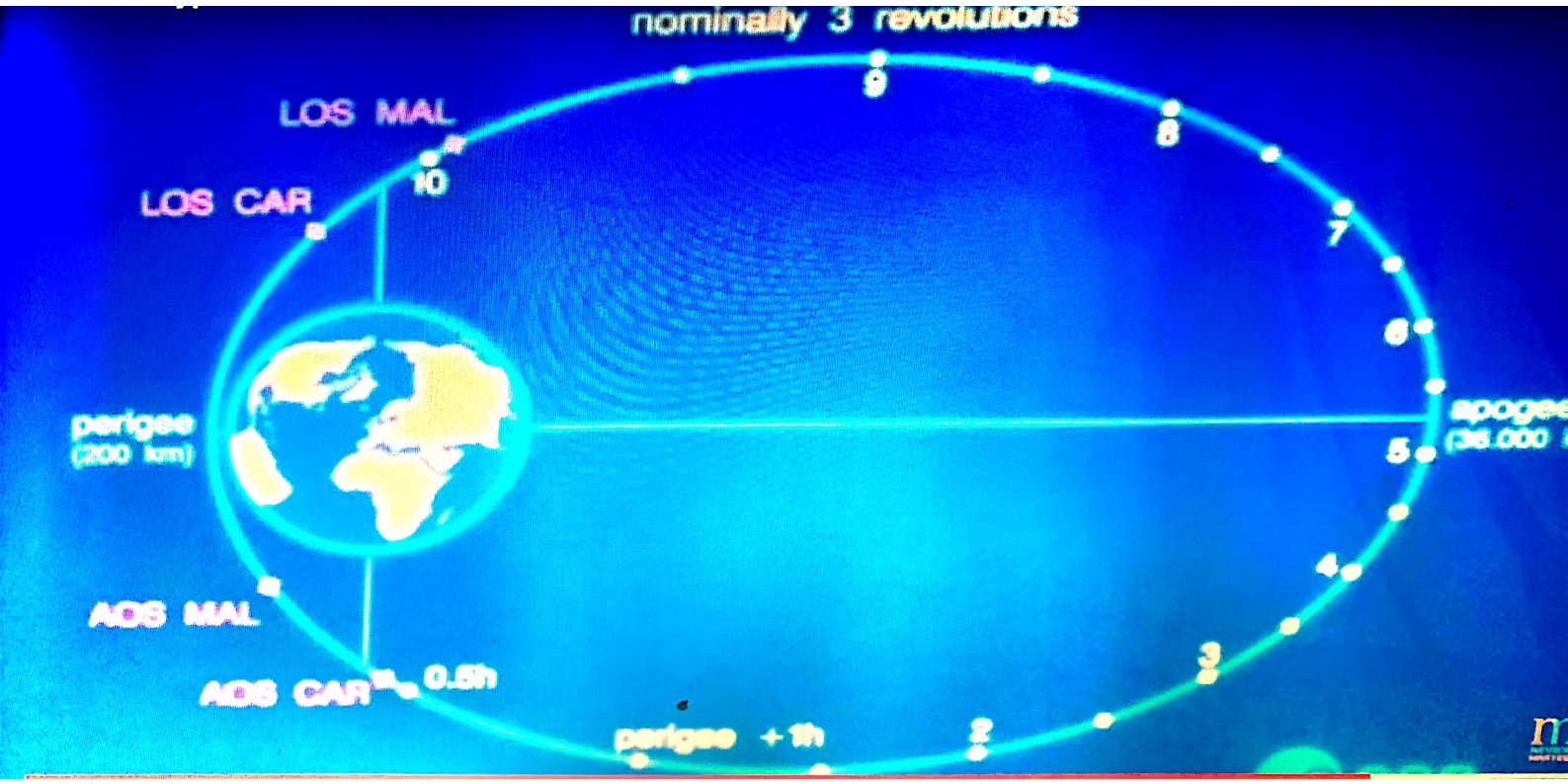
- Rate is equal to average rate of Earth's rotation around the sun
- Position of Sun relative to orbital plane remains relatively constant
- Sun Synchronous orbits can be achieved around other central bodies
  - Usually near 90º inclinations











Advantages of GEO

- It covers large geographical area.
- Three satellites are required to cover the entire Earth.
- Visible for 24 hours from single location on the Earth.
- It is ideal for broadcasting and multi-point applications.
- Ground station tracking is not required.

Disadvantages of GEO

- Due to longer transmission , the received s/l is very weak.
- Better LNA, modem increases cost of ground station.
- More propagation delay in the signal.

Low Earth Orbit (LEO)

- LEO satellites are much closer to the earth ranging from 500 to 1,500 km above the surface.
- LEO satellites don't stay in fixed position relative to the surface, and are only visible for 15 to 20 minutes each pass.
- A network of LEO satellites is necessary for LEO satellites to be useful

Advantages of LEO

- LEO satellites near to earth provides better s/l strength.
- Less power (about 1 watt) is needed for transmission.
- It has least propagation delay compare to other orbits.
- Low cost equipments are sufficient for ground stations.
- Better frequency reuse due to smaller footprints.

Disadvantages of LEO

- Small distance from earth, it covers less region.
- Large number of satellites are needed to cover.
- Only visible for 15 to 20 minutes from particular area of the earth, less time for maintenance.
- Shorter life span (5 to 8 years) compare to GEO.

Medium Earth Orbit (MEO)

- MEO satellite is in orbit somewhere between 8,000 to 18,000 km above the earth surface.
- MEO satellites are similar to LEO in functionality.
- Visible for much longer periods of time, usually between 2 to 8 hours.
- MEO satellites have a larger coverage area than LEO satellites.

Advantages of MEO

- Placed at higher altitude compare to LEO satellites.
- Less number of satellites are needed to cover entire area of the earth.
- Requires slightly higher transmission power compare to LEO satellites.
- Reduced latency compared to GEO satellites.
- Maintains a footprint well suited for regional networks.

Disadvantages of MEO

- The signals become weak when they reach earth from MEO compare to LEO.
- More transmit power is needed to overcome pathloss and other attenuating atmosphere.
- It is visible for only 2 to 8 hours from earth.

Disadvantages of MEO

- The signals become weak when they reach earth from MEO compare to LEO.
- More transmit power is needed to overcome pathloss and other attenuating atmosphere.
- It is visible for only 2 to 8 hours from earth.
- The system is more expensive compare to LEO.
- Multiple MEO satellites are needed to cover the region continuously.

Molniya Orbit Satellites

- Molniya Orbit is an elliptical orbit.
- The satellite remains in a nearly fixed position relative to earth for eight hours.
- A series of three Molniya satellites can act like a GEO satellite.
- Useful in near polar regions.

GEO orbit satellite is used in communication.

LEO orbit satellite is used in capturing image of earth.