

## **ROCKETS AND SATELLITES**

### DETAILED SYLLABUS

#### **OBJECTIVES**

It aims at enabling the student to understand fundamentals of rockets and satellites

#### **UNIT- I FUNDAMENTAL OF ROCKET PROPULSION**

Principle of rocket propulsion and their application- Types of rocket engine, Chemical rocket engine, Solid propellant rocket motor, Liquid propellant rocket engine, Hybrid propellant rocket, Nuclear propellant rocket, Electric rocket- Types of Liquid propellant, Monopropellant, bipropellant, Liquid oxidizer and fuel- properties of liquid propellant- Types of solid propellant, Heterogeneous and Homogeneous, Solid propellant fuel and oxidiser

#### **UNIT- II PERFORMANCE OF ROCKET ENGINE**

impulse, specific impulse, effective exhaust velocity, Specific propellant consumption, mass ratio, propellant mass fraction impulse to weight ratio. Thrust, nozzle exit velocity, burning rate & types of solid propellant grain configuration

#### **UNIT- III Introduction to Modern Developments in The Field**

Introduction to modern developments in the field: fundamental of cryogenic engine and space shuttle. Noise Pollution caused by Rockets- Effects of Noise Pollution and Measures to reduce noise pollution- Industrial waste from Rocket industry- Effect of waste on environment, Measures to reduce waste generation- Rocket propellant pollution

#### **UNIT- IV HISTORY, APPLICATION & TYPES OF SATELLITES & SERVICES**

History: space race, time line of space flight- Applications: Earth observation satellites/ spy satellites, communication satellites, satellite Navigation, space- observatory, space exploration- Satellites: Natural and artificial satellites- Types of artificial satellites- 1military and civilian- Earth observation satellites, crop monitoring,, satellites navigation, weather satellites, research satellites- space stations- human spacecraft in orbits- Life limitation of satellites- list of satellite launch capable countries- attack on satellite- jamming of satellite- sat communication. Space debris, graveyard orbit

### **UNIT- V TYPES OF ORBITS**

Types of orbits, Geo- centric orbits, Helio centric orbits, Aro centric orbits- Altitude classification of Geo centric orbits – LEO, MEO , GEO ,HEO- Inclination classification : Inclined orbit , Polar orbit , Polar Sun- synchronous orbit- Eccentricity calcifications : Circular orbit, Elliptical orbit , Geo –synchronous transfer orbit

### **UNIT- VI SATELLITE SUB SYSTEMS**

Space craft module: position monitoring system - altitude and orbit control system- Electrical power system – Battery and Solar panel system- Communication system – Transponder, receiver, uplink, amplifier, processing, transmission and down link- Environmental control system

### **REFERENCES**

1. Satellite Communications. Dennis Roddy Mc Graw Hill Education.
2. Fundamentals of Rockets and Missiles Air commodore Sajjad Rahim.