

7 th Semester	RAE7D003	Space Dynamics	L-T-P 3-0-0	3 Credits
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Module-I:**BASIC CONCEPTS**

The Solar System – Reference Frames and Coordinate Systems – The Celestial Sphere – The Ecliptic – Motion of Vernal Equinox – Sidereal Time – Solar Time – Standard Time – The Earth's Atmosphere.

Module-II:**THE GENERAL N-BODY PROBLEM**

The many body Problem – Lagrange – Jacobian Identity – The Circular Restricted ThreeBody Problem – Libration Points- Relative Motion in the N-body Problem – Two –Body Problem – Satellite Orbits – Relations Between Position and Time – Orbital Elements.

Module-III:**SATELLITE INJECTION AND SATELLITE ORBIT PERTURBATIONS**

General Aspects of satellite Injections – Satellite Orbit Transfer – Various Cases – Orbit Deviations Due to Injection Errors – Special and General Perturbations – Cowell's Method – Encke's Method – Method of variations of Orbital Elements – General Perturbations Approach.

Module-IV:**INTERPLANETARY TRAJECTORIES**

Two Dimensional Interplanetary Trajectories – Fast Interplanetary Trajectories – Three Dimensional Interplanetary Trajectories – Launch of Interplanetary Spacecraft – Trajectory about the Target Planet.

Module-V:**BALLISTIC MISSILE TRAJECTORIES AND MATERIALS**

The Boost Phase – The Ballistic Phase – Trajectory Geometry- Optimal Flights – Time of Flight – Re – entry Phase – The Position of the Impact Point – Influence Coefficients. Space Environment – Peculiarities – Effect of Space Environment on the Selection of Spacecraft Material.

Books:

- [1] Cornelisse, J.W., "Rocket Propulsion and Space Dynamic", W.H. Freeman & Co., 1984.
- [2] Sutton, G.P., "Rocket Propulsion Elements", John Wiley, 1993.
- [3] Van de Kamp, P., "Elements of Astro-mechanics", Pitman, 1979.
- [4] Parker E.R., "Materials for Missiles and Spacecraft", McGraw-Hill Book Co. Inc., 1982.

Digital Learning Resources:

Course Name: Space Flight Mechanics
 Course Link: <https://nptel.ac.in/courses/101/105/101105030/>
 Course Instructor: Dr.Manoranjan Sinha