

7 th Semester	RAE7D004	Rocket and Missile	L-T-P 3-0-0	3 Credits
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Module-I:**ROCKETSYSTEMS**

Ignition System in rockets - types of Igniters - Igniter Design Considerations - Design Consideration of liquid Rocket Combustion Chamber, Injector Propellant Feed Lines, Valves, Propellant Tanks Outlet and Helium Pressurized and Turbine feed Systems - Propellant Slosh and Propellant Hammer - Elimination of Geysering Effect in Missiles - Combustion System of Solid Rockets.

Module-II:**AERODYNAMICS OF ROCKETS ANDMISSILES**

Airframe Components of Rockets and Missiles - Forces Acting on a Missile While Passing Through Atmosphere - Classification of Missiles - methods of Describing Aerodynamic Forces and Moments- Lateral Aerodynamic Moment - Lateral Damping Moment and Longitudinal Moment of a Rocket - lift and Drag Forces - Drag Estimation - Body Upwash and Downwash in Missiles - Rocket Dispersion

Module-III:**ROCKET MOTION IN FREE SPACE AND GRAVITATIONALFIELD**

One Dimensional and Two Dimensional rocket Motions in Free Space and HomogeneousGravitational Fields - description of Vertical, Inclined and Gravity Turn Trajectories - Determination of range and Altitude Simple Approximations to Burnout Velocity.

Module-IV:**STAGINGANDCONTROL OF ROCKETS AND MISSILES**

Rocket Vector Control - Methods - Thrust determination - SITVC - Multistaging of rockets -Vehicle Optimization - Stage Separation Dynamics - Separation Techniques.

Module-V:**MATERIALS FOR ROCKETS AND MISSILES**

Selection of Materials - Special Requirements of Materials to Perform under Adverse Conditions

Books:

- [1] Sutton, G.P., et al., "Rocket Propulsion Elements", John Wiley & Sons Inc., New York, 1993.
- [2] Mathur, M., and Sharma, R.P., "Gas Turbines and Jet and Rocket Propulsion",StandardPublishers, New Delhi 1991.
- [3] Cornelisse, J.W., "Rocket Propulsion and Space Dynamics", J.W., Freeman & Co.Ltd., London,1912.

Digital Learning Resources:

Course Name: Rocket Propulsion
 Course Link: <http://nptel.ac.in/courses/112106073/>
 Course Instructor: Prof. K. Ramamurthi, IIT Madras