

AE8013 ROCKETS AND MISSILES

DETAILED SYLLABUS

OBJECTIVE

- To give revelation on basic concepts of rocket motion, rocket aerodynamics, staging & control of rockets, materials and propulsion systems of rockets and missiles to students to augment their knowledge in the region of rockets and missile flight.

UNIT I CLASSIFICATION OF ROCKETS AND MISSILES

History of rockets and missiles, Various methods of classification of missiles and rockets – Basic aerodynamic characteristics of surface to surface, surface to air, air to surface and air to air missiles – Examples of various Indian space launch vehicles and missiles – Current status of Indian rocket and missile programme.

UNIT II ROCKET MOTION IN FREE SPACE AND GRAVITATIONAL FIELD

One Dimensional and Two-Dimensional rocket Motions in Free Space and Homogeneous Gravitational Fields – description of Vertical, Inclined and Gravity Turn Trajectories – Determination of range and Altitude, Simple Approximations to Burnout Velocity and altitude-estimation of culmination time and altitude.

UNIT III AERODYNAMICS OF ROCKETS AND MISSILES

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.

UNIT IV STAGING AND CONTROL OF ROCKETS AND MISSILES

Multistaging of rockets and ballistic missiles – Multistage Vehicle Optimization – Stage Separation Dynamics – Stage Separation Techniques in atmosphere and in space, Introduction to aerodynamic and jet control methods – various types of aerodynamic control methods for tactical and short-range missiles- aerodynamic characteristics - various types of rocket thrust vector control methods.

UNIT V ROCKET PROPULSION SYSTEMS AND MATERIALS FOR ROCKETS AND MISSILES

Ignition System in rockets – types of Igniters– Design Consideration of liquid Rocket Combustion Chamber, Injector Propellant Feed Lines, Valves, Propellant Tanks Outlet and propellant feed Systems – Propellant Slash and Propellant Hammer – Elimination of Geysering Effect in Missiles – Selection of Materials – Special Requirements of Materials to Perform under Adverse Conditions.

TEXT BOOKS

1. Cornelisse, J.W., “Rocket Propulsion and Space Dynamics”, J.W., Freeman & Co. Ltd., London, 1982.
2. Sutton, G.P., et al., “Rocket Propulsion Elements”, John Wiley & Sons Inc., New York, 1993.

Diploma, Anna Univ UG & PG Courses

Notes

Syllabus

Question Papers

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REFERENCES

1. Mathur, M., and Sharma, R.P., "Gas Turbines and Jet and Rocket Propulsion", Standard Publishers, New Delhi 1998.
2. Parker, E.R., "Materials for Missiles and Spacecraft", McGraw-Hill Book Co. Inc., 1982.