

AE8504 PROPULSION – II

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UNIT I RAMJET AND SCRAMJET PROPULSION 8

Operating principle of Ramjet engine – combustion in Ramjet engine- ramjet performance and sample ramjet design calculations - Introduction to hypersonic air breathing propulsion, hypersonic vehicles and supersonic combustion- need for supersonic combustion for hypersonic propulsion – salient features of scramjet engine and its applications for hypersonic vehicles – problems associated with supersonic combustion – engine/airframe integration aspects of hypersonic vehicles – various types scramjet combustors – fuel injection schemes in scramjet combustors.

UNIT II CHEMICAL ROCKET PROPULSION 9

Operating principle – specific impulse of a rocket – internal ballistics – performance characteristics of rockets – simple rocket design problems – types of igniters- Rocket nozzle classification - preliminary concepts in nozzle-less propulsion – air augmented rockets – pulse rocket motors –static testing of rockets & instrumentation –safety considerations

UNIT III SOLID ROCKET PROPULSION 10

Salient features of solid propellant rockets – selection criteria of solid propellants – estimation of solid propellant adiabatic flame temperature - propellant grain design considerations – erosive burning in solid propellant rockets – combustion instability – strand burner and T-burner – applications and advantages of solid propellant rockets.

UNIT IV LIQUID AND HYBRID ROCKET PROPULSION 10

Salient features of liquid propellant rockets – selection of liquid propellants – various feed systems and injectors for liquid propellant rockets -thrust control and cooling in liquid propellant rockets and the associated heat transfer problems – combustion instability in liquid propellant rockets – peculiar problems associated with operation of cryogenic engines - Introduction to hybrid rocket propulsion – standard and reverse hybrid systems- combustion mechanism in hybrid propellant rockets – applications and limitations

UNIT V ADVANCED PROPULSION SYSTEMS 8

Electric rocket propulsion– types of electric propulsion techniques - Ion propulsion – Nuclear rocket – comparison of performance of these propulsion systems with chemical rocket propulsion systems – future applications of electric propulsion systems - Solar sail – current scenario of advanced propulsion projects worldwide.

TEXT BOOKS:

1. Mathur, M.L., and Sharma, R.P., “Gas Turbine, Jet and Rocket Propulsion”, Standard Publishers and Distributors, Delhi, 2014.
2. Sutton, G.P., “Rocket Propulsion Elements”, John Wiley & Sons Inc., New York, 8th Edition, 2010.