SUBJECT NO-CR61036, SUBJECT NAME- CRYOGENIC AND SEMI-CRYOGENIC ROCKET PROPULSION

LTP- 3-0-0,CRD- 3

SYLLABUS :-

Introduction, use of rockets, orbits, types of rockets, PSLV, GSLV, Space Shuttle, Ariane-5 etc., Definitions and fundamentals - multistaging, Construction of rockets, solid and liquid, Chemical propellants, desirable thermo-physical properties, hypergolic propellants, fuels and oxidizer, monopropellants, Cryogenic propellants, fuels and oxidizers – properties, performance comparison, Feed system, pressure fed and pump fed systems, pressurant selection, stored gas system, evaporation system for cryogenic propellants, pressurant from chemical reaction, solid and liquid gas generation systems, Pump-fed systems, basic concept, pumps and turbines – general configuration, Liquid rocket engine cycles, selection criteria, fluid circuits of space shuttle and Arian-5 engines, comparison of various world class rocket vehicles, Design of combustion chamber, throat diameter, volume and shape, Design of nozzle - under and over expansion, various shapes, Design of injector, impingement patterns, hydraulic characteristics, water calibration, Cooling systems, solid motor – ablative cooling, throat inserts, cooling of liquid engine - regenerative cooling, dump cooling, film cooling, transpiration cooling, ablative cooling, radiation cooling, Semi-cryo engine, advantages and disadvantages, propellants, engine cycle, cooling, injector design, On-board storage of cryogenic propellants, insulation, thermal stratification, destratification, Geysering effect – prevention, Zero –‘g’ problem, effects and prevention.