JET AND ROCKET PROPULSION
(Elective – I)

Course Code: 13ME2307

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Pre requisites: Thermodynamics and Thermal Engineering

Course Educational Objectives:

To make the student understand

1. jet and rocket propulsion cycles
2. combustion of solid and liquid propellants
3. basics of rocket engine
4. hybrid propellant rocket
5. selection of rocket propulsion systems

Courses Outcomes:

The student will be able to explain

1. jet and rocket propulsion cycles
2. working of rocket engines
3. combustion principles of solid and liquid propellants
4. working of hybrid rocket engines
5. selection process of rocket propulsion systems

UNIT-I

Ramjet engine, pulse jet engine, turboprop engine, turbojet engine, thrust and thrust equation, specific thrust of turbojet engine, specific thrust of the turbojet engine, efficiencies, parameters effecting the flight performance, thrust augmentation.

Duct jet propulsion, rocket propulsion, chemical rocket propulsion, nuclear rocket engines, electric rocket propulsion, applications of rocket propulsion-space launch vehicles, spacecraft, missiles and other applications.

UNIT-II

Liquid propellant rocket engine-propellants, propellant feed systems, gas feed systems, propellant tanks, tank pressurization, turbo pump feed system and engine cycles, flow and pressure balance, valves and pipe lines, engine support structure.

Liquid Propellant properties, liquid oxidizers, liquid fuels liquid monopropellants, gelled propellants, combustion process, analysis, combustion instability.

UNIT-III

Solid propellant rocket engine - propellant burning rate, basic performance relations, propellant grain and grain configuration, propellant grain stress and strain, attitude control.

Motor case – metal cases, wound –filament –reinforced plastic cases, nozzles- classification, design and construction, heat absorption and nozzle materials, rocket motor design approach.

UNIT-IV

Solid propellants-classification, propellant characteristics, propellant ingredients, smokeless propellant, igniter propellants, physical and chemical processes, ignition process, extinction or thrust termination, combustion instability.

UNIT-V

Hybrid propellant rockets - applications and propellants, performance analysis and grain configuration, combustion instability. Rocket propulsion systems - selection process, criteria for selection, interfaces.

TEXT BOOKS:

1. V Ganesan, "*Gas Turbines"*, Tata McGraw-Hill, 2nd Edition, 2003.

2. Sutton P and Oscar Biblaz," *Rocket Propulsion Elements"*, Wiley India Pvt.Ltd. 2010.

REFERENCES:

1. Khajuria and Dubey, "*Gas Turbines & Propulsive System"*, DhanpatRai Publications, 2012.

2. Hill and Peterson, "*Mechanics and Dynamics of Propulsion"*, 2nd Edition, Prentice Hall, 1991.