GUJARAT TECHNOLOGICAL UNIVERSITY

MECHANICAL (THERMAL ENGINEERING) (21)

JET PROPULSION & AIR-CRAFT ENGINEERING

SUBJECT CODE: 2712109

M.E. 1st SEMESTER

Type of course: Major Elective - I

Prerequisite: Enthusiasm to learn the course

Rationale: The course is prepared to provide the insight of jet propulsion engines their performance characteristics and relevant technology.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	PA (V)		PA (I)		
						ESE	OEP	PA	RP	
4	2	0	5	70	30	30	0	20	0	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Fundamental of Gas Dynamics:** Study of Wave motion, stagnation condition and parameters, Mach Number and its influence, Isentropic Flow, Rayleigh and Fanno Flow	6	10
2	**Principles of Jet Propulsion:** Fundamentals of aircraft propulsion, aircraft matching, thrust, various efficiencies, rockets and air breathing jet engines, classifications, turbo-jet, turbo-fan, turbo-prop, pulse jet & ramjet engine and their performance characteristics	15	30
3	**Solid & Liquid Propulsion System:** The concept of Solid & Liquid propellants, classification, homogeneous and heterogeneous propellants, composite propellant oxidizers and binders, effect of binder on propellant properties, burning rate and burning rate laws, factors influencing the burning rate, methods of determining burning rates, liquid propellants; classification, cryogenic and storage propellants, physical and chemical characteristics of liquid propellant	14	25
4	**Solid & Liquid Propulsion Engines:** Solid propellant rocket engine, internal ballistics, equilibrium motor operation and equilibrium pressure to various parameters, rocket motor hardware design, heat transfer considerations in solid rocket motor design, Liquid propellant rocket engine, system layout, pump and pressure feed systems, feed system components, design of combustion chamber, characteristic length, constructional features, and chamber wall stresses, heat transfer and cooling aspects	15	30

Reference Books:

1. Mechanics and Dynamics of Propulsion – Hill and Peterson
2. Principles of Jet Propulsion and Gas Turbines- Zucrow N.J., John Wiley and Sons New York
3. Gas Turbines & Propulsive Systems – Khajuria & Dubey (Dhanpatrai)

4. Rocket propulsion elements – Sutton
5. Rocket propulsion – Bevere
6. Jet propulsion – Nicholas Cumpst
7. Aircraft and Missile Propulsion - Zucrow N.J.Vol. I and Vol. II, John Wiley and Sons Inc, New York
8. Fundamentals of Compressible Flow - S. M.Yahya, Third edition, New Age International Pvt Ltd

Course Outcome:

After learning the course the students should be able to:

1. To understand the working of different types of aircraft and rocket propulsion systems and their performance characteristics