GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering
Subject Code: 3732107
Semester – III
Jet Propulsion and Air-Craft Engineering

Type of course: Program Elective

Prerequisite: Nil

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
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	00	00	100

Content:

Sr. No.	Content	Total Hrs
1	**Fundamental of Gas Dynamics:** Study of Wave motion, stagnation condition and parameters, Mach Number and its influence, Isentropic Flow, Rayleigh and Fanno Flow	5
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	12
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	12
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	13

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**20**	**20**	**20**	**20**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

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 Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Explain fundamental of gas dynamics	12
CO-2	Appraise the working of different types of aircraft and rocket propulsion systems and their performance characteristics.	58
CO-3	Discuss different propulsion engine with respect to various operating and effecting parameters	40

List of Experiments: NA

Major Equipment: NA

List of Open Source Software/learning website: https://nptel.ac.in/courses/101101002/