COURSE CODE	GAS DYNAMICS AND JET PROPULSION	L	T	P	C
1152ME127		3	0	0	3

1. Preamble

This course will help the students understand the fundamentals of as dynamics and jet propulsion.

2. Pre-Requisite

Basic Engineering Thermodynamics

3. Links to other courses

Project work

4. Course Educational Objectives

Students undergoing this course are expected to:

- To understand the theoretical concepts about compressible flow.
- To understand the isentropic flow with variable area
- To understand the flow in a constant area duct with friction
- To understand the flow in a constant area duct with heat transfer
- To understand the effects of normal and oblique shock wave on flow parameter
- To understand the construction, operation and performance of different types of aircrafts and rocket engines.

5. Course Outcomes

The students would be benefitted with the following outcomes:

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Apply the concepts of compressible flow and isentropic flow with variable area to solve the problems.	K3
CO2	Understand the concepts of Fanno flow and Rayleigh flow to solve the problems.	K3
CO3	Understand the concepts shock waves and solve the problems.	K3
CO4	Understand the construction and operation of various types of aircraft engines and its performance.	K3
CO5	Understand the construction and operation of various types of rocket engines and its performance.	K3

(K2 - Understand, K3-Apply)

6. Correlation of CO's with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	L					L					L	H	
CO2	H	L					L					L	H	
CO3	H	L					L					L	H	
CO4	H	L					L					L	H	
CO5	H	L					L					L	H	

H- High; M-Medium; L-Low

7. Course Content

UNIT ICOMPRESSIBLE FLOW AND ISENTROFIC FLOW WITH VARIABLE AREA L -9

Energy and momentum equations of compressible fluid flows- Various regions of flows - Reference velocities - Stagnation state – Mach wave and Mach cone - Effect of Mach number on compressibility. Isentropic flow with variable area - Nozzle and Diffuser- Use of gas tables.

UNIT II FLOW IN CONSTANT AREA DUCTS L-9

Flow in constant area ducts with friction (Fanno flow) – Fanno curves and Fanno flow equation - Variation of flow properties and variation of Mach number with duct length - Flow in constant area ducts with heat transfer (Rayleigh flow) - Rayleigh curves and Rayleigh flow equation - Variation of flow properties.

UNITIII NORMAL AND OBLIQUE SHOCK WAVES L- 9

Governing equations - Variation of flow parameters across the normal shock – Prandtl-Meyer equation - Impossibility of a shock in subsonic flow – Supersonic wind tunnels - Flow with oblique shock waves (elementary treatment only).

UNIT IV JET PROPULSION L- 9

Types of jet engines - Theory of jet propulsion - Energy flow through jet engines - Performance of turbo jet engines - Thrust augmentation.

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UNIT V ROCKET PROPULSION L-9

Types of rocket engines - Applications -Theory of rocket propulsion - Performance study – flow through rocket nozzles - Solid and liquid propellants – Propellant feeding systems.

TOTAL: 45 Periods

8. Text Books

1. S. M. Yahya., Fundamental of Compressible Flow, New Age International Pvt Ltd. New Delhi,

9. Reference

1. S. M. Yahya., Gas Tables for Compressible Flow, New Age International Pvt Ltd., New Delhi
2. E. Rathakrishnan, Gas Dynamics, Prentice Hall of India, New Delhi, 2008
3. Patrich.H. Oosthvizen, William E. Carscallen, Compressible fluid flow, Tata McGraw Hill Publishing Company Pvt Ltd., New Delhi,2004
4. Cohen. H., R. E. C Rogers and Sravanamutoo, Gas Turbine Theory, Addison Wesley Ltd.
5. P. Balachandran, Fundamental of Compressible Fluid Dynamics, Prentice Hall of India, New Delhi, 2009.