



FACULTY OF ENGINEERING & TECHNOLOGY

First Year Master of Engineering

Semester I

Course Code: 102440103

Course Title: Gas Turbines and Jet Propulsion

Type of Course: Program Elective I

Course Objectives: The course aims at providing the knowledge of gas turbines and jet propulsion related systems.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Internal		External		Total
				Theory	J/V/P*	Theory	J/V/P*	
3	0	2	4	40 /16	20 /08	60 /24	30 /12	150 /60

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	COMPRESSIBLE FLOW Wave propagation and sound velocity; Mach number and compressible flow regimes; basic equations for one-dimensional compressible flow, isentropic flow relations; area-velocity relation; normal shock waves, relation between upstream and downstream flow parameters.	7
2	GAS TURBINE SYSTEMS AND CYCLES System of operation of gas turbines-constant volume and constant pressure gas turbines; thermodynamics of Brayton cycle; regeneration-intercooling, reheating and their combinations; closed cycle and semiclosed cycle gas turbines; gas v/s I.C engines and steam turbines.	7
3	COMPRESSORS Classification-positive displacement and dynamic compressors, Operation of single stage reciprocating compressors; best value of index of compression; isothermal efficiency; effect of clearance and volumetric efficiency; multi-stage compression; air motors. Centrifugal compressors; static and total head values; velocity vector diagrams; slip factor; pressure coefficient and pre-whirl, Axial flow compressors; degree reaction and polytropic efficiency Performance characteristics; surging, choking and stalling.	9
4	COMBUSTION SYSTEMS Types, combustion process, combustion intensity efficiency and pressure loss.	4
5	AIR-BREATHING PROPULSION SYSTEMS Principle of jet propulsion; analysis and performance characteristics of turbojet, turboprop, ramjet and pulsejet; thrust power and propulsion efficiency	6



6	ROCKET PROPULSION Operating principle; solid and liquid propellants, performance analysis-calculations for specific impulse and propulsive efficiency	6
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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks						R: Remembering; U: Understanding; A: Application, N: Analyze; E: Evaluate; C: Create
R	U	A	N	E	C	
10%	20%	30%	25%	10%	5%	

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	Gas Turbine Theory by H Cohen & GFC Rogers, Pearson Publication
2	Principle of Jet Propulsion and Gas Turbine by Zucrow M J, John Wiley & Sons
3	Rocket Propulsion Elements by George P. Sutton, Wiley
4	Fundamentals of Compressible Flow by S. M. Yahya, New Age International Pvt Ltd
5	Gas Turbines and Propulsive Systems by Khajuria P. R, Dhanpat Rai Publishing Co Pvt Ltd
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Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Students able to understand the importance of compressible flow in gas turbine and jet propulsion	20
CO-2	Students able to identify the compressor system for gas turbine and jet propulsion system	20
CO-3	Students able to know the combustion system used in gas turbine and jet propulsion	25
CO-4	Students able to understand the working principle of jet and rocket propulsion systems	20
CO-5	Students able to performance analysis of various propulsion system	15
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CO-7	Click or tap here to enter text.	Click
CO-8	Click or tap here to enter text.	Click
CO-9	Click or tap here to enter text.	Click
CO-10	Click or tap here to enter text.	Click



List of Practicals / Tutorials:

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1	To Study Gas Turbine system, centrifugal and axial flow
2	To Study Gas turbine cycle with reheat cycle
3	To Study Centrifugal Compressors and Radial flow turbines
4	To Study gas turbine power cycles
5	To Study Axial and centrifugal Compressors
6	To Study Turboprop engines and propellers
7	To Study Introduction to Aircraft (Jet) Propulsion
8	To Study Combustion Systems, Intakes and Propelling Nozzles
9	To Study Ramjets, Pulsejets and Scramjets
10	To Study Rocket Propulsion
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Supplementary learning Material:

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Curriculum Revision:

Version:	1
Drafted on (Month-Year):	Apr-20
Last Reviewed on (Month-Year):	Jul-20
Next Review on (Month-Year):	Apr-22