

Introduction to Propulsion - Video course

COURSE OUTLINE

Basic Principles of Propulsion, Historical background, Conservation Equations, Review of basic thermodynamics, Review of compressible flow; Quasi One dimensional flow, Normal shock, Oblique shock, Rayleigh flow, Fanno flow, Air intake, Nozzle flow, Boundary layer flow,

Elements of combustion: Introduction to combustion; thermochemistry, Adiabatic temperature, premixed Flame and Diffusion Flame, Droplet combustion

Jet engines: Thrust expressions and performance parameters

Gas turbine ideal cycle analysis of ramjet, turbojet, turbofan and turboprop engines; Performance characteristics of various components of gas turbine engines: air-intake, compressor, combustor, turbine, and nozzle; Gas turbine Real cycle analysis

Elements of Rocket Engine; Introduction rocket propulsion, classification of rocket engines, rocket engine performance, Types of propellant, Propellant and its composition, rocket engine nozzle and its performance; Solid rocket engine, liquid rocket engines and hybrid rocket engine

COURSE DETAIL

Lecture	Topics
1	Basic principles of Propulsion
2-3	Historical background, Classification of propulsive devices, Applications of aircraft and rocket engines
4-5	Review of basic thermodynamics, Introduction to fluid flow
6-7	Conservation Equations,
7-8	Introduction to compressible flow
9-10	Quasi-One dimensional flow
11-13	Nozzle Flow, Normal and Oblique shock,
14-15	Rayleigh flow, Fanno Flow
16-21	Elements of combustion: thermochemistry, Adiabatic temperature, Chemical Equilibrium,
22-23	Premixed Flame and flame stabilization



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Aerospace Engineering

Pre-requisites:

- Thermodynamics
- Gas dynamics

Coordinators:

Dr. D.P. Mishra
Department of
Aerospace
Engineering IIT Kanpur

24-25	Jet Diffusion flame and droplet combustion
26-27	Thrust expressions and performance parameters
28-31	Ideal cycle analysis of ramjet, turbojet, turbofan and turboprop engines
32-35	Real cycle analysis of ramjet, turbojet, turbofan and turboprop engines
36-40	Chemical rocket engines: solid rocket engine, liquid rocket engines and hybrid rocket engine

References:

1. J D Mattingly, Elements of Gas Turbine Propulsion, McGraw Hill, 1997
2. H. Cohen, G F C Rogers and H I H Sarvanmatto, Gas Turbine Theory, Longman 1987
3. J P Holman, Heat Transfer, 2nd Ed., McGraw Hill
4. J L Kerrebrock, Aircraft Engine and Gas Turbine, MIT Press, 1991
5. Gordon C Oates, Aircraft Propulsion, System Technology & Design, AIAA Publications
6. P G Hill & C R Peterson, Mechanics and Thermodynamics of Propulsion, Addison-Wesley, 1970.
7. D. P. Mishra, Fundamentals of Combustion, Prentice Hall of India, New Delhi, 2008.
8. D. P. Mishra, Engineering Thermodynamics, Cengage Learning, New Delhi, 2011.