

<b>4<sup>th</sup> Semester</b>	<b>RAE4D003</b>	<b>Combustion</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
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**Module-I (7hours)**

**FUNDAMENTAL CONCEPTS IN COMBUSTION, CHEMICAL KINETICS AND FLAMES**

Thermo chemical equations – heat of reaction- first, second and third order reactions – premixed flames – diffusion flames – measurement of burning velocity – various methods – effect of various parameters on burning velocity – flame stability – deflagration – detonation – Rankine- Hugoniot curves – radiation by flames.

**Module-II (8hours)**

**COMBUSTION IN AIRCRAFT PISTON ENGINES**

Introduction to combustion in aircraft piston engines – various factors affecting the combustion efficiency - fuels used for combustion in aircraft piston engines and their selection – detonation in piston engine combustion and the methods to prevent the detonation

**Module-III (10hours)**

**COMBUSTION IN GAS TURBINE AND RAMJET ENGINES 10**

Combustion in gas turbine combustion chambers - recirculation – combustion efficiency, factors affecting combustion efficiency, fuels used for gas turbine combustion chambers – combustion stability – ramjet combustion – differences between the design of ramjet combustion chambers and gas turbine combustion chambers- flame holders types – numerical problems.

**Module-IV (8hours)**

**SUPERSONIC COMBUSTION**

Introduction to supersonic combustion – need for supersonic combustion for hypersonic airbreathing propulsion- supersonic combustion controlled by diffusion, mixing and heat convection – analysis of reactions and mixing processes - supersonic burning with detonation shocks - various types of supersonic combustors.

**Module-V (10hours)**

**COMBUSTION IN SOLID, LIQUID AND HYBRID ROCKETS**

Solid propellant combustion - double and composite propellant combustion – various combustion models – combustion in liquid rocket engines – single fuel droplet combustion model – combustion hybrid rockets.

**Books:**

- Sharma, S.P., and Chandra Mohan, “Fuels and Combustion”, Tata Mc. Graw Hill Publishing Co., Ltd., New Delhi, 1987.
- Mathur, M.L., and Sharma, R.P., “Gas Turbine, Jet and Rocket Propulsion”, Standard Publishers and Distributors, Delhi, 1988.
- Loh, W.H.T., “Jet, Rocket, Nuclear, Ion and Electric Propulsion: Theory and Design”, Springer Verlag, New York, 1982.
- Beer, J.M., and Chiger, N.A. “Combustion Aerodynamics”, Applied Science Publishers Ltd., London, 1981.
- Sutton, G.P., “Rocket Propulsion Elements”, John Wiley & Sons Inc., New York, 5th Edition, 1993.