

For Syllabus, Question Papers, Notes & many More

AE6404 PROPULSION – I

DETAILED SYLLABUS

UNIT I FUNDAMENTALS OF AIR BREATHING ENGINES

Operating principles of piston engines – thermal efficiency calculations – classification of piston engines - illustration of working of gas turbine engine – the thrust equation – factors affecting thrust – effect of pressure, velocity and temperature changes of air entering compressor – methods of thrust augmentation – characteristics of turboprop, turbofan and turbojet – performance characteristics.

UNIT II INLETS, NOZZLES AND COMBUSTION CHAMBERS FOR JET ENGINES

Internal flow and Stall in subsonic inlets – relation between minimum area ratio and external deceleration ratio – diffuser performance – supersonic inlets – starting problem on supersonic inlets – shock swallowing by area variation – real flow in nozzles and nozzle efficiency – losses in nozzles – equilibrium flow and frozen flow in nozzles- two phase flow in nozzles – ejector and variable area nozzles - interaction of nozzle flow with adjacent surfaces – thrust reversal- classification of combustion chambers – combustion chamber performance – effect of operating variables on performance – flame stabilization

UNIT III COMPRESSORS FOR JET ENGINES

Principle of operation of centrifugal compressor and axial flow compressor– Work done and pressure rise – velocity diagrams – degree of reaction – free vortex and constant reaction designs of axial flow compressor – performance characteristics of centrifugal and axial flow compressors– stage efficiency calculations - cascade testing

UNIT IV TURBINES FOR JET ENGINES

Principle of operation of axial flow turbines– limitations of radial flow turbines- Work done and pressure rise – Velocity diagrams – degree of reaction – free vortex and constant nozzle angle designs – performance characteristics of axial flow turbine– turbine blade cooling methods – stage efficiency calculations – basic blade profile design considerations – matching of compressor and turbine.

For Syllabus, Question Papers, Notes & many More

UNIT V RAMJET PROPULSION

Operating principle of ramjet engine – various components of ramjet engines and their efficiencies – Combustion in ramjet engine – critical, subcritical and supercritical modes of operation -ramjet engine and its performance characteristics – sample ramjet design calculations – flame stability problems in ramjet combustors –integral ram rockets.

TEXT BOOKS

1. Hill, P.G. & Peterson, C.R. “Mechanics & Thermodynamics of Propulsion” Addison – Wesley Longman INC, 1999.
2. James Award, "Aerospace Propulsion System"

REFERENCES

1. Cohen, H. Rogers, G.F.C. and Saravana muttoo, H.I.H. “Gas Turbine Theory”, Longman, 1989.
2. Oates, G.C., “Aero thermodynamics of Aircraft Engine Components”, AIAA Education Series, New York, 1985.
3. Rolls Royce, "Jet Engine", 5th Edition, Rolls Royce Technical Publications, 2005.
4. Mathur, M.L. and Sharma, R.P., “Gas Turbine, Jet and Rocket Propulsion”, Standard Publishers & Distributors, Delhi, 1999.

OBJECTIVES

To introduce basic concepts and salient features of engine components of jet propelled engines which are operated in atmosphere to students. This course is also aimed at making students familiarize with advanced jet propulsion methods like hypersonic propulsion.