

ASE202:PROPULSION-I

L:3 T:0 P:0 Credits:3

Course Outcomes: Through this course students should be able to

- CO1 :: Recall the basics of Gas turbine engines and it's Components
- CO2 :: Describe the operating principal of subsonic and Supersonic inlets
- CO3 :: Compute the concepts of axial flow ompressors and performance characteristics
- CO4 :: List and Practice problems of centrifugal compressors and their performance characteristics
- CO5 :: Categorize the performance of various type of combustion chambers
- CO6 :: Analyze the design concepts of turbines and solve problems with velocity triangle diagram

Unit I

Fundamentals of Gas Turbine : 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

Unit II

Inlets : Internal flow and Stall in subsonic inlets, Boundary layer separation, Major features of external flow near a subsonic inlet, Relation between minimum area ratio and eternal deceleration ratio, Diffuser performance, Supersonic inlets, Starting problem on supersonic inlets, Shock swallowing by area variation, External declaration, Models of inlet operation

Unit III

Axial flow compressors : Elementary theory of axial flow compressor, Velocity triangles, degree of reaction, Three dimensional flow, Air angle distributions for free vortex and constant reaction designs, Compressor blade design, Centrifugal and Axial compressor performance characteristics

Unit IV

Centrifugal Compressors : Principal of operation of centrifugal compressor, Work done and pressure rise, Velocity diagrams, Diffuser vane design considerations, Concept of prewhirl, Rotation stall

Unit V

Combustion Chambers : Classification of combustion chambers, Important factors affecting combustion chamber design, Combustion Process, Combustion chamber performance, Effect of operating variables on performance, Flame tube cooling, Flame stabilization, Use of flame holders

Unit VI

Elementary turbine Design : Introduction, impulse and reaction turbine, Compounding of turbine, efficiency of turbine, velocity diagrams, work and efficiency, Degree of reaction, turbine multi staging and stage performance, Factors limiting turbine design, cooling of turbine blade

Text Books:

1. INTERNAL COMBUSTION ENGINE by V GANESHAN, S Chand Publishing
2. GAS TURBINE AND JET & ROCKET PROPULSION by DR. M.L. MATHUR & R.P. SHARMA, Standard Publisher Distributors

References:

1. MECHANICS & THERMODYNAMICS OF PROPULSION by HILL, P.G. & PETERSON, C.R., PEARSON
2. GAS TURBINE THEORY by COHEN, H. ROGERS, G.F.C. AND SARAVANAMUTTOO H I H, PEARSON

