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Aircraft Engines

Instructor

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Department: Aerospace Engineering

Course Time:

Lecture venue:

Detailed Course Page:

Announcements

Brief description of the course

The course offers salient topics associated with gas turbine engines used in commercial and military airplanes. The course is meant for students who wanted to get specialized in aircraft propulsion. The topic covered in the course are very well used for the understanding of gas turbine engines used in power generation.

Aircraft engine is the main source of power to propel an aircraft. The performance of an aircraft, whether it is a commercial airplane or a military aircraft, is largely governed by its engine performance. During the design and development process of an aircraft, one need to choose an appropriate aircraft engine system as per the design requirement. In this context, one need to understand different types of aircraft engines used in aviation. A detailed understanding on the analysis of these engines are crucial for the entire aircraft performance.

The course begins with different types of aircraft engines and their thermodynamic cycle analysis. In this analysis, each of the major components used in the engine are treated as control volume. However such analysis could not able to highlight the technology significance and complications associated with the design of aircraft engines. A detailed analysis each of the major components (intake, compressor, combustor, turbine,

and nozzle) is also needed enhance the understanding of such engines.

Prerequisites

None

Syllabus

Description and classifications of aircraft engines, introduction and definition of engine performance parameters, thermodynamic cycle analysis of turbojet, turbo-prop, turbofan, and ramjet engines, estimation of engine performance characteristics, and thrust augmentation.

Description of major engine components (intake, compressor, combustor, turbine, and nozzle), centrifugal and axial compressors, velocity diagrams, degree of reaction, analysis of radial equilibrium, performance characteristics of compressors, introduction to axial turbine, velocity diagram, various types of blading, blade cooling, and performance characteristics of turbines.

Types of combustors used in aircraft engines, factors affecting the performance of combustors, pressure loss estimation, and major subsystems associated with the combustor.

Flow description inside an engine intake, types of intakes, and flow through nozzles.

Course outcomes

After the completion of course, the student could able to:

1) Describe the the thermodynamic flow process inside different aircraft engines;

2) Carry out performance analysis of different types of aircraft engine

3) Can provide estimation of specific thrust, specific impulse, isentropic efficiencies of major engine components, etc.

4) Can able to distinguish and describe engine flow across various engine components

5) Can actively participate in aircraft engine design

6) Can understand the complications associated with the aircraft engine technology

Grading policy

20% for first test

20% for mid-term examination

10% for assignments

50% for the final examination

Assignments

Resources

H.I.H. Saravanamuttoo, C.F.C. Rogers, and H. Cohen, Gas turbine theory

J.D. Mattingly, Elements of gas turbine propulsion

P.G. Hill and C.R. Perterson, Mechanics and thermodynamics of propulsion

Class lecture notes