BITS PILANI, HYDERABAD CAMPUS
SECOND SEMESTER 2023 – 2024
Course Handout

Date: 09/01/2024

Course No.	:	**AN F312**
Course Title	:	**Aircraft Propulsion**
Instructor-in-charge	:	**Dr. Sayan Das**

Course Description:
This course is an introductory course on aircraft propulsion and deals with the different types of aircraft engines currently in use. The purpose of the course is to discuss the various components used in those engines, do simplified thermodynamic analysis based on their components and discuss the relative scope of applications. The course also imparts a system level approach for aircraft propulsion by discussing the intake, combustion and exhaust systems describing the role of those systems and their roles.

Scope and Objective of the Course:
1. Introduce propulsion techniques used in aircraft.
2. Describe various components of aircraft engines including system level
3. Thermodynamic analysis using simplified assumptions
4. Analyze performance parameters of various aircraft engines
5. Physical understanding of system level components of various systems such as intake, combustor, and exhaust.

Course Pre/Co- requisite (if any): BITS F111 Thermodynamics and ME F212 Fluid Mechanics

Text books:
[TB1] Ahmed F. El-Sayed, Aircraft Propulsion and Gas Turbine engines, CRC Press, 2008.

Reference books:
[RB1] H.I.H. Saravanamuttoo, GFC Rogers and H. Cohen, Gas Turbine Theory, 5th Ed., PearsonEducation, 2001.
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Course Plan:

Lecture Nos.	Learning Objectives	Topics to be covered	Book
1-2	Introduction & history of Aerospace engines	Introduction, Airbreathing engines, Jet engines and their classifications ,	1
3-6	Performance of Jet engines	Introduction, Thrust, Factors affecting thrust, Engine performance parameters	2
7-10	Pulsejet and Ramjet engines	Introduction, Valved & Valveless Pulsejet, Ideal ramjet cycle	3
11-12	Shock Waves	Normal and Oblique Shock waves and their relations	3
13-18	Turbojet engines	Introduction, Single spool engine, Components, Thermodynamic analysis, Ideal and actual cycles, Operative and inoperative afterburners, Thrust augmentation methods	4
19-23	Turbofan engines	Introduction, Thermodynamic analysis, Various components, Variation of thrust and drag with bypassratio	5
24-28	Turboprop engines	Introduction, classification of turboprop engines, components, thermodynamic analysis of single spoolturboprop engine	6
29-32	Intakes	Subsonic & supersonic intakes, Inlet performance and performance parameters, Matching intake and engine	9
33-38	Combustion systems	Subsonic combustors, combustion process, Combustion chemistry, Combustion chamber performance, Combustor cooling, Aircraft fuels & emissions	10
39-41	Exhaust systems	Nozzles, converging diverging nozzles	11

The lectures may slightly diverge from above mentioned plan, which include special lectures and discussions based on student'sinterests that would be scheduled and notified accordingly.

Evaluation scheme:

Evaluation Components	Nature of Component	Duration	Weightage %	Date & Time
Test-I	Open Book	50 mins	10%	TBA
Test-2	Open Book	50 mins	10%	TBA
Seminar	Open Book	15 mins	10%	TBA
Mid Sem Exam	Closed book	90 mins	30%	11/03 - 4.00 - 5.30PM
Comprehensive Exam	Closed Book	3 hours	40%	07/05 AN

Chamber consultation hours: Wednesday 5-6 PM. Other days with prior appointment.

Make-up policy: Total of 3 tests will be conducted and the best two will be considered for evaluation. So, no make-up will be taken for tests. For mid-sem and comprehensive exams, the institute norms will be followed for make-up.

Notices: All notices concerning this course shall be displayed on the CMS (the Institute's web-based course management system). Students are advised to regularly visit CMS for the latest updates.

Academic Honesty and Integrity Policy: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Sayan Das
(SAYAN DAS)

Instructor-in-Charge
AN F312