The University of Texas at El Paso
College of Engineering
Department of Aerospace and Mechanical Engineering

Course number	**Title of Course**	**Semester/year**
16337 (AERO4322)	Aerospace Propulsion	Fall 2023

Time: Tuesday & Thursday 7:30 – 8:50 AM

Location: Physical Science Building 314

Instructor: Dr. Jaeyoung Cho (he, his, him)
Assistant Professor
Department of Aerospace and Mechanical Engineering
College of Engineering
The University of Texas at El Paso
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Office: Engineering Building, Room A-105

Office hours: With appointment via email, Tuesday & Thursday & Friday 9:30 – 10:30 AM

Prerequisite: MECH2311 – Introduction to Thermo-Fluid Science

Course Description: This course will cover the fundamental and practical aspects of various aerospace propulsion systems, including liquid/solid rocket motors, turbojet/turbofan engines, and ramjet/scramjet engines. Brief courses for utilizing Python and Cantera (open-source software for thermodynamic and chemical kinetic calculation) will be provided for reduced modeling of propulsion systems.

Method of Evaluation: The final grade will be evaluated as below.

Grading Components		*Grading Scale*	
Midterm exam	100pts	A	271 – 300 pts
Final exam	100pts	B	241 – 270 pts
Project	50pts	C	211 – 240 pts
Homework	50pts	D	181 – 210 pts
Total	300pts	F	0 – 180 pts

Project: Students will be taught to use Python and Cantera to calculate the thermodynamic properties and combustion characteristics of fuel/air mixture in propulsion-relevant conditions. The project will be about calculating the performance of aerospace propulsion systems with varying operating conditions and fuel composition. The students are expected to discuss how to design a sustainable aviation system based on the predicted results.

Homework: Homework will be assigned every two weeks. Students are expected to submit the homework within a given deadline.

Blackboard: The instructor will communicate with students via Blackboard.

Course Content

1. Review of thermodynamics
    a. Conservation law
    b. Process and cycle
2. Turbojet/turbofan engines
    a. Ideal gas turbine
    b. Performance of each component
3. Review of compressible flow
    a. Mach number
    b. Shock wave
4. Ramjet/scramjet engines
    a. Ramjet
    b. Scramjet
5. Rockets
    a. Ideal rocket
    b. Solid rocket motors
    c. Liquid rocket motors
    d. Non-chemical rockets
6. Python/Cantera programming
    a. Python programming
    b. Cantera programming
    c. Reduced modeling of propulsion systems

Recommended Texts: Course materials (mostly PowerPoint slides) will be provided by the instructor based on the following references.
[1] Ward, Thomas A. Aerospace propulsion systems. John Wiley & Sons, 2010.
[2] Sforza, Pasquale M. Theory of aerospace propulsion. Butterworth-Heinemann, 2016. (Online version available from UTEP library)
[3] Lee, Tae-Woo. Aerospace propulsion. John Wiley & Sons, 2013. (Online version available from UTEP library)

Attendance: Attendance is not required but strongly encouraged. Additional explanations unwritten in the course material may be provided during the lecture, which may benefit the students physically attending to get successful results from exams, homework, and the project.

Ethics: Students are expected to follow the "Student Conduct and Discipline" in Section 2 of the Handbook of Operating Procedure.
(https://www.utep.edu/hoop/section-2/student-conduct-and-discipline.html)