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

Course number	**Title of Course**	**Semester/year**
27795 (MECH5390)	Special Topics Mechanical Engr	Spring 2024

Time: Tuesday & Thursday 9:00 – 10:20 AM

Location: Liberal Arts Building 208

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 10:30 – 11:30 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: A total of four homework will be assigned during the semester. 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
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)

Languages of Course Materials: As a part of a commitment to a Hispanic-serving institution, this course will provide the course materials in both English and Spanish language. The instructor encourages the students who feel more comfortable with Spanish to initially read the Spanish version before transitioning to the English version. However, it is important to note that all the testing materials, including homework, midterm and final exam, and project, as well as the lecture itself, will be given only in English. If there is any translational error between the English and Spanish versions, the instructor prioritizes the information in the English version.

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.

Accommodations Policy: The University is committed to providing reasonable accommodations to students with documented disabilities. Students who become pregnant may also request reasonable accommodations, in accordance with state and federal laws and regulations and University policy. Accommodations that constitute undue hardship are not reasonable. To make a request, please register with the UTEP Center for Accommodations and Support Services (CASS). Contact CASS at 915-747-5148, email them at cass@utep.edu, or apply for accommodations online via the CASS portal.

Scholastic Integrity: Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as ones' own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. To learn more, please visit HOOP: Student Conduct and Discipline.

Guidance on Artificial Intelligence: Use of AI technologies or automated tools, particularly generative AI, is only allowed with approval from the instructor BEFORE being used. Without permission, you will be expected to think creatively and critically to complete assignments without assistance from these tools. If given permission to use any of these tools, students must properly cite and give full credit to the program used upon submission of every relevant assignment. A short paragraph describing how the tool(s) was/were used for the assignment must be included.