MECH4100 Experiential Projects in Aerospace Engineering

Course Code: MECH4100	**Course Title:** Experiential Projects in Aerospace Engineering
Required Course Or Elective Course: BEng (AE) Elective Course	**Terms Offered (Credits):** Spring (3 credits)
Faculty In Charge: Larry Li	**Pre-Requisites:** MECH 1907 OR (MECH 2020 AND MECH 2310)

Course Structure:

Seminar (2 hours/week), Lab sessions (3 hours/week), Field trips (10 hours/term)

Textbook/Required Material:

Aircraft Design: A Conceptual Approach (Daniel P. Raymer), AIAA Education Series, 2012

Course Description:

This course takes an experiential approach to aerospace engineering through (i) a series of seminars and workshops delivered by faculty and industry professionals, (ii) student-initiated tutorials on aerospace-related topics, and (iii) participation in an international aerospace competition. As well as giving students the opportunity to apply theoretical classroom knowledge to real-world engineering problems, this course will nurture skills in technical communication, teamwork, conflict resolution, and project management. This course will initially be led by faculty and then self-directed by students with faculty retreating as coaches. Students should seek approval from the course instructor prior to enrolling.

Course Topics:

1. Course overview; team selection; project timeline; introduction to the DBF competition; experience sharing from previous years
2. Sub-team formation; lessons learned from previous competitions
3. Rule interpretation; loophole identification; score sensitivity analysis; finances and budgeting; solicitation of sponsorship
4. Flight mission analysis; score modeling; materials procurement
5. Brain-storming for conceptual design; preliminary layout and sizing; aerodynamics; airfoil selection; wing geometry; fuselage design; empennage selection and sizing; tail configuration; wing loading
6. Structural design; stress analysis; materials selection; manufacturing processes; destructive and non-destructive testing
7. Landing gear configuration and sizing; flight stability; control surface selection and sizing; balance and handling performance
8. Avionics and propulsion systems; battery technology, motor performance, data logging; safety considerations; human factors
9. Design review and refinement; prototype build; mission simulation
10. Detailed design; prototype build; flight testing; design refinement
11. Prototype build; flight testing; design refinement
12. Prototype build; flight testing; design refinement
13. Design justification via performance calculations and self-collected flight data (submission of report and oral presentation)

Course Objectives:	1. To equip students with the fundamental working principles and technologies used in aerospace engineering today. 2. To introduce basic and entry-level theory and terminology of aerospace engineering. 3. To provide students with an overview of the social and environmental impacts of the aviation industry.
Course Outcomes:	A. Students will have a clear understanding and knowledge of the fundamental engineering and mathematical theories underlying aerospace engineering. B. Be able to use CAD and CFD software to simulate the behavior of aerospace components such as flow over the wings, propellers, and structural members. C. Be able to understand and identify the social and environmental impacts of the aviation industry.
Assessment Tools:	Lab sessions 70% Group discussion 30%