MECH3690 Aerospace Engineering Laboratories

Course Code: MECH3690	**Course Title:** Aerospace Engineering Laboratories
Lecturer: Prof. Stephane REDONNET (Rm2577F)	**TAs:** STBD
Terms Offered (Credits): Spring (3 credits)	**Pre/Co-Requisites:** Fundamental AE courses
Course Structure: Lectures (~ 2 hours/week × 4 weeks); Experiment (~ 3 hours/week × 10 weeks, in two sessions)	

Textbook and Learning resources:

- Richard S. Figliola and Donald E. Beasley, 1995, Theory and Design of Mechanical Measurements, John Wiley & Sons
- Joseph E. Shigley and Charles R. Mischke, 1989, Mechanical Engineering Design, 5th. ed., McGraw Hill
- AE Lab manual from HKUST/MAE

Course Description:

This course provides a series of aerospace engineering hands-on laboratories, which are covered through both Lectures and Experiments. Lectures introduce general information on how to design, perform and exploit experimental tests, along with some basic information pertaining to each experimental topic. Experiments include basic tests pertaining to flows and structures, along with more advanced tests relating to specific topics e.g. propulsion aerodynamics/aeroacoustics, aircraft design and flight dynamics (through a glider design competition). The course is targeted towards aerospace engineering students who have completed fundamental AE courses.

Course Topics:

1. Basic concepts and nomenclature
2. Design of experiments
3. Data acquisition & Analysis
4. Stresses & strains
5. Venturi Flow
6. Boundary Layer
7. Fracture toughness
8. Vibrations
9. Aeroacoustics of Cavities
10. Buckling & bending of structures
11. Turbojet Engine Performance
12. Glider design competition (experiential)

Course Objectives:	➢ To grasp the basic notions pertaining to experimental data acquisition and exploitation (P-O3) ➢ To perform basic hands-on experiments pertaining to aerospace engineering core subjects (P-O1, P-O3) ➢ To learn how to document a scientific experiment through a technical report aligning with common engineering practices (P-O1, P-O3, P-O5) ➢ To learn how to carry out experimental work in a safe and efficient manner, both independently and collaboratively as a team (P-O1, P-O3, P-O5)
Learning Outcomes:	✓ To grasp the fundamental concepts in aerospace via direct, hands-on experiments (POC1,2,3,4,5,6,7) ✓ To know how to properly design, conduct and exploit an experimental test (POC1,2,3,4,6,7,8) ✓ To become familiar with all engineering practices underlying testing and experiments (POC1,2,3,4,6) ✓ To know how to present experimental results in a proper way via a technical report (POC1,2,3,7) ✓ To develop investigative skills via Problem Based Learning & Laboratory activities (POC1,2,3,4,5,6,7) ✓ To be able to work as a team with individual tasks assigned (POC2,4,7,8)
Assessment Method:	✓ Lab participation & notebook (10%) ✓ Course quiz (15%) ✓ Lab reports (75%) ✓ *Policy Options for GenAI in Assessments: Restrict all use of generative AI for assessment*

Academic integrity and learning environment:

HKUST Academic Integrity : https://registry.hkust.edu.hk/resource-library/academic-integrity

BEng in Aerospace Engineering (4-year program)

Program Objectives:

P-O1. Be able to communicate and perform as an effective engineering professional in both individual and team-based project environments,

P-O2. Have an international outlook with clear perspectives on the Pearl River Delta and Greater China,

P-O3. Be able to research, design, develop, test, evaluate and implement engineering solutions to problems that are of complexity encountered in professional practice and leadership,

P-O4. Clearly Consider the ethical implications and societal impacts of engineering solutions,

P-O5. Continuously improve through lifelong learning.

Program Outcomes:

POC1. Ability to identify and formulate problems in multidisciplinary environment with an understanding of engineering issues and constraints.

POC2. Ability to design and conduct experiments as well as analyze and interpret data.

POC3. Ability to apply knowledge of mathematics, science, and engineering for problem solving in aerospace engineering and related sectors or for further education in a research career.

POC4. Ability to develop specification and to design system, component, or process to meet needs.

POC5. Ability to understand the design, operation, and maintenance of aircraft components and systems.

POC6. Ability to use modern engineering tools, techniques, and skills in engineering practice.

POC7. Ability to communicate effectively.

POC8. Ability to function in multi-disciplinary teams and provide leadership.

POC9. Broadly educated with an understanding of the impact of engineering solutions on issues such as economics, business, politics, environment, health and safety, sustainability, and societal context.

POC10. Clear understanding of professional and ethical responsibilities.

POC11. Recognition of the need for life-long learning and continuing education.

POC12. International outlook with knowledge of contemporary issues.