MECH4820 – Flight Mechanics

Course Code: MECH 4820
Course Title: Flight Mechanics

Required Course Or Elective Course: Elective Course
Terms Offered (Credits): Fall or Spring (3 credits)

Faculty In Charge: Xun Huang
Pre-Requisites: MECH 2210

Course Structure:
Lecture – 3 hours per week; Tutorial – 1 hour per week

Textbook/Required Material:

OTHER REFERENCES:
(3) Supplementary materials will be delivered during the lectures.

Course Description:
An introduction to atmospheric flight vehicle dynamics, static stability, and performance and the related aerodynamics, propulsion, and Equations of motion. The two lectures each week will try to link aerodynamics and mechanics together to explain flight mechanics in particular. In addition, classical design and analysis tools will be introduced during the lectures and/or tutorials. Students are expected to spend no less than an additional four hours per week to go through lecture materials and prepare homework.

Course Topics:
1. Review of basic aerodynamics
2. Aerodynamic analysis method and tools (lifting line theory, panel method and xfoil etc.)
3. Review of basic propulsion
4. Modeling of aircraft turbofan engine
5. Aircraft performance
6. Aircraft equations of motion (EoM)
7. Matlab modeling of aircraft EoM
8. Aircraft static stability
9. Analysis tool of stability

Course Objectives:
1. To introduce basic concepts of aerodynamics and propulsions directly related to flight mechanics.
2. To provide students with fundamental understanding of aerodynamics and propulsions for aircraft performance in classical flying stages.
3. To equip student to grasp classical analysis and design methods and computer tools pertaining to aircraft aerodynamics, performance and static stability.

| Course Outcomes:         | A. Become proficient in evaluating basic aerodynamic and flight performance characteristics of aircraft.  
                          | B. The student will have a clear understanding of the fundamental concepts leading to aircraft flight mechanics and performance. |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| Assessment Tools:        | • Homework 30%  
                          | • Mid-term 30%  
                          | • Final 40% |