Subject Description Form

Subject Code	AAE3011
Subject Title	Aircraft Performance and Flight Management
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	**Pre-requisite:** AMA2112 Mathematics II
Objectives	To teach students fundamental aerodynamic principles and performance analysis for the management of aircraft flight in atmosphere.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Design systems, components, or processes to meet desired needs including the aircraft wing aerodynamic forces and their management in cruising flight, aircraft maneuver stability for managing flying qualities, etc.; b. Use the techniques, skills, and modern computational and information technology necessary for engineering practice (including definition of the combinations of aircraft aerodynamic features and propulsion methods for different cruising requirements, description of relationships between the performance prescriptions and the power and thrust requirements for steady flight); and c. Function professionally in multidisciplinary teams related to aircraft performance and flight management.
Subject Synopsis/ Indicative Syllabus	**Aircraft Aerodynamics** – Airfoil lift, drag and moments; Airfoil data; Compressibility correction; Finite wing aerodynamics; Induced drag; High-lift mechanisms. **Aircraft Performance** – Drag polar; Propulsion characteristics; Tradeoff between thrust availability and performance efficiency; Thrust and power requirements for cruising flight; Altitude effects; Climb and descent performance; Gliding flight; Takeoff and landing; Level turn, pull-up and pull-down. **Maneuvering Flight Management** – Equations of motion; Small perturbation theory; Flying qualities; Pitching moments of airfoil; Aerodynamic center and trim; Static and dynamic stability; Stability and control Longitudinal and lateral stability; Stalling and spinning; Flight management and guidance computers (FMGC).

Teaching/Learning Methodology

Lectures are used to deliver the fundamental knowledge in relation to various aspects of aerodynamic characteristics for aircraft as well as their influence in determining the aircraft performance and maneuver management for atmospheric flight (Outcomes a to c).

Tutorials are used to illustrate the application of fundamental knowledge to practical flight situations (Outcomes a and c).

Experiment on evaluating the effects on aircraft wing profile on aerodynamic force characteristics, either in laboratory or numerical setup, is provided for bridging the knowledge of aerodynamics with flight performance. Students are exposed to proper use of knowledge taught and analysis skills on evaluating their experimental results (Outcomes a and c).

Teaching/Learning Methodology	Intended subject learning outcomes to be covered		
	a	b	c
1. Lecture	✓	✓	✓
2. Laboratory	✓	✓	✓
3. Tutorial	✓	✓	✓

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed		
		a	b	c
1. Assignment	10%	✓	✓	
2. Laboratory report	20%	✓		✓
3. Test	20%	✓	✓	
4. Examination	50%	✓	✓	
Total	100%			

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Overall Assessment:

$0.50 \times$ End of Subject Examination + $0.50 \times$ Continuous Assessment

Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by continuous assessment including assignment, laboratory report and test, which provide timely feedback to both lecturers and students on various topics of the syllabus. The in-class quiz (none assessment) will help students to better understand what they learn in the class. Homework and test are designed to enhance the students' learning of fundamental flight mechanics of an aircraft. The laboratory report provides students an opportunity to capitalize on the knowledge they learn for tackling practical aircraft flight performance problems.

Student Study Effort Expected	Class contact:	
	▪ Lecture	30 Hrs.
	▪ Laboratory/Tutorial	9 Hrs.
	Other student study effort:	
	▪ Self-study	45 Hrs.
	▪ Assignments	13 Hrs.
	▪ Laboratory report	13 Hrs.
	Total student study effort	110 Hrs.
Reading List and References	1. Kermondes, A. C., Mechanics of Flight, Prentice Hall, latest edition. 2. Anderson Jr., J. D., Introduction to Flight, McGraw-Hill, latest edition. 3. Torenbeek, E., and Wittenberg, H., Flight Physics, Springer, latest edition. 4. Hull, D. G., Fundamentals of Airplane Flight Mechanics, Springer, latest edition. 5. Etkin, Bernard, Dynamics of Atmospheric Flight, John Wiley& Sons Inc., 1972.	

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