Subject Description Form

Subject Code	ME47005
Subject Title	Aircraft Performance and Flight Management
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Nil
Objectives	To teach students the fundamental aerodynamic principles and performance analyses for the management of aircraft flight in atmosphere.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Demonstrate a good understanding of the aircraft wing aerodynamic forces and their management in cruising flight; b. Define the combinations of aircraft aerodynamic features and propulsion methods for different cruising requirements; c. Describe the relationships between the performance prescriptions and the power and thrust requirements for steady flight; d. Evaluate the aircraft manoeuvre stability for managing flying qualities.
Subject Synopsis/ Indicative Syllabus	***Aircraft Wing Aerodynamics*** – Airfoil lift, drag and moments. Airfoil data. Compressibility correction. Finite wing aerodynamics. Induced drag. High-lift mechanisms. ***Aircraft Performance*** – Concept of 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. ***Manoeuvre Management*** – Flying qualities. Elementary concepts of stability and control. Tail surfaces. Pitching moments of airfoil. Static and dynamic stability. 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 manouvre management for atmospheric flight (Outcomes a to d).

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

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	Outcomes			
	a	b	c	d
Lectures	√	√	√	√
Homework assignments		√	√	√
Test		√	√	
Examination	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Homework assignments	20%	√	√	√	√
2. Experiment	15%		√		
3. Test	15%		√	√	
4. Examination	50%	√	√	√	√
Total	100%				

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

Overall Assessment:

0.50 × End of Subject Examination + 0.50 × 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 assignments projects and test(s), which provide timely feedback to both lecturers and students on various topics of the syllabus. Assigned homework and test are designed to enhance the students' learning of fundamental flight mechanics of an aircraft. The experiment provides students an opportunity to capitalize on the knowledge they learn for tackling practical aircraft flight performance problems. Written report and oral presentation on a specific project or case study is used to assess the students' knowledge in contemporary aeronautical engineering practice.

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorials	6 Hrs.
	Other student study effort:	
	▪ Self Study	42 Hrs.
	▪ Homework assignments	12 Hrs.
	▪ Project/Case study	12 Hrs.
	Total student study effort	105 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.	

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