Subject Description Form

Subject Code	AAE5201
Subject Title	Aerodynamics and Computational Fluid Dynamics
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To provide students with knowledge of aerodynamics and computational fluid dynamics (CFD). 2. To develop students' capability in theoretical and numerical analysis of canonical aerodynamic problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. acquire fundamental knowledge of aerodynamics and CFD primarily in terms of inviscid flow; b. perform theoretical and numerical analysis of canonical aerodynamic problems; and c. gain basic understanding of state-of-the-art CFD techniques.
Subject Synopsis/ Indicative Syllabus	**Inviscid, incompressible flow**: Laplace equation and elementary solutions; Thin airfoil theory **Inviscid, compressible flow**: Shock and expansion waves; Quasi-one-dimensional flow; Linearized flow; Transonic flow; Hypersonic flow **Basics of numerics**: Finite differences; Difference equations; Stability analysis **Numerical techniques for incompressible flow**: Pressure correction technique **Time-marching techniques for compressible flow**: Lax–Wendroff technique; MacCormack's technique; Stability criterion **Modern CFD techniques**: Upwind schemes; Limiters; Total variation diminishing; Implicit methods

Teaching/Learning Methodology

The teaching and learning methods include lectures and tutorials, which are aimed at providing students with integrated knowledge required for aerodynamics and CFD. Technical/scientific examples and problems will be presented and discussed.

Teaching/Learning Methodology	Outcomes		
	a	b	c
Lecture	√	√	√
Tutorial	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)		
		a	b	c
1. Homework	30%	√	√	√
2. Test	20%	√	√	
3. Final examination	50%	√	√	
Total	100%			

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

Overall Assessment:

$$0.5 \times \text{Continuous Assessment} + 0.5 \times \text{Final Examination}$$

The continuous assessment consists of homework and test, which are aimed at evaluating the progress of students' study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes and enhancing the integration of the knowledge learnt.

The final examination is used to assess the knowledge acquired by the students for understanding and analysing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.

Student Study Effort Expected

Class contact:	
▪ Lecture	33 Hrs.
▪ Tutorial	6 Hrs.
Other student study effort:	
▪ Self-learning	30 Hrs.
▪ Homework	40 Hrs.
Total student study effort	109 Hrs.

Reading List and References	1. Anderson J. D., Fundamentals of Aerodynamics. McGraw-Hill, 6th edition. 2. Anderson J. D., Computational Fluid Dynamics: The Basics with Applications. McGraw-Hill, 1st edition. 3. Bertin J. J. and Cummings R. M., Aerodynamics for Engineers. Pearson, 6th edition.

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