Subject Description Form

Subject Code	AAE6101
Subject Title	Advanced Aerospace Structures and Materials
Credit Value	3
Level	6
Pre-requisite/ Co-requisite/ Exclusion	N/A
Objectives	1. To provide students with tools that are needed to carry out stress and failure analysis of aerospace structural components. 2. To provide students with an overview of the advanced materials that are used for aerospace vehicles. 3. To provide students with an overview of the non-destructive testing techniques that are used to ensure the safe operation of aerospace vehicles.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. perform stress analysis for typical aerospace structural components using both analytical methods and computational tools; b. determine the optimal materials for different aerospace structural components; c. choose the non-destructive testing methods that best suit certain aerospace structural components; d. recognize the frontier of research in aerospace structures and materials.
Subject Synopsis/ Indicative Syllabus	**Thin-wall structures** – wings; fuselages; empennages; thin-wall approximation. **Metallic materials** – material chemistry; forming; light-weight alloys; superalloys. **Composite materials** – rule of mixtures; laminated plate theory; fabrication; functional composite materials. **Analysis of aerospace structural components** – bending; shear; torsion; combined loading; stress; angle of twist; deflection; fatigue; fracture. **Non-destructive testing** – ultrasonic testing; piezoelectric transducer; guided wave testing; phased array scanning; structural health monitoring. **Finite element analysis** – 1D elements; 2D elements; 3D elements; high-order elements; static analysis; dynamic analysis.

Teaching/Learning Methodology	Lectures and tutorials are used to deliver the fundamental knowledge and research elements in relation to aircraft structures and materials.

Teaching/Learning Methodology	Intended subject learning outcomes			
	a	b	c	d
1. Lecture	√	√	√	√
2. 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	d
1. In-class tests and/or take-home assignments	40%	√	√	√	√
2. Final examination	60%	√	√	√	√
Total	100 %				

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

Overall Assessment: 0.6 × End of Subject Examination + 0.4 × Continuous Assessment

An examination is adopted to assess students on the overall understanding and the ability to apply the concepts. It is supplemented by Assignments and Quizzes. The Assignments and Quizzes can provide timely feedback to both lecturers and students on various topics of the syllabus.

Student Study Effort Expected

Class contact:	
▪ Lecture	26 Hrs.
▪ Tutorial	13 Hrs.
Other student study effort:	
▪ Self-Study	40 Hrs.
▪ Completion of assignments	40 Hrs.
Total student study effort	119 Hrs.

Reading List and References	1. Eringen, A. C., & Suhubi, E. S. (2013). *Linear theory*. Academic press. 2. Fu, Y. B., & Odgen, R. W. (2002). *Nonlinear Elasticity: Theory and Applications*. Cambridge UK: Cambridge University Pressing. 3 Megson, T.H.G. *Aircraft structures for engineering students*. Elsevier. Latest edition. 4. Gibson, R. F., *Principles of Composite Material Mechanics*. McGraw-Hill, latest edition. 5. Chandrupatla, T. R., & Belegunda, A. D. (2011). *Introduction to Finite Elements in Engineering* (4th ed.). Pearson.

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