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. obtain in-depth understanding of the materials that are used for aerospace vehicles; 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	**Elasticity** – linear elasticity; nonlinear elasticity. **Typical Loading-Bearing Aerospace Structures** – non-symmetrical beams; thin-wall beams; tapered beams; shear panels; ribs, cut-outs; plates; shells. **Metallic materials** – material chemistry; forming; damage and fracture mechanics; light-weight alloys; superalloys. **Composite materials** – rule of mixtures; laminated plate theory; fabrication; damage and fracture mechanics; functional composite materials. **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, tutorials and guided study by Mini-project / Case study/ Literature survey 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	√	√	√	√
3. Guided study by Mini-project / Case study/ Literature survey		√	√	√

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. Homework Assignment	20%	√			
2. Mini-project / Case study/ Literature survey	20%		√	√	√
3. Quiz	10%	√			
4. Examination	50%	√	√	√	√
Total	100 %				

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

Overall Assessment: 0.5 × End of Subject Examination + 0.5 × Continuous Assessment

Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by the assignments, quizzes and Mini-project / Case study/ Literature survey. The assignments and quizzes can provide timely feedbacks to both lecturers and students on various topics of the syllabus. The Mini-project / Case study/ Literature survey can provide the guided study for enhancing the students' research capability.

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 Siddiqui, T. (2014). *Aircraft Materials and Analysis* (4th ed.). McGraw-Hill Education. 4. Hyer, M. (1998). *Stress Analysis of Fiber-Reinforced Composite Materials*. DEStech Publications. 5. Chandrupatla, T. R., & Belegunda, A. D. (2011). *Introduction to Finite Elements in Engineering* (4th ed.). Pearson.	

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