

Subject Description Form

Subject Code	AAE3002
Subject Title	Aircraft Structures and Materials
Credit Value	3
Level	3
Pre-requisite / Co-requisite/ Exclusion	Pre-requisite: ENG2001 Fundamentals of Materials Science and Engineering OR ME23001 Engineering Mechanics
Objectives	<ol style="list-style-type: none"> 1. To provide students key knowledge relevant to aircraft structures and materials; and 2. To provide students an overview of the composites used in modern aircraft; and 3. To provide students with stress analysis tools to formulate and solve engineering problems related to aircraft structures and materials.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a. Demonstrate a good understanding of key aspects of aircraft structures; and b. Analyze and assess aircraft structures subject to various types of loading using stress analysis tools and failure criteria; and c. Comprehend characteristics of various materials used in aircraft; and d. Understand mechanical behaviors of composite materials used in aircraft.
Subject Synopsis/ Indicative Syllabus	<p>Characteristics of Aircraft Structures - Aircraft structural elements. Wing, fuselage, tail and landing gear.</p> <p>Fundamentals of Aircraft Materials and Joints - Material fundamentals. Metallic alloys. Composites. Riveting. Aircraft fasteners. Adhesive joint.</p> <p>Stress Analysis - Stress and strain. Equations of equilibrium. Principal stresses. Linear stress-strain relations.</p> <p>Loads Applied on Aircraft - Compression and tension. Torsion. Bending. Membrane stresses in pressure vessels. Flexural shear in closed thin-walled sections. Buckling of columns. Loads and stresses on ribs and frames. Aircraft structures under combined loading.</p> <p>Failure Criteria for Isotropic Materials - Strength criteria for brittle materials. Yield criteria for ductile materials. Stress concentration. Fatigue. Fractures. Corrosion of materials and prevention.</p> <p>Heat Treatment Processes - Heat treatment of metals. Surface treatment.</p> <p>Fundamentals of Aircraft Composites - Mechanical behavior of composite materials. Processing and Fabrication techniques for aircraft composites.</p>

Teaching/Learning Methodology	Lectures and tutorials are used to deliver the fundamental knowledge in relation to aircraft structures and materials (outcomes a to d).					
Assessment Methods in Alignment with Intended Learning Outcomes	Teaching / Learning Methodology		Intended subject learning outcomes to be covered			
	1. Lectures	✓	✓	✓	✓	
	2. Tutorials	✓	✓	✓	✓	
	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be covered			
			a	b	c	d
	1. Examination	60%	✓	✓	✓	✓
2. Assignments and quiz	30%	✓	✓	✓	✓	
3. Laboratory	10%	✓	✓			
Total	100%					
<p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Overall Assessment:</p> $0.6 \times \text{End of Subject Examination} + 0.4 \times \text{Continuous Assessment}$ <p>Examination is adopted to assess students on the overall understanding and the ability of applying the concepts. It is supplemented by the tests and assignments which provide timely feedbacks to both lecturers and students on various topics of the syllabus.</p>						
Student Study Effort Expected	Class contact:					
	▪ Lecture	33 Hrs.				
	▪ Tutorial	6 Hrs.				
	Other student study effort:					
	▪ Self Study	45 Hrs.				
	▪ Case study report preparation and presentation	21 Hrs.				
	Total student study effort		105 Hrs.			

Reading List and References

1. C.T. Sun, Mechanics of Aircraft Structures, John Wiley & Sons, latest edition.
2. T.H.G. Megson, Aircraft Structures for Engineering Students, Elsevier, latest edition.
3. R.F. Gibson, Principles of Composite Material Mechanics, McGraw-Hill International Editions, latest edition.

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