

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. Riveting. Aircraft fasteners. Adhesive joint.</p> <p>Fundamentals of Aircraft Materials - Material fundamentals. Metallic alloys and their heat treatment. Composites.</p> <p>Aircraft Structural Analysis – Loads Applied on Aircraft. Bending, shear, torsion of thin-walled beam. Structural idealization. Practical stress analysis of wings and fuselages under combined loading.</p> <p>Failure Criteria for Isotropic Materials - Strength criteria for brittle materials. Yield criteria for ductile materials. Stress concentration. Fatigue. Fracture. Stability of beams under transverse and axial loads</p> <p>Fundamentals of Aircraft Composites - Mechanical behavior of composite materials. Processing and Fabrication techniques for aircraft composites.</p>

Teaching/Learning Methodology	Lectures are used to deliver the fundamental knowledge in relation to aircraft structures and materials (outcomes a to d).																																						
	Teaching / Learning Methodology	Intended subject learning outcomes to be covered																																					
		a	b	c	d																																		
1. Lectures	✓	✓	✓	✓																																			
Assessment Methods in Alignment with Intended Learning Outcomes	<table border="1"> <thead> <tr> <th data-bbox="488 595 775 763" rowspan="2">Specific assessment methods/tasks</th> <th data-bbox="775 595 919 763" rowspan="2">% weighting</th> <th colspan="4" data-bbox="919 595 1439 696">Intended subject learning outcomes to be covered</th> </tr> <tr> <th data-bbox="919 696 1046 763">a</th> <th data-bbox="1046 696 1174 763">b</th> <th data-bbox="1174 696 1302 763">c</th> <th data-bbox="1302 696 1439 763">d</th> </tr> </thead> <tbody> <tr> <td data-bbox="488 763 775 831">1. Examination</td> <td data-bbox="775 763 919 831">60%</td> <td data-bbox="919 763 1046 831">✓</td> <td data-bbox="1046 763 1174 831">✓</td> <td data-bbox="1174 763 1302 831">✓</td> <td data-bbox="1302 763 1439 831">✓</td> </tr> <tr> <td data-bbox="488 831 775 931">2. Assignments and quiz</td> <td data-bbox="775 831 919 931">30%</td> <td data-bbox="919 831 1046 931">✓</td> <td data-bbox="1046 831 1174 931">✓</td> <td data-bbox="1174 831 1302 931">✓</td> <td data-bbox="1302 831 1439 931">✓</td> </tr> <tr> <td data-bbox="488 931 775 999">3. Midterm exam</td> <td data-bbox="775 931 919 999">10%</td> <td data-bbox="919 931 1046 999">✓</td> <td data-bbox="1046 931 1174 999">✓</td> <td data-bbox="1174 931 1302 999"></td> <td data-bbox="1302 931 1439 999"></td> </tr> <tr> <td data-bbox="488 999 775 1066">Total</td> <td data-bbox="775 999 919 1066">100%</td> <td colspan="4" data-bbox="919 999 1439 1066"></td> </tr> </tbody> </table> <p data-bbox="472 1111 1447 1178">Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p data-bbox="472 1200 727 1234">Overall Assessment:</p> <p data-bbox="472 1245 1270 1279">$0.6 \times \text{End of Subject Examination} + 0.4 \times \text{Continuous Assessment}$</p> <p data-bbox="472 1290 1447 1435">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>					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. Midterm exam	10%	✓	✓			Total	100%				
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Student Study Effort Expected	Class contact:																																						
	▪ Lecture	39 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	<ol style="list-style-type: none"> <li data-bbox="488 1895 1447 1973">1. C.T. Sun, Mechanics of Aircraft Structures, John Wiley & Sons, latest edition. <li data-bbox="488 1973 1447 2024">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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Revised in July 2022