

Subject Description Form

Subject Code	AAE5202
Subject Title	Advanced Aircraft Structures and Materials
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Exclusion: ME577 Advanced Aircraft Structures
Objectives	<ol style="list-style-type: none"> 1. To provide students an overview of the structures in modern aircraft. 2. To provide students with tools that are needed to formulate and solve problems concerning compression/tension, bending, torsion and buckling in aircraft structures. 3. To provide students with an overview of the advanced materials that are used for aircraft vehicles. 4. To provide students with an overview of the non-destructive testing techniques that are used to ensure the safe operation of aircraft vehicles.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> a. perform stress analysis for typical aircraft structural components using both analytical methods and computational tools; b. obtain in-depth understanding of the mechanical behavior of the materials that are used for aircraft vehicles; c. choose the non-destructive testing methods that best suit certain aerospace structural components; and d. recognize the frontier of research in aircraft structures and materials.
Subject Synopsis/ Indicative Syllabus	<p>Structures: Structural components of aircraft; Airframe load; Bending, shear and torsion of thin-wall beams; Stress analysis of aircraft structural components.</p> <p>Materials: Typical aircraft materials and characteristics; Characteristics of composite materials; Lamina and laminate theories; Functional composites.</p> <p>Non-destructive testing (NDT): Standard NDT techniques; Ultrasonic testing; Piezoelectric transducers; Guided wave testing; Phased array scanning; Structural health monitoring.</p> <p>Finite element analysis: 1D elements; 2D elements; 3D elements; High-order elements; Static analysis; Dynamic analysis.</p>

Teaching/Learning Methodology	<p>Lectures is used to deliver the fundamental knowledge and research elements in relation to aircraft structures and materials.</p> <table border="1" data-bbox="549 293 1372 501"> <thead> <tr> <th data-bbox="549 293 874 427">Teaching/Learning Methodology</th> <th colspan="4" data-bbox="874 293 1372 353">Outcomes</th> </tr> <tr> <td data-bbox="549 353 874 427"></td> <th data-bbox="874 353 997 427">a</th> <th data-bbox="997 353 1121 427">b</th> <th data-bbox="1121 353 1246 427">c</th> <th data-bbox="1246 353 1372 427">d</th> </tr> </thead> <tbody> <tr> <td data-bbox="549 427 874 501">Lecture</td> <td data-bbox="874 427 997 501">√</td> <td data-bbox="997 427 1121 501">√</td> <td data-bbox="1121 427 1246 501">√</td> <td data-bbox="1246 427 1372 501">√</td> </tr> </tbody> </table>					Teaching/Learning Methodology	Outcomes					a	b	c	d	Lecture	√	√	√	√																			
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Assessment Methods in Alignment with Intended Learning Outcomes	<table border="1" data-bbox="533 566 1386 1048"> <thead> <tr> <th data-bbox="533 566 810 768" rowspan="2">Specific assessment methods/tasks</th> <th data-bbox="810 566 970 768" rowspan="2">% weighting</th> <th colspan="4" data-bbox="970 566 1386 701">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th data-bbox="970 701 1070 768">a</th> <th data-bbox="1070 701 1171 768">b</th> <th data-bbox="1171 701 1272 768">c</th> <th data-bbox="1272 701 1386 768">d</th> </tr> </thead> <tbody> <tr> <td data-bbox="533 768 810 835">1. Project report</td> <td data-bbox="810 768 970 835">20%</td> <td data-bbox="970 768 1070 835">√</td> <td data-bbox="1070 768 1171 835">√</td> <td data-bbox="1171 768 1272 835"></td> <td data-bbox="1272 768 1386 835"></td> </tr> <tr> <td data-bbox="533 835 810 902">2. Assignment</td> <td data-bbox="810 835 970 902">40%</td> <td data-bbox="970 835 1070 902"></td> <td data-bbox="1070 835 1171 902">√</td> <td data-bbox="1171 835 1272 902">√</td> <td data-bbox="1272 835 1386 902">√</td> </tr> <tr> <td data-bbox="533 902 810 969">3. Final examination</td> <td data-bbox="810 902 970 969">40%</td> <td data-bbox="970 902 1070 969">√</td> <td data-bbox="1070 902 1171 969">√</td> <td data-bbox="1171 902 1272 969">√</td> <td data-bbox="1272 902 1386 969">√</td> </tr> <tr> <td data-bbox="533 969 810 1048">Total</td> <td data-bbox="810 969 970 1048">100%</td> <td data-bbox="970 969 1070 1048"></td> <td data-bbox="1070 969 1171 1048"></td> <td data-bbox="1171 969 1272 1048"></td> <td data-bbox="1272 969 1386 1048"></td> </tr> </tbody> </table> <p data-bbox="533 1070 1402 1137">Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p data-bbox="533 1149 778 1182">Overall Assessment:</p> <p data-bbox="624 1193 1297 1227" style="text-align: center;">$0.6 \times \text{Continuous Assessment} + 0.4 \times \text{Final Examination}$</p> <p data-bbox="533 1249 1402 1518">The project report is aimed at enhancing the students' comprehension and understanding of aircraft structures and the state-of-the-art technologies in relevant area. The assignment is used to assess the students' understanding of the stress analysis methods and their capabilities of mathematical problem formulation and programme application for typical aircraft structures. The final examination will be conducted to evaluate the students' performance in all the topics of the syllabus with a limited examination time.</p>					Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				a	b	c	d	1. Project report	20%	√	√			2. Assignment	40%		√	√	√	3. Final examination	40%	√	√	√	√	Total	100%				
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Student Study Effort Expected	Class contact:																																						
	<ul style="list-style-type: none"> ▪ Lecture 				39 Hrs.																																		
	Other student study effort:																																						
	<ul style="list-style-type: none"> ▪ Self-learning 				45 Hrs.																																		
	<ul style="list-style-type: none"> ▪ Project report preparation 				22 Hrs.																																		
	Total student study effort				106 Hrs.																																		

Reading List and References	<ol style="list-style-type: none">1. Sun C. T., Mechanics of Aircraft Structures, John Wiley & Sons, latest edition.2. Megson, T. H. G., Aircraft Structures for Engineering Students, Elsevier, latest edition.3. Gibson, R. F., Principles of Composite Material Mechanics, McGraw-Hill, International Editions, latest edition.
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