

Subject Description Form

Subject Code	ME579																																
Subject Title	Aircraft Noise and Aeroacoustics																																
Credit Value	3																																
Level	5																																
Pre-requisite/ Co-requisite/ Exclusion	Students should have fundamental knowledge in acoustics and fluid mechanics.																																
Objectives	To provide students in-depth knowledge of the noise generation mechanisms of aircraft noise and its environmental issues. Analysis using aeroacoustic theory will be introduced.																																
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> possess state-of-the-art knowledge and skills in the area of aircraft noise; apply their knowledge, skills and hand-on experience to analyze the noise generation of key aircraft components, its radiation and environmental consequences; extend their ability to integrate various noise suppression techniques in achieving quiet design and operation of aircraft ; and have recognition of the need for, and an ability to engage in life-long learning. 																																
Subject Synopsis/ Indicative Syllabus	<p>Noise Radiation from Aircraft: Aircraft noise descriptors. Human response to aircraft noise. Actions against aircraft noise. Noise certification and regulation.</p> <p>Introduction to Aeroacoustic Theory: Equation of linear acoustics. Free-space Green's function. Acoustics of point sources. Lighthill's acoustic analogy and its extensions. Acoustics of turbulence near a rigid body. Radiation from compact and non-compact sources. Fuselage dynamics and cabin noise.</p> <p>Noise Source Mechanisms: Airframe noise. Propeller noise. Fan and compressor noise. Turbine noise. Jet noise. Combustor noise. Sonic boom. Helicopter noise. Interior noise.</p> <p>Noise Control: Noise control at sources. Cabin noise control. Quiet aircraft design and operational characteristics. Quiet airport operation.</p>																																
Teaching/Learning Methodology	<ol style="list-style-type: none"> The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination. The continuous assessment and examination are aimed at providing students with integrated knowledge required for understanding and analysis of aircraft noise. Technical/practical examples and problems are raised and discussed in class/tutorial sessions. <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 50%;">Teaching/Learning Methodology</th> <th colspan="4">Intended subject learning outcomes</th> </tr> <tr> <th style="width: 12.5%;">a</th> <th style="width: 12.5%;">b</th> <th style="width: 12.5%;">c</th> <th style="width: 12.5%;">d</th> </tr> </thead> <tbody> <tr> <td>1. Lecture</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> </tr> <tr> <td>2. Tutorial</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> </tr> <tr> <td>3. Homework assignment</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> </tr> <tr> <td>4. Case study report and presentation</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td></td> </tr> </tbody> </table>				Teaching/Learning Methodology	Intended subject learning outcomes				a	b	c	d	1. Lecture	√	√	√	√	2. Tutorial	√	√	√	√	3. Homework assignment	√	√	√	√	4. Case study report and presentation	√	√	√	
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1. Lecture	√	√	√	√																													
2. Tutorial	√	√	√	√																													
3. Homework assignment	√	√	√	√																													
4. Case study report and presentation	√	√	√																														

Assessment Methods in Alignment with Intended Learning Outcomes	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
			a	b	c	d
	1. Homework assignment	20%	√	√	√	√
	2. Test	20%	√	√		
	3. Case study report and presentation or Laboratory	10%	√	√	√	√
	4. Examination	50%	√	√	√	√
Total	100%					
	Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes: Overall Assessment: $0.50 \times \text{End of Subject Examination} + 0.50 \times \text{Continuous Assessment}$ The continuous assessment consists of three components: homework assignments, test, and case study report & presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt. The examination is used to assess the knowledge acquired by the students for understanding and analysing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.					
Student Study Effort Expected	Class contact:					
	▪ Lecture		24 Hrs.			
	▪ Tutorial/Case study/Laboratory		15 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	Textbooks:					
	<ol style="list-style-type: none"> 1. Crighton, D. G., Dowling, A. P., Ffowcs Williams, J. E., Heckl, M., Leppington, F. G., <i>Modern Methods in Analytical Acoustics – Lecture Notes</i>, Springer, latest edition. 2. Goldstein, M. E., <i>Aeroacoustics</i>, McGraw-Hill, latest edition. 3. Howe, M. S., <i>Theory of Vortex Sound</i>, Cambridge University Press, latest edition. 4. Hubbard, H. H. (Ed.), <i>Aeroacoustics of Flight Vehicles – Theory and Practice, Vols. 1 & 2</i>, Acoustical Society of America, latest edition. 5. Nelson, P. M. (Ed.), <i>Transportation Noise Reference Book</i>, Butterworths, latest edition. 6. Pierce, A. D., <i>Acoustics – An Introduction to Its Physical Principles and Applications</i>, Acoustical Society of America, latest edition. 7. Smith, M. J. T., <i>Aircraft Noise</i>, Cambridge University Press, latest edition. 					
Journals:						
<ol style="list-style-type: none"> 1. <i>AIAA Journal</i>, American Institute of Aeronautics and Astronautics. 2. <i>International Journal of Aeroacoustics</i>, Multi-Science. 3. <i>Journal of the Acoustical Society of America</i>, Acoustical Society of America. 4. <i>Journal of Sound and Vibration</i>, Academic Press. 						