Subject Description Form

Subject Code	ME41005
Subject Title	Noise Control Engineering
Credit Value	3
Level	4
Pre-requisite/ Co-requisite/ Exclusion	Pre-requisite: ME34002 Engineering Thermodynamics; and ME34004 Fluid Mechanics
Objectives	To provide students with fundamental concepts and knowledge of acoustic noise and control, including sound generation mechanism, noise abatement technology and applications
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Understand the sound generation mechanisms and the method to analyze the type of noise source. b. Understand the simple sound fields and identify the noise sources and their respective mitigation measures. c. Understand the importance and usage of the noise assessment criteria for typical problems such as duct and room noise applications. d. Apply the state-of-the-art noise abatement technology and design elementary reactive and absorptive noise control device, analyze and interpret its performance from measurement. Understand basic principles in structural noise and aero-acoustic noise.
Subject Synopsis/ Indicative Syllabus	***Noise Characteristics and its modeling –*** Sound and noise characterization, sound measure in time frequency domain, elementary noise source, modelling of acoustic waves, and various types of sound source models. Overview of control strategy for different frequency ranges. ***Sound Reflection and Absorption –*** Sound propagation in different acoustic media, typical sound propagation phenomena and characterization, duct acoustics, sound reflection by expansion chamber, Helmholtz resonator, sound absorbing materials and absorbers, design of reactive silencers, acoustic enclosures etc. ***Flow-induced Noise and Control –*** Von Karman vortices, turbulence noise, cavitations, jet noise, fan noise etc. ***Structure-induced Noise and Control –*** Basic sound radiation phenomena, vibration isolation and absorption, sound transmission and mass law. ***Environmental Noise and Control –*** Basic concepts of sound propagation outdoors, absorption of sound in air; attenuation of sound over ground, temperature gradient etc. Noise reduction by sound barriers, Maekawa formula. Train noise, etc. ***Room Acoustic Control –*** Basic concepts of room acoustics, direct and diffuse sound

<table>
<tr><td></td><td>field, reverberation time, Sabin formula, prediction of internal sound field and noise mitigation measures.

Laboratory Experiment
There is one 1-hour laboratory session.
Typical experiment:
1. Helmholz resonator
2. Expansion chamber</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Lectures are aimed at providing students with the knowledge of acoustics and noise control for achieving the subject outcomes. (Outcomes a to d)

Tutorials are aimed at enhancing students' skills necessary for analyzing and designing the noise control method. (Outcomes a, b and d)

Laboratory experiments are conducted to improve students' ability to apply their knowledge to implement real engineering systems, to develop the students' interest and curiosity in the design of noise control method. (Outcomes b to d)

<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Tutorial</td><td>√</td><td>√</td><td></td><td>√</td></tr>
<tr><td>Experiment</td><td></td><td>√</td><td>√</td><td>√</td></tr>
</table>
</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="4">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Homework</td><td>30%</td><td>√</td><td>√</td><td></td><td>√</td></tr>
<tr><td>2. Lab report</td><td>10%</td><td></td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Examination</td><td>60%</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100%</td><td colspan="4"></td></tr>
</table>

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

Overall Assessment:
0.60 × End of Subject Examination + 0.40 × Continuous Assessment

Examination is applied to assess students on understanding and the ability to apply the concepts. It is supplemented by the homework and laboratory reports which provide timely feedbacks to both lecturers and students on various topics of the syllabus.</td></tr>
</table>

Student Study Effort Expected	Class contact:	
	▪ Lecture	33 Hrs.
	▪ Tutorial/Laboratory	6 Hrs.
	Other student study effort:	
	▪ Reading and review	44 Hrs.
	▪ Homework assignment	12 Hrs.
	▪ Laboratory report	10 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	1. A.D. Pierce, Acoustics: an Introduction to its Physical Principles and Applications, Acoustical Society of America, Woodbury, N.Y., latest edition. 2. A.P. Dowling and J.E. Ffowcs Williams, Sound and Sources of Sound, Chichester: E. Horwood, latest edition. 3. L.L. Beranek, Noise and Vibration Control Engineering: Principles and Applications, Wiley, latest edition. 4. D.A. Bies and C.H. Hansen, Engineering Noise Control: Theory and Practice, E & FN Spon, latest edition.	

Developed Jan. 2018