Subject Description Form

<table>
<tr><td>Subject Code</td><td>ME534</td></tr>
<tr><td>Subject Title</td><td>Engineering Acoustics</td></tr>
<tr><td>Credit Value</td><td>3</td></tr>
<tr><td>Level</td><td>5</td></tr>
<tr><td>Pre-requisite/
Co-requisite/
Exclusion</td><td>Students should have basic knowledge in Dynamics and Thermofluids.</td></tr>
<tr><td>Objectives</td><td>To provide the ingredients for students to acquire a sound background in modern acoustics and control of noise.</td></tr>
<tr><td>Intended Learning Outcomes</td><td>Upon completion of the subject, students will be able to:
a. possess state-of-the-art knowledge and skills in the area of physical characteristics of sound, noise radiation mechanism and phenomena of sound propagation;
b. apply their knowledge, skills and hand-on experience to measure and analyse the content of sound and design the noise control system;
c. extend their knowledge of noise radiation mechanism and noise control principles to different situations of engineering context and professional practice; and
d. have recognition of the need for, and an ability to engage in life-long learning.</td></tr>
<tr><td>Subject Synopsis/
Indicative Syllabus</td><td>Fundamentals of Acoustics: Physical characteristics and acoustic phenomena; noise effect on human beings; noise pollution; human ear; subjective response to noise; wave propagation in media; wave speed, energy and intensity; power and radiation from sources; modeling of wave phenomena; Euler’s equation of motion; wave equation and Helmholtz equation.
Wave Propagation with the Presence of Boundaries: Reflection at rigid and impedance boundaries; transmission through interfaces; reactive silencers; wave reflection inside enclosures and acoustic modes.
Noise Analysis: Quantitative measures of sound; frequency content of sounds; acoustic scales; data acquisition and acoustic measurement; digital sampling; signal processing; frequency analysis.
Noise Sources: Flow-induced noises; Von Karman vortices; turbulence noise; jet noise; structural acoustics and vibrations; acoustic structural coupling; elementary sound radiators; and sound source.
Noise Control: Noise attenuation; active noise cancellation; abatement of sound propagation; estimation of barrier insertion loss; acoustical properties of sound absorbing materials and measurement; damping and absorption; viscoelastic damping treatment; impedance of wall structures; calculation of noise level inside a room; transmission and acoustic isolation.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>1. The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.
2. The continuous assessment and examination are aimed at providing students with integrated knowledge required for engineering acoustics.
3. Technical/practical examples and problems are raised and discussed in class/tutorial sessions.
<table>
<tr><td rowspan="2">Teaching/Learning Methodology</td><td colspan="4">Intended subject learning outcomes</td></tr>
<tr><td>a</td><td>b</td><td>c</td><td>d</td></tr>
<tr><td>1. Lecture</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>2. Tutorial</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>3. Homework assignment</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>4. Case study report and presentation</td><td>√</td><td>√</td><td>√</td><td></td></tr>
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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:

$0.50 \times$ End of Subject Examination + $0.50 \times$ 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 analyzing 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:

1. Hansen C. H. and Snyder S. D., *Active Control of Noise and Vibration*, Spon, latest eidtion.
2. Pierce A. D., *Acoustics*, Acoustic Society of America, latest edition.
3. Kleppe J. A., *Engineering Application of Acoustics*, Artech House, latest edition.
4. Everest F. A., *The Master Handbook of Acoustics*, Tab Books Inc., latest edition.
5. Bies D. A. and Hansen C. H., *Engineering Noise Control*, Spon, latest edition.
6. Norton M. P., Fundamentals of *Noise and Vibration Analysis for Engineers*, Cambridge University Press, latest edition.
7. Kinsler L. E. et al, *Fundamentals of acoustics*, Wiley, latest edition.

Journals:

- The Journal of the Acoustical Society of America, Acoustical Society of America.
- Journal of Sound and Vibration, Academic Press.
- Acustica united with Acta Acustica, S. Hirzel Verlag.
- Applied Acoustics, Elsevier Applied Science.