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## 1. Module details

**Module name**

**NOISE AND VIBRATION CONTROL**

**Nominal duration**

One module  
It is anticipated that students will achieve the competencies specified in 35 to 40 hours.

**Module codes**

**EA137**

**Discipline code**

## 2. Module purpose

To enable students to test and analyse results in order to control noise and vibration which is caused by mechanical services equipment.

## 3. Prerequisites

EA002 - Engineering Maths A  
NBB002 - Occupational Health and Safety

## 4. Relationship to competency standards

TBA

## 5. Content

1. Fundamentals of Sound
  - frequency
  - decibels
  - octave bands
  - direct sound
  - velocity
  - sound pressure level
  - sound power level
  - sound meters
2. Noise and people
  - physical measurement of sound
  - weighting networks
  - NR curves
  - noise damage to hearing
  - evaluate daily noise exposures
  - peak noise levels
  - attenuation for hearing protectors
  - excess noise levels permissible
  - noise abatement acts
3. Identify and analyse problems
  - one-dimensional sound waves
  - standing waves
  - energy in a sound wave
  - sources
  - effects of air turbulence
  - transmitters

- amplifiers
- absorptivity
- reflectivity
- room characteristics
- acoustic design in buildings
- fan and air noise transmission in ducts

4. Methods of control

- natural attenuation
- sound absorbing materials, placement
- duct lining
- lined plenums
- lined duct splitters
- duct attenuators
- white noise
- vibration isolators

5. Acoustic specifications

- attenuator ratings

**6. Learning outcome details**

**Learning outcome 1**

**Assessment criteria**

On the completion of this module, the learner will be able to:

State the physical properties of sound waves.

Written short answer questions.

1.1 State the physical properties of waves and their classification.

1.2 Differentiate between transverse and longitudinal waves.

1.3 State the relationship between velocity, frequency and wave length in transverse waves.

1.4 Describe the motion of a compressional pulse

1.5 State what constitutes an elastic medium

1.6 List and state the meaning of:

- frequency (f)
- period (T)
- wavelength
- amplitude (A)

1.7 State the principle of superposition of waves

1.8 Solve a variety of problems involving

- wave speed
- determination of amplitude, wave length, frequency, and displacement.

1.9 Define sound.

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**Learning outcome 2**

**Assessment criteria**

- 1.10 Explain propagation of sound in air and other materials.
  - 1.11 Describe at least 2 methods by which sound may be generated and give examples of the application of each method.
  - 1.12 Outline the effect of sound being generated in a closed space.
  - 1.13 Differentiate between simple and complex sounds.
  - 1.14 Define 'sound pressure level' and 'sound power level', sound intensity and acoustic power.
  - 1.15 Outline the importance of sound intensity and list the meaningful relationships.
  - 1.16 Complete the various examples to determine SPL (Sound Pressure Level), SWL (Sound Power Level), I, pressure and power of sound waves.
  - 1.17 Show using 'decibel arithmetic' why it is that decibel SWL and SPL cannot be added in normal arithmetic way (use long addition laws with sound waves).
  - 1.18 Calculate the sound pressure level resulting from a given sound power source (using octave bands).
  - 1.19 List types of sound level meters.
- Identify the reasons for measuring sound and the methods used to reduce noise levels.
- Written short answer questions.  
Practical assignment.
- 2.1 Outline the importance of relating physical measurements of sound to human perception.
  - 2.2 State the reasons for introducing the 'weighting networks' and calculate them from octave band readings.
  - 2.3 Define and calculate Noise Rating Curves from octave band readings.
  - 2.4 List the other methods of assessing sound.
  - 2.5 Outline the ways in which noise may damage hearing and the degrees of noise damage to hearing.
  - 2.6 List the ways in which excessive noise levels may be reduced.
  - 2.7 State hearing protection assessment procedure.
  - 2.8 List noise hazard criteria used assessment of areas considered

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|                                      | <p>to be a risk to personnel and equipment.</p> <p>2.9 Calculate the required attenuation for personal hearing protectors.</p> <p>2.10 Evaluate a person's total daily noise exposure.</p> <p>2.11 Measure peak noise levels and evaluate their effect.</p> <p>2.12 Identify noise levels that are in excess of those allowed by local authorities.</p> <p>2.13 Interpret the requirement of the relevant 'Noise Abatement Act'.</p>  |
| <b>Learning outcome 3</b>            | Analyse results and identify sound and vibration problems associated with mechanical services equipment.  |
| <b>Assessment criteria</b>           | <p>Short answer test.</p> <p>Project/assignments.</p> <p>3.1 List and describe typical problems associated with sound and vibration in HVAC systems.</p> <p>3.2 Provide an analysis of typical problems associated with sound and vibration in HVAC systems and other mechanical services.</p>  |
| <b>Learning outcome 4</b>            | Prepare acoustic specifications for various air conditioning plant and other mechanical services, in accordance with OH&S regulations.  |
| <b>Assessment criteria</b>           | <p>Project/assignments.</p> <p>4.1 For various given air conditioning applications, prepare acoustic specifications in accordance with HOS&amp;W regulations.</p>   |
| <b>7. Assessment Strategies</b>      | See Assessment Criteria   |
| <b>8. Module Delivery Strategies</b> | <p>This module contains learning outcomes that will require both theory and practical instruction. As such, it will require resources to facilitate both on and off-the-job delivery strategies.</p> <p>These strategies may involve:</p> <ul style="list-style-type: none"> <li>- co-operative registered off-the-job provider/employer delivery sharing available resources.</li> <li>- delivery by an employer who is subregistered as an off-the-job provider, with qualified trainers in-house using resources to facilitate on and off-the-job delivery.</li> <li>- off-the-job objectives should focus on the industry context while on-the-job objectives should reflect</li> </ul> |

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application within enterprise operations.

Assessment instruments will need to be developed by the module provider. These instruments will need to reflect consistency with stated module learning outcomes and related assessment criteria.

Student records will be the responsibility of the off-the-job provider and where more than one off-the-job provider is involved, formal processes for transfer of student information must be established.

## 9. Resource Requirements

AIRAH 1989 AIRAH Handbook.

AIRAH. Application Manuals - Noise Control, parts 1 & 2

ASHRAE, ASHRAE Handbook, HVAC Systems, Atlanta

Harris, Handbook of Noise.

Jones, Air Conditioning Engineering.

NEBB, Procedural Standards for Measuring Sound and Vibration.

Noise Control in Mechanical Services, Sound Attenuators Ltd/Sound Research Laboratories Ltd, Anchor Press - Colchester.

Practical Guide to Fan Engineering, Woods of Colchester Ltd.

Standards Australia - Latest Editions to be used:

AS1055 parts 1,2, and 3, Acoustics - Description and Measurement of Environmental Noise.

AS1277, Acoustics - Measurement procedures of ducted silencers.

AS1359.51 Noise level limits

AS1366, Rigid Cellular Plastic Sheets for Thermal Insulation.

AS2991 part 1&2, Acoustics - Method for the Determination of Airborne Noise emitted by household and similar appliances.

Stoecker W.F., Jones J.W, 1982. Refrigeration and Air Conditioning, McGraw-Hill.

The Trane Company 1986. Trane Air Conditioning Manual. Additionally, further information may be sourced from journal articles.