



## UNSW Course Outline

# MECH9325 Fundamentals of Acoustics & Noise - 2024

Published on the 17 May 2024

## General Course Information

**Course Code :** MECH9325

**Year :** 2024

**Term :** Term 2

**Teaching Period :** T2

**Is a multi-term course? :** No

**Faculty :** Faculty of Engineering

**Academic Unit :** School of Mechanical and Manufacturing Engineering

**Delivery Mode :** In Person

**Delivery Format :** Standard

**Delivery Location :** Kensington

**Campus :** Sydney

**Study Level :** Undergraduate, Postgraduate

**Units of Credit :** 6

### Useful Links

[Handbook Class Timetable](#)

## Course Details & Outcomes

### Course Description

This course will focus on fundamental concepts of acoustics and noise. It begins with an introduction to basic features of sound and noise including pure tones, loudness of sound and weighting networks. Decibel scales, octave band frequency scales and measurement of sound

are described. The effects of noise on people and acceptable limits for industrial and community noise are identified. The course presents the acoustic wave equation and introduces several important parameters including acoustic pressure, characteristic impedance and acoustic power. Sound wave transmission including transmission of plane waves between different media, through walls and along pipes is investigated. This course also examines a range of noise control treatments and introduces basic analyses of expansion chamber mufflers and pipe side-branches.

## **Course Aims**

This course is intended to provide an introduction to the field of acoustics and noise. Important matters such as the measurement of sound and the effects of noise on people are considered. It is of particular value to students who intend to undertake a thesis project in acoustics. A laboratory component is included in this course.

# Course Learning Outcomes

Course Learning Outcomes
CLO1 : Describe the basic features of sound and noise including cause of sound, pure tones, decibel scales, loudness, and Australian standards for occupational noise management.
CLO2 : Perform frequency analysis of acoustic signals to determine how the strengths of the components of the sound pressure are distributed as a function of frequency.
CLO3 : Calculate the sound power of a source based on octave band sound pressure levels and reverberation times.
CLO4 : Calculate the sound transmission loss through a barrier and for various arrangements of an expansion chamber reactive muffler.

Course Learning Outcomes	Assessment Item
CLO1 : Describe the basic features of sound and noise including cause of sound, pure tones, decibel scales, loudness, and Australian standards for occupational noise management.	<ul style="list-style-type: none"><li>• Online Quizzes (x8)</li><li>• Labs</li><li>• Assignment</li><li>• Final Examination</li></ul>
CLO2 : Perform frequency analysis of acoustic signals to determine how the strengths of the components of the sound pressure are distributed as a function of frequency.	<ul style="list-style-type: none"><li>• Online Quizzes (x8)</li><li>• Labs</li><li>• Assignment</li><li>• Final Examination</li></ul>
CLO3 : Calculate the sound power of a source based on octave band sound pressure levels and reverberation times.	<ul style="list-style-type: none"><li>• Online Quizzes (x8)</li><li>• Labs</li><li>• Final Examination</li></ul>
CLO4 : Calculate the sound transmission loss through a barrier and for various arrangements of an expansion chamber reactive muffler.	<ul style="list-style-type: none"><li>• Assignment</li><li>• Online Quizzes (x8)</li><li>• Final Examination</li></ul>

## Learning and Teaching Technologies

Moodle - Learning Management System | Microsoft Teams

# Assessments

## Assessment Structure

Assessment Item	Weight	Relevant Dates
Online Quizzes (x8) Assessment Format: Individual	40%	Start Date: 06/06/2024 05:00 PM Due Date: Thursdays 5pm-6pm on weeks 2, 3, 4, 5, 7, 8, 9, 10.
Labs Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Lab 1 report is due Tuesday 25 June 5pm. Lab 2 report is due Tuesday 23 July 5pm.
Assignment Assessment Format: Individual	20%	Start Date: Not Applicable Due Date: Part 1 is due Tuesday 9 July 5pm. Part 2 is due Tuesday 30 July 5pm.
Final Examination Assessment Format: Individual	20%	

## Assessment Details

### Online Quizzes (x8)

#### Assessment Overview

**Assessment length:** 1 hour per quiz

The quizzes will cover the lecture material covered to date in the course.

There are eight (8) quizzes. The duration of each quiz is 1 hour.

The quizzes are to be done individually by all students. Each quiz is worth 5% worth.

The quizzes are marked online.

Marks for each quiz are returned immediately when the quiz ends.

There is no special consideration for the online quizzes. If you miss a quiz, you will not receive a mark for that quiz (5% of the course).

#### Course Learning Outcomes

- CL01 : Describe the basic features of sound and noise including cause of sound, pure tones, decibel scales, loudness, and Australian standards for occupational noise management.
- CL02 : Perform frequency analysis of acoustic signals to determine how the strengths of the components of the sound pressure are distributed as a function of frequency.
- CL03 : Calculate the sound power of a source based on octave band sound pressure levels

and reverberation times.

- CL04 : Calculate the sound transmission loss through a barrier and for various arrangements of an expansion chamber reactive muffler.

#### **Detailed Assessment Description**

The quizzes will be held on Thursday from 5pm-6pm in weeks 2, 3, 4, 5, 7, 8, 9, 10. The online quizzes can be found in Moodle.

#### **Assessment Length**

1 hour

#### **Submission notes**

via Moodle

#### **Assignment submission Turnitin type**

Not Applicable

### **Labs**

#### **Assessment Overview**

There are two labs.

Lab 1 will compare different descriptors for time varying noise. Lab 2 will calculate the sound power levels of a sound source from sound pressure level measurements.

A marking rubric will be provided for each lab.

The main body of your report (excluding the cover page and any appendices) should not exceed 5 pages.

Each lab is worth 10%. Marks for each lab will be returned within 2 weeks of the due date.

#### **Course Learning Outcomes**

- CL01 : Describe the basic features of sound and noise including cause of sound, pure tones, decibel scales, loudness, and Australian standards for occupational noise management.
- CL02 : Perform frequency analysis of acoustic signals to determine how the strengths of the components of the sound pressure are distributed as a function of frequency.
- CL03 : Calculate the sound power of a source based on octave band sound pressure levels and reverberation times.

#### **Assessment Length**

The main body of your report (excluding the cover page and any appendices) should not exceed

5 pages.

#### Submission notes

via Moodle

#### Assignment submission Turnitin type

This is not a Turnitin assignment

### **Assignment**

#### Assessment Overview

The assignment is the numerical design of a noise control element.

The assessment has two parts. A poster is to be submitted for each part.

Each poster is limited to one page.

A marking rubric will be provided for the assignment.

The poster for Part 1 is worth 5%. Part 1 will be peer-reviewed. A mark is provided for the peer review.

The poster for Part 2 is worth 15%.

Marks for each part of the assignment will be returned within 1 week of the due date.

#### Course Learning Outcomes

- CL01 : Describe the basic features of sound and noise including cause of sound, pure tones, decibel scales, loudness, and Australian standards for occupational noise management.
- CL02 : Perform frequency analysis of acoustic signals to determine how the strengths of the components of the sound pressure are distributed as a function of frequency.
- CL04 : Calculate the sound transmission loss through a barrier and for various arrangements of an expansion chamber reactive muffler.

#### Assessment Length

Each poster is limited to one page.

#### Submission notes

via Moodle

#### Assignment submission Turnitin type

This is not a Turnitin assignment

# Final Examination

## Assessment Overview

**Assessment length:** 2 hours

The final exam is based on the lecture material covered throughout the course.

There is one final exam to be held during the examination period at the end of term.

## Course Learning Outcomes

- CL01 : Describe the basic features of sound and noise including cause of sound, pure tones, decibel scales, loudness, and Australian standards for occupational noise management.
- CL02 : Perform frequency analysis of acoustic signals to determine how the strengths of the components of the sound pressure are distributed as a function of frequency.
- CL03 : Calculate the sound power of a source based on octave band sound pressure levels and reverberation times.
- CL04 : Calculate the sound transmission loss through a barrier and for various arrangements of an expansion chamber reactive muffler.

## Assessment Length

2 hours

## Submission notes

via Moodle

## Assignment submission Turnitin type

This is not a Turnitin assignment

# General Assessment Information

## Grading Basis

Standard

# Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Lecture	Tuesday 28 May, 2pm-4pm in Webster Theatre B Unit 1 - Introduction to acoustics: noise and sound, pure tones, decibel scales, frequency analysis, loudness of sound, weighting networks
	Workshop	Wednesday 29 May, 11am-1pm in Ainsworth 202 Wednesday 29 May, 4pm-6pm on Teams
Week 2 : 3 June - 9 June	Lecture	Tuesday 4 June, 2pm-4pm in Webster Theatre B Unit 2 - Measurement and analysis of sound pressures, sound level meters, microphones. Frequency analysis, frequency bands, decibel scales, descriptors for time varying noise levels
	Workshop	Wednesday 5 June, 11am-1pm in Ainsworth 202 Wednesday 5 June, 4pm-6pm on Teams
	Online Activity	Quiz 1 Thursday 6 June, 5pm-6pm in Moodle
Week 3 : 10 June - 16 June	Lecture	Tuesday 11 June, 2pm-4pm in Webster Theatre B Unit 3 - Sound sources, sound fields, semi-reverberant field techniques, sound in large spaces, absorption, reverberation time
	Workshop	Wednesday 12 June, 11am-1pm in Ainsworth 202 Wednesday 12 June, 4pm-6pm on Teams
	Online Activity	Quiz 2 Thursday 13 June, 5pm-6pm in Moodle
Week 4 : 17 June - 23 June	Lecture	Tuesday 18 June, 2pm-4pm in Webster Theatre B Unit 4 - Measurement of sound power
	Workshop	Wednesday 19 June, 11am-1pm in Ainsworth 202 Wednesday 19 June, 4pm-6pm on Teams
	Online Activity	Quiz 3 Thursday 20 June, 5pm-6pm in Moodle
Week 5 : 24 June - 30 June	Lecture	Tuesday 25 June, 2pm-4pm in Webster Theatre B Unit 5 - Effects of noise on people: human ear, loudness, weighted sound levels, masking, sound rating, hearing loss
	Workshop	Wednesday 26 June, 11am-1pm in Ainsworth 202 Wednesday 26 June, 4pm-6pm on Teams
	Online Activity	Quiz 4 Thursday 27 June, 5pm-6pm in Moodle
Week 6 : 1 July - 7 July	Other	Term break
Week 7 : 8 July - 14 July	Lecture	Tuesday 9 July, 2pm-4pm in Webster Theatre B Unit 6 - One dimensional plane acoustic waves: wave equation, standing waves, acoustic energy
	Workshop	Wednesday 10 July, 11am-1pm in Ainsworth 202 Wednesday 10 July, 4pm-6pm on Teams
	Online Activity	Quiz 5 Thursday 11 July, 5pm-6pm in Moodle
Week 8 : 15 July - 21 July	Lecture	Tuesday 16 July, 2pm-4pm in Webster Theatre B Unit 7 - Applications of the wave equation: transmission between media, transmission through a wall
	Workshop	Wednesday 17 July, 11am-1pm in Ainsworth 202 Wednesday 17 July, 4pm-6pm on Teams
	Online Activity	Quiz 6 Thursday 18 July, 5pm-6pm in Moodle
Week 9 : 22 July - 28 July	Lecture	Tuesday 23 July, 2pm-4pm in Webster Theatre B Unit 8 - Applications of the wave equation: transmission in pipes
	Workshop	Wednesday 24 July, 11am-1pm in Ainsworth 202 Wednesday 24 July, 4pm-6pm on Teams
	Online Activity	Quiz 7 Thursday 25 July, 5pm-6pm in Moodle
Week 10 : 29 July - 4 August	Workshop	Wednesday 31 July, 11am-1pm in Ainsworth 202 Wednesday 31 July, 4pm-6pm on Teams
	Online Activity	Quiz 8 Thursday 1 August, 5pm-6pm in Moodle

## Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.



# General Schedule Information

The dates and times for the lectures, workshops and online quizzes are listed below.

## Course Resources

### Recommended Resources

Recommended texts for this course, which are available in the UNSW bookshop as well as the UNSW library, are listed below:

Smith, B.J., Peters, R.J. and Owen, S. Acoustics and noise control, 2nd edition, Addison Wesley Longman, 1996.

Norton, M.P. and Karczub, D. Fundamentals of noise and vibration analysis for engineers, 2nd Edition, Cambridge University Press, Cambridge, 2003.

Bies, D. A. and Hansen C.H. Engineering Noise Control: Theory and Practice, 3rd Edition, E&FN Spon, 2003.

Useful links:

UNSW Library website: <https://www.library.unsw.edu.au/>

Moodle: <https://moodle.telt.unsw.edu.au/login/index.php>

Teams: <https://teams.microsoft.com/v2/>

## Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in class, and at the School student/staff meetings. Your feedback is taken seriously. Continual improvements are made to the course based, in part, on your feedback.

# Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Nicole Kessissoglou		Room 408G, Level 4, Ainsworth building J17		Teams	Yes	Yes
Demonstrator	Nathan Wendt				Teams	No	No
	Alex McIntosh				Teams	No	No

## Other Useful Information

### Academic Information

#### I. Special consideration and supplementary assessment

If you have experienced an illness or misadventure beyond your control that will interfere with your assessment performance, you are eligible to apply for Special Consideration prior to, or within 3 working days of, submitting an assessment or sitting an exam.

Please note that UNSW has a Fit to Sit rule, which means that if you sit an exam, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's [Special Consideration page](#).

#### II. Administrative matters and links

All students are expected to read and be familiar with UNSW guidelines and policies. In particular, students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)
- [Equitable Learning Services](#)

#### III. Equity and diversity

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course convener prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the Equitable Learning Services. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

#### **IV. Professional Outcomes and Program Design**

Students are able to review the relevant professional outcomes and program designs for their streams by going to the following link: <https://www.unsw.edu.au/engineering/student-life/student-resources/program-design>.

*Note: This course outline sets out the description of classes at the date the Course Outline is published. The nature of classes may change during the Term after the Course Outline is published. Moodle or your primary learning management system (LMS) should be consulted for the up-to-date class descriptions. If there is any inconsistency in the description of activities between the University timetable and the Course Outline/Moodle/LMS, the description in the Course Outline/Moodle/LMS applies.*

#### **Academic Honesty and Plagiarism**

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: [student.unsw.edu.au/plagiarism](https://student.unsw.edu.au/plagiarism). The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis or contract cheating) even suspension from the university. The Student Misconduct Procedures are available here:

[www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf](http://www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf)

## Submission of Assessment Tasks

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of five percent (5%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day. This is for all assessments where a penalty applies.

Work submitted after five days (120 hours) will not be accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These will be clearly indicated in the course outline, and such assessments will receive a mark of zero if not completed by the specified date. Examples include:

- Weekly online tests or laboratory work worth a small proportion of the subject mark;
- Exams, peer feedback and team evaluation surveys;
- Online quizzes where answers are released to students on completion;
- Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date; and,
- Pass/Fail assessment tasks.

## Faculty-specific Information

[Engineering Student Support Services](#) – The Nucleus - enrolment, progression checks, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries e.g. admissions, fees, programs, credit transfer

## **Phone**

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

## **School-specific Information**

### **Short Extensions**

Short extensions are not currently applicable to Mechanical and Manufacturing Engineering Courses.

### **Review of Results**

The purpose of a review of results is if there was a marking error. Review of results is for when you have cause to believe that there is a marking error. Review of Results cannot be used to get feedback. If you would like feedback for assessments prior to the final exam, you are welcome to contact the course convenor directly. No feedback will be provided on final exams.

### **Use of AI**

The use of AI is prohibited unless explicitly permitted by the course convenor. Please respect this and be aware that penalties will apply when unauthorised use is detected, such as through Turnitin. If the use of generative AI, such as ChatGPT, is allowed in a specific assessment, they must be properly credited, and your submissions must be substantially your own work.

## **School Contact Information**

### **Location**

UNSW Mechanical and Manufacturing Engineering

Ainsworth building J17, Level 1

Above Coffee on Campus

## Hours

9:00–5:00pm, Monday–Friday\*

\*Closed on public holidays, School scheduled events and University Shutdown

## Web

[School of Mechanical and Manufacturing Engineering](#)

[Engineering Student Support Services](#)

[Engineering Industrial Training](#)

[UNSW Study Abroad and Exchange](#) (for inbound students)

[UNSW Future Students](#)

## Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

(+61 2) 9385 4097 – School Office\*\*

\*\*Please note that the School Office will not know when/if your course convenor is on campus or available

## Email

[Engineering Student Support Services](#) – current student enquiries

- e.g. enrolment, progression, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries

- e.g. admissions, fees, programs, credit transfer

[School Office](#) – School general office administration enquiries

- NB: the relevant teams listed above must be contacted for all student enquiries. The School will only be able to refer students on to the relevant team if contacted

### Important Links

- [Student Wellbeing](#)
- [Urgent Mental Health & Support](#)
- [Equitable Learning Services](#)
- [Faculty Transitional Arrangements for COVID-19](#)
- [Moodle](#)
- [Lab Access](#)
- [Computing Facilities](#)
- [Student Resources](#)
- [Course Outlines](#)
- [Makerspace](#)
- [UNSW Timetable](#)
- [UNSW Handbook](#)