

MECH9325

Fundamentals of Acoustics & Noise

Term 2, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Nicole Kessissoglou	n.kessissoglou@unsw.edu.au	Teams	Room 408G, Level 4, Ainsworth building J17	

Demonstrators

Name	Email	Availability	Location	Phone
Kai Lin	cikai.lin@unsw.edu.au			
Gyani Shankar Sharma	gyanishankar.sharma@unsw.edu.au			

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](#)

Course Details

Units of Credit 6

Summary of the Course

This course will focus on the fundamental concepts and measurement of sound. 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 introduction of 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

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Describe the basic features of sound and noise including cause of sound, pure tones, decibel scales, loudness and occupational noise management.	PE1.1, PE1.2, PE1.3, PE1.6
2. 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.	PE1.1, PE1.2, PE1.3
3. Calculate the sound power of a source based on octave band sound pressure levels and reverberation times.	PE1.1, PE1.2, PE1.3, PE2.1
4. Calculate the sound transmission loss through a barrier and for various arrangements of an expansion chamber reactive muffler.	PE1.1, PE1.2, PE1.3, PE2.1, PE2.2

Teaching Strategies

Lectures in the course are designed to cover the core concepts and background theory in acoustics and noise. Topics covered by this course are separated into eight units. A range of texts in acoustics were used to develop the lecture material. Lecture notes and pre-recorded lecture videos are available to students electronically before each class via the UNSW online learning management system. Non-assessed tutorial exercises are provided to reinforce the lecture material. Students are encouraged to work through these exercises during the workshops and also during their own personal study time. The

assessment is divided into a range of activities to reinforce the lecture material.

This course is intended to give you skills to meet the needs of those embarking on a career in acoustics. This course will provide awareness of noise and its generation. This course will also develop written communication and research skills. Lecture material and tutorial exercises have been carefully selected and a wide range of assessment activities will be given. Invited industry acoustic consultants will give guest lectures to demonstrate the relevance of acoustics and noise across a range of applications.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Online 1 hour quiz in weeks 2-5, 7-10	40%	Friday 4-5pm in weeks 2, 3, 4, 5, 7, 8, 9, 10,	1, 2, 3, 4
2. Labs	20%	Lab 1 report is due Tuesday 28 June 5pm. Lab 2 report is due Tuesday 19 July 5pm.	1, 2, 3
3. Assignment	20%	Preliminary poster due Tuesday 12 July 5pm. Final poster due Tuesday 2 August 5pm.	1, 2, 4
4. Final Examination	20%	Examination period at the end of term.	1, 2, 3, 4

Assessment 1: Online 1 hour quiz in weeks 2-5, 7-10

Start date: 10/06/2022 04:00 PM

Assessment length: 1 hour

Submission notes: via Moodle

Due date: Friday 4-5pm in weeks 2, 3, 4, 5, 7, 8, 9, 10,

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

There are eight (8) Moodle quizzes. The duration of each quiz is 1 hour. The quizzes will be held on Friday from 4-5pm in weeks 2, 3, 4, 5, 7, 8, 9, 10.

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

The quizzes are marked online.

There is no special consideration for the quizzes. If you miss a quiz, you will not receive a mark for that quiz.

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

This is not a Turnitin assignment

Assessment 2: Labs

Assessment length: Refer to the handout for each lab.

Submission notes: via Moodle

Due date: Lab 1 report is due Tuesday 28 June 5pm. Lab 2 report is due Tuesday 19 July 5pm.

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.

The labs are to be conducted individually.

A marking rubric will be provided for each lab.

Each lab is worth 10%. Lab 1 is due Tuesday 28 June 5pm. Lab 2 is due Tuesday 19 July 5pm.

Marks for each lab will be returned within 2 weeks of the due date.

The UNSW standard late policy applies. Please refer to the Late Policy in this course outline.

This assignment is submitted through Turnitin and students do not see Turnitin similarity reports.

Assessment 3: Assignment

Submission notes: via Moodle

Due date: Preliminary poster due Tuesday 12 July 5pm. Final poster due Tuesday 2 August 5pm.

The assignment is the numerical design of a muffler.

The assessment has two parts. A preliminary poster worth 5% is due in week 7. The final poster worth 15% is due in week 10.

The assignment is an individual assessment.

A marking rubric will be provided for the assignment.

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

The UNSW standard late policy applies. Please refer to the Late Policy in this course outline.

This is not a Turnitin assignment

Assessment 4: Final Examination

Assessment length: 2 hours

Submission notes: via Moodle

Due date: Examination period at the end of term.

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.

The final exam is an individual exam.

The final exam will be marked online.

This is not a Turnitin assignment

Attendance Requirements

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

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
O-Week: 23 May - 27 May		
Week 1: 30 May - 3 June	Lecture	Monday 30 May, 10am-12pm on Teams Unit 1 - Introduction to acoustics: noise and sound, pure tones, decibel scales, frequency analysis, loudness of sound, weighting networks
	Workshop	Friday 3 June, 11am-1pm in the Rex Vowels Theatre Friday 3 June, 1pm-3pm on Teams
Week 2: 6 June - 10 June	Lecture	Monday 6 June, 10am-12pm on Teams 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	Friday 10 June, 11am-1pm in the Rex Vowels Theatre Friday 10 June, 1pm-3pm on Teams
	Online Activity	Quiz 1 Friday 10 June, 4pm-5pm in Moodle
Week 3: 13 June - 17 June	Lecture	Monday 13 June, NO LECTURE (Queen's Birthday) Unit 3 - Sound sources, sound fields, semi-reverberant field techniques, sound in large spaces, absorption, reverberation time
	Workshop	Friday 17 June, 11am-1pm in the Rex Vowels Theatre

		Friday 17 June, 1pm-3pm on Teams
	Online Activity	Quiz 2 Friday 17 June, 4pm-5pm in Moodle
Week 4: 20 June - 24 June	Lecture	Monday 20 June, 10am-12pm on Teams Unit 4 - Measurement of sound power
	Workshop	Friday 24 June, 11am-1pm in the Rex Vowels Theatre Friday 24 June, 1pm-3pm on Teams
	Online Activity	Quiz 3 Friday 24 June, 4pm-5pm in Moodle
Week 5: 27 June - 1 July	Lecture	Monday 27 June, 10am-12pm on Teams Unit 5 - Effects of noise on people: human ear, loudness, weighted sound levels, masking, sound rating, hearing loss
	Workshop	Friday 1 July, 11am-1pm in the Rex Vowels Theatre Friday 1 July, 1pm-3pm on Teams
	Online Activity	Quiz 4 Friday 1 July, 4pm-5pm in Moodle
Week 6: 4 July - 8 July		Term break
Week 7: 11 July - 15 July	Lecture	Monday 11 July, 10am-12pm on Teams Unit 6 - One dimensional plane acoustic waves: wave equation, standing waves, acoustic energy
	Workshop	Friday 15 July, 11am-1pm in the Rex Vowels Theatre Friday 15 July, 1pm-3pm on Teams
	Online Activity	Quiz 5 Friday 15 July, 4pm-5pm in Moodle
Week 8: 18 July - 22 July	Lecture	Monday 18 July, 10am-12pm on Teams Unit 7 - Applications of the wave equation: transmission between media, transmission

		through a wall
	Workshop	Friday 22 July, 11am-1pm in the Rex Vowels Theatre Friday 22 July, 1pm-3pm on Teams
	Online Activity	Quiz 6 Friday 22 July, 4pm-5pm in Moodle
Week 9: 25 July - 29 July	Lecture	Monday 25 July, 10am-12pm on Teams Unit 8 - Applications of the wave equation: transmission in pipes
	Workshop	Friday 29 July, 11am-1pm in the Rex Vowels Theatre Friday 29 July, 1pm-3pm on Teams
	Online Activity	Quiz 7 Friday 29 July, 4pm-5pm in Moodle
Week 10: 1 August - 5 August	Workshop	Friday 5 August, 11am-1pm in the Rex Vowels Theatre Friday 5 August, 1pm-3pm on Teams
	Online Activity	Quiz 8 Friday 5 August, 4pm-5pm in Moodle

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/l/team/19%3a07123fa00cfd43e7805ff6cfe109f1f%40thread.tacv2/conversations?groupId=487e4fd1-e70e-4589-99b1-40b117b45f3b&tenantId=3ff6cfa4-e715-48db-b8e1-0867b9f9fba3>

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.

Submission of Assessment Tasks

Assessment submission and marking criteria

Should the course have any non-electronic assessment submission, these should have a standard School cover sheet.

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Late policy

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 example:

- Your course has an assessment task worth a total of 100 marks.
- You submit the assessment 2 days (or part thereof) late (i.e. from 24-48 hours after the deadline).
- The submission is graded and awarded a mark of 65/100.
- A late penalty of 10 marks is deducted from your awarded mark (2 days @ 5% of 100 marks).
- Your adjusted final score is 55/100.

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

1. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
2. Online quizzes where answers are released to students on completion, or
3. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
4. Pass/Fail assessment tasks.

Examinations

You must be available for all quizzes, tests and examinations. For courses that have final examinations,

these are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for Provisional Examination timetable publish dates. For further information on exams, please see the [Exams](#) webpage.

Special Consideration

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 submitting an assessment or sitting an exam.

UNSW now has a [Fit to Sit / Submit rule](#), which means that if you attempt an exam or submit a piece of assessment, 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](#).

Please note that students will **not** be required to provide **any** documentary evidence to support absences from any classes missed **because of COVID-19 public health measures such as isolation**. UNSW will **not** be insisting on medical certificates from anyone deemed to be a positive case, or when they have recovered. Such certificates are difficult to obtain and put an unnecessary strain on students and medical staff.

Applications for special consideration **will** be required for assessment and participation absences – but no documentary evidence **for COVID-19 illness or isolation** will be required.

Special Consideration Outcomes

Assessments have default Special Consideration outcomes. The default outcome for the assessment will be advised when you apply for Special Consideration. Below is the list of possible outcomes:

Outcome	Explanation	Example
Time extension	Student provided more time to submit the assessment	e.g. 1 more week of time granted to submit a report
Supplementary assessment	Student provided an alternate assessment at a later date/time	e.g. a supplementary exam is scheduled during the supplementary exam period of the term
Substitute item	The mark for the missed assessment is substituted with the mark of another assessment	e.g. mark for Quiz 1 applied also applied as mark for Quiz 2, meaning if a student achieved a mark of 20/30 for Quiz 1 and was granted Special Consideration for Quiz 2, a mark of 20/30 would be applied for Quiz 2, etc
Exemption	All course marks are recalculated excluding this assessment and its weighting	e.g. The course has an assessment structure of: - Assignments 30%, - Lab report 30%, - Final Exam 40%. If the Lab report is missed and student is granted Special Consideration, then the assessment structure may be reweighted as follows: - Assignments 50% - Final Exam 50% as though the Lab report did not exist
Non-standard	Course Coordinator is contacted for the outcome when special consideration is granted as the outcome differs on a case-by-case basis	e.g. typical for group assessments where time extension supplementary assessment could be granted to the group member, time extension could be granted to the whole group, etc. Clarify with your Course Convenor for

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. 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.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

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) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Academic Information

Credit points

Course credit is calculated in Units-Of-Credit (UOC). The normal workload expectation for one UOC is approximately 25 hours per term. This includes class contact hours, private study, other learning activities, preparation and time spent on all assessable work.

Most coursework courses at UNSW are 6 UOC and involve an estimated 150 hours to complete, for both regular and intensive terms. Each course includes a prescribed number of hours per week (h/w) of scheduled face-to-face and/or online contact. Any additional time beyond the prescribed contact hours should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

Guidelines

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](#)

Note: This course outline sets out 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 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 (as updated in Moodle), the description in the Course Outline/Moodle applies.

Image Credit

Photo by Stephen Blake March 2017, Willis Annexe (J18) Thermofluids lab

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	✓
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	✓
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	✓
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in professional and lay domains	
PE3.3 Creative, innovative and pro-active demeanour	
PE3.4 Professional use and management of information	
PE3.5 Orderly management of self, and professional conduct	
PE3.6 Effective team membership and team leadership	