UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Term 2 2019

MECH9325

FUNDAMENTALS OF ACOUSTICS AND NOISE

Contents

1. Staff contact details

Contact details and consultation times for course convenor

Name: Dr Kana Kanapathipillai
Office location: Room 408J, Ainsworth Building J17, Level 4
Tel: (02) 9385 4251
Email: s.kanapathipillai@unsw.edu.au
Moodle: https://moodle.telt.unsw.edu.au/login/index.php
Consultation time: Thursday 4-5pm (face-to-face)

Contact details and consultation times for additional lecturers/demonstrators/lab staff

Mr Gyani Shankar Sharma
Email: gyanishankar.sharma@unsw.edu.au
Consultation times: Face to face consultation times can be arranged through email

Please see the course Moodle.

2. Important links

- Moodle
- Lab Access
- Computing Facilities
- Student Resources
- Course Outlines
- Engineering Student Support Services Centre
- Makerspace
- UNSW Timetable
- UNSW Handbook
- UNSW Mechanical and Manufacturing Engineering

3. Course details

Credit points

This is a 6 unit-of-credit (UoC) course and involves 3 hours per week (h/w) of face-to-face contact.

The normal workload expectations of a student are approximately 25 hours per term for each UOC, including class contact hours, other learning activities, preparation and time spent on all assessable work.

You should aim to spend about 9 h/w on this course. The additional time should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

Contact hours

	Day	Time	Location
Lectures	Tuesday	12noon - 2pm	Ainsworth G03
(Web stream)	Any	Any	Moodle
Demonstrations	Thursday	4pm – 5pm	Webster Theatre B
	Thursday	4pm – 5pm	Colombo Theatre B
Lab	Wednesday	See class schedule	UTL
	Thursday	See class schedule	UTL
	Friday	See class schedule	UTL
Class Test (Week 7)	Monday	6pm – 8pm	Sir John Clancy Auditorium

Please refer to your class timetable for the learning activities you are enrolled in and attend only those classes.

Summary and Aims of the course

This course will focus on the fundamental concepts and measurement of sound. It begins with the development of the acoustic plane wave equation and introduction of important parameters including acoustics pressure, acoustic impedance, characteristic impedance, acoustic energy density, acoustic intensity and acoustic power. The decibel scales and octave band frequency scales for noise are described. In this course, the effect of noise on people and acceptable limits for industrial and community noise are identified. Transmission phenomena including transmission of plane waves between different media, through walls and along pipes are investigated. This includes the basic analysis of expansion chamber mufflers and pipe side-branches. A basic energy approach to room acoustics is derived. This course is intended to provide an introduction to acoustics and noise. It constitutes a self-contained and practically useful body of knowledge in the field of acoustics. Important matters such as the measurement of sound and the effect of noise on people are considered. It is of particular value to students who are undertaking noise and vibration thesis projects. A laboratory component is included in this course.

Student learning outcomes

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

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

Learning Outcome	EA Stage 1 Competencies
Describe the basic features of sound and noise including cause of sound, pure tones, decibel scales, loudness, and Australian standards for occupational noise management.	1.1, 1.2, 1.3, 1.5, 1.6, 2.1, 2.2
Perform elementary frequency analyses to determine how the strengths of the components of the sound pressure are distributed as a function of frequency.	1.1, 1.2, 1.3, 1.5, 1.6, 2.1, 2.2
Calculate the sound power of a source based on octave band sound pressure levels and reverberation times.	1.1, 1.2, 1.3, 2.1, 2.2
Calculate the sound transmission loss through a barrier and for various arrangements of an expansion chamber reactive muffler.	1.1, 1.2, 1.3, 2.1, 2.2

4. Teaching strategies

Lectures in the course are designed to cover the core concepts and background theory in acoustics and noise. The assessment is divided into a range of activities to reinforce the lecture material. Topics covered by this course are separated into ten units. A range of texts in acoustics were used to develop the lecture material. The lecture material is available to students electronically before each class via the UNSW online learning management system (Moodle). The lecture material will be delivered using PowerPoint or PDF notes. Non-assessed exercises are embedded within each unit to reinforce the lecture material. Students are required to work through these exercises during the class and also during their own personal study time. Solutions to the exercises for a given unit are uploaded to Moodle two weeks after the lecture for that unit.

5. Course schedule

Week	Topic	Location	Suggested Readings
Week 1	Unit 1	Ainsworth G03	Introduction to acoustics: noise and sound, pure tones, decibel scales, frequency analysis, loudness of sound, weighting networks
Week 2	Unit 2	Ainsworth G03	One dimensional plane acoustic waves: wave equation, standing waves, acoustic energy
Week 3	Unit 3	Ainsworth G03	Measurement and analysis of sound pressures: sound level meters, microphones

Week	Topic	Location	Suggested Readings
Week 4	Unit 4	Ainsworth G03	Frequency analysis, frequency bands, decibel scales, descriptors for time varying noise levels
Week 5	Unit 5	Ainsworth G03	Effects of noise on people: human ear, loudness, weighted sound levels, masking, sound rating, hearing loss
Week 6	Unit 6	Ainsworth G03	Sound sources, sound fields, semi-reverberant field techniques, sound in large spaces, absorption, reverberation time
Week 7	Unit 7	Ainsworth G03	Measurement of sound power
Week 8	Unit 8	Ainsworth G03	Applications of the wave equation: transmission between media, transmission through a wall
Week 9	Unit 9	Ainsworth G03	Applications of the wave equation: transmission in pipes
Week 10		Ainsworth G03	Industry Guest Lecture

6. Assessment

Assessment overview

Assessment	Group Project? (# Students per group)	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Group assignment and Labs (2)	Yes (10)/No	1500 words approximately	30% (3x10%)	1, 2,3	Unit 1 – 3 for assignment, Unit 1 - 4 for Lab 1; Unit 1, 2, 6, & 7 for Lab 2	Midnight, Friday 28th June for Assignment , 19th July for Lab 1 and 2nd August via Moodle	Midnight, Friday 5th July for Assignment, 26th July for Lb 1 and 9th August for Lab1	Two weeks after submission
Weekly on line Quizzes (10)	No	10 multiple choice	10%	1,2,3,4	Unit 1 - 9	Please see Moodle page for due dates	N/A	immediate
Test	No	2 hours	30%	1, 2,3	Unit 1- 5	Week 7 6pm – 8pm	N/A	2 weeks after the Test
Final exam	No	2 hours	30%	1, 2 and 3	All course contents from weeks 1-10 inclusive.	Exam period, date TBC	N/A	Upon release of final results

Assignments

The assignment is a group-based assessment, and the tasks will be placed on Moodle at least two weeks prior to the due date and an announcement for each assessment task will be made in Moodle and emailed to all students. The assessment tasks will also be announced in class.

Assignments including lab reports should be submitted through the Moodle drop box by midnight on the due dates.

Presentation

All non-electric submissions should have a standard School cover sheet which is available from this course's Moodle page.

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.

Submission

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) 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.

Work submitted after the 'deadline for absolute fail' is not 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 are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

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

Marking

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.

Examinations

The final examination for this course will be a 2-hour open book exam that is worth 30% of the course mark. As an open book examination, you may bring in text books and lecture material to the examination.

You must be available for all tests and examinations. Final examinations for each course 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.

Calculators

You will need to provide your own calculator of a make and model approved by UNSW for the examinations. The list of approved calculators is available at student.unsw.edu.au/exam-approved-calculators-and-computers

It is your responsibility to ensure that your calculator is of an approved make and model, and to obtain an "Approved" sticker for it from the Engineering Student Supper Services Centre prior to the examination. Calculators not bearing an "Approved" sticker will not be allowed into the examination room.

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 submitting an assessment or sitting an exam.

Please note that UNSW now has a Fit to Sit / Submit rule, which means that if you sit 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.

7. Expected resources for students

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.

UNSW Library website: https://www.library.unsw.edu.au/
Moodle: https://moodle.telt.unsw.edu.au/login/index.php
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Moodle: https://moodle.telt.unsw.edu.au/login/index.php

8. Course evaluation and development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

In this course, recent improvements resulting from student feedback include providing more practical examples and demonstration of complex concepts.

9. 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

10. Administrative matters and links

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

- Attendance
- UNSW Email Address
- Computing Facilities
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism
- Student Equity and Disabilities Unit
- Health and Safety
- Lab Access

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex 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
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (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