UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Semester 1 2018

MECH9325

FUNDAMENTALS OF ACOUSTICS AND NOISE

Contents

1. Staff contact details

Contact details and consultation times for course convenor

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Consultation time: Thursday 4-5pm (face-to-face)

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

Dr Noel Hanna
Email: n.hanna@unsw.edu.au
Consultation times: Face to face consultation times can be arranged through email

Mr Nicholas Gilmore
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Mr Gyani Shankar Sharma
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Consultation times: Face to face consultation times can be arranged through email

Please see the course Moodle.

2. Important links

- Moodle
- UNSW Mechanical and Manufacturing Engineering
- Course Outlines
- Student intranet
- UNSW Mechanical and Manufacturing Engineering Facebook
- UNSW Handbook

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 UNSW website states “The normal workload expectations of a student are approximately 25 hours per semester for each UoC, including class contact hours, other learning activities, preparation and time spent on all assessable work. Thus, for a full-time

enrolled student, the normal workload, averaged across the 16 weeks of teaching, study and examination periods, is about 37.5 hours per week."

This means that 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	Thursday	2pm - 4pm	Mathews Theatre B
Demonstrations	Thursday	4pm - 5pm	Mathews Theatre B/C Civil Engineering G1
Lab	Monday (Week 6 & 10)	1 hour between 9am and 5 pm	UTL
	Tuesday (Week 6 & 10)	1 hour between 9am and 5 pm	UTL

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
1.	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
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
3.	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
4.	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 the online learning management system two weeks after the lecture for that unit.

5. Course schedule

Date	Topic	Location	Lecture Content
1/3/18 Week 1	Unit 1	Mathews B	Introduction to acoustics: noise and sound, pure tones, decibel scales, frequency analysis, loudness of sound, weighting networks
8/3/18 Week 2	Unit 2	Mathews B	One dimensional plane acoustic waves: wave equation, standing waves, acoustic energy
15/3/18 Week 3	Unit 3	Mathews B	Measurement and analysis of sound pressures: sound level meters, microphones
22/3/18 Week 4	Unit 4	Mathews B	Frequency analysis, frequency bands, decibel scales, descriptors for time varying noise levels
29/3/18 Week 5	Unit 5	Mathews B	Effects of noise on people: human ear, loudness, weighted sound levels, masking, sound rating, hearing loss
9/4/18 Week 6		Willis Annexe UTL	Laboratory 1
19/4/18 Week 7	Unit 6	Mathews B	Sound sources, sound fields, semi-reverberant field techniques, sound in large spaces, absorption, reverberation time
26/4/18 Week 8	Unit 7	Mathews B	Measurement of sound power
3/5/18 Week 9	Unit 8	Mathews B	Applications of the wave equation: transmission between media, transmission through a wall
7/5/18 Week 10		Willis Annexe UTL	Laboratory 2
17/5/18 Week 11	Unit 9	Mathews B	Applications of the wave equation: transmission in pipes
24/5/18 Week 12		Mathews B	Industry Guest Lecture

31/5/18 Week 13		Mathews B	Guest Lecture - Application of computational techniques in acoustics

6. Assessment

Assessment overview

Assessment	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date and submission requirements	Deadline for absolute fail	Marks returned
Assignment (Group-based) and Labs(2)	Approximately 1500 words each	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, Wednesday 21st March for Assignment, 25th April for Lab 1 & 23th May for Lab 2 via Moodle	Midnight Sunday 28th March for Assignment, 2nd May for Lab 1& 30 May for Lab 2	Two weeks after submission
Test	2 hours	30%	1, 2, 3	Unit 1 - 4	Week 6 Thursday 2pm	N/A	2 weeks after the Test
Weekly online Quizzes (10)	30 minutes	10%	1, 2, 3, 4	Unit 1 - 12	Please see Moodle page for due dates	N/A	immediate
Final exam	2 hours	30%	1, 2, 3, 4	All course content from weeks 1-12 inclusive.	Exam period, date TBC	N/A	Upon release of final results

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.

Assignments

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

Late submissions will be penalised 5 marks per calendar day (including weekends). An extension may only be granted in exceptional circumstances. Special consideration for assessment tasks must be processed through student.unsw.edu.au/special-consideration.

It is always worth submitting late assessment tasks when possible. Completion of the work, even late, may be taken into account in cases of special consideration.

Where there is no special consideration granted, the 'deadline for absolute fail' in the table above indicates the time after which a submitted assignment will not be marked, and will achieve a score of zero for the purpose of determining overall grade in the course.

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, which are June for Semester 1 and November for Semester 2.

Provisional Examination timetables are generally published on myUNSW in May for Semester 1 and September for Semester 2

For further information on exams, please see the Exams section on the intranet.

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 shown 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 School Office or the Engineering Student Centre prior to the examination. Calculators not bearing an "Approved" sticker will not be allowed into the examination room.

Special consideration and supplementary assessment

For details of applying for special consideration and conditions for the award of supplementary assessment, see the School intranet, and the information on UNSW's Special Consideration page.

7. Attendance

You are required to attend a minimum of 80% of all classes, including lectures, labs and seminars. It is possible to fail the course if your total absences equal to more than 20% of the required attendance. Please see the School intranet and the UNSW attendance page for more information.

8. 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

9. 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 online recorded lecture notes and online weekly quizzes.

10. 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: 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

Further information on School policy and procedures in the event of plagiarism is available on the intranet.

11. Administrative matters and links

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

- Attendance, Participation and Class Etiquette
- UNSW Email Address
- Computing Facilities
- Assessment Matters (including guidelines for assignments, exams and special consideration)
- Academic Honesty and Plagiarism
- Student Equity and Disabilities Unit
- Health and Safety
- Student Support Services

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