--- Syllabus ---

MECH 405: Acoustics and Noise Control

1. Overview

MECH 405 is a fourth-year technical-elective introduction to the field of engineering acoustics and noise control, offered by way of lectures and experimental sessions. It shares these with MECH 543 with which it is cross-listed. MECH 543 students must, in addition, do an individual project.

2. Instructor/TA

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Instructor	Murray Hodgson
Email	murray.hodgson@ubc.ca
Office	CIRS 2156
Office hours	No set hours – email for appointment
TA	Alice LAM

3. Schedule, Location

Lectures	Tues 9:30-11:00 CEME 1215	Thurs 9:30-11:00 CEME 1215
Experimental session (attend only one - mandatory)	L1A: Wed, 3:00-4:00, Location TBA	L1B: Wed, 4:00-5:00, Location TBA

4. Textbook/Course notes

There is no required textbook for this course. The instructor will provide students with four sets of custom course notes and other handouts, which are essential to the successful completion of the course. Students interested in purchasing a textbook to support the course should discuss this with the course instructor.

5. Calculation exercise sets

Analyzing noise problems analytically and performing related calculations using appropriate theoretical methods is an essential part of the course and is crucial to succeeding on course exams. To give students practice at this work, at approximately weekly intervals, they will be given sets of problems related to the current course material. These are not marked. Model solutions are provided after students have had the time to do the exercises.

6. Aims and Learning Objectives

Our overall aim of this course is to give students the conceptual, analytic, experimental and practical knowledge they require to work as acoustical engineers or to undertake graduate studies in acoustics. By the end of the course, you should be able to:

- **Conceptualize** sound and its propagation in environments
- **Describe** noise problems conceptually and **translate** into theory
- **Analyze** acoustical problems to determine the need for noise-control measures
- **Design** noise-control measures to solve basic noise problems
- **Assess** the results of acoustical measurements or calculations
- **Perform** acoustical measurements in the lab and in the field, discussing the measurement principles and results in reports submitted for marking.

7. Schedule

The approximate course schedule, of lectures, experimental sessions and midterm exams, is shown below (subject to change)

Module	Day	Class Topic	Experimental session
t1. Introduction to course and acoustics	Sep 6	No class (Imagine Day)	
	Sep 7	Course introduction	
	Sep 8	Sound waves, Fourier Theorem	
	Sep 13	Sound propagation; sound sources	
	Sept 14		Experiencing sound
	Sep 15	Acoustical parameters; decibel	
	Sep 20	Frequency analysis	
	Sep 21		Sound level meter
2. Sound and people	Sep 22	Human hearing; dBA	
	Sep 27	Hearing loss; hearing protectors	

3. Evaluating sound	Sep 28		Industrial noise survey
	Sep 29	**Occupational noise regulations**	
	Oct 4	Environmental noise; Verbal communication	
	Oct 5		Traffic noise survey
	Oct 6	Community noise, bye-laws	
4: Sound sources and waves	Oct 11	Wave theory, characteristics	
	Oct 12		Midterm exam 1
	Oct 13	Real sound sources	
	Oct 18	Transportation noise	
	Oct 19		Sound intensity measurement
	Oct 20	Free-field sound propagation; source-sound-power determination	
5. Outdoor sound	Oct 25	Outdoor sound propagation	
	Oct 26		Sound power measurement
	Oct 27	Noise control by barriers, screens	
6. Sound in ducts and pipes; HVAC noise	Nov 1	HVAC-system noise	
	Nov 2		Midterm exam 2
	Nov 3	Noise control by silencers	
7. Room acoustics	Nov 8	Introduction to sound in rooms	
	Nov 9	Diffuse-field theory	
	Nov 10	Noise control in rooms; sound absorption	
	Nov 15	Sound in real rooms; prediction model	
	Nov 16		Room acoustical measurement
	Nov 17	Sound transmission into/out of rooms	
8. Noise-control measures	Nov 22	Sound absorbing materials 1	
	Nov 23		Sound transmission measurement
	Nov 24	Sound-absorbing materials 2	
	Dec 1	Partition sound transmission 1	
	Dec 2	No class	
	Dec 3	Partition sound transmission 2	

9. Evaluation and Grading Structure

Course evaluation will involve two midterm and one final exam, and six experimental-session reports. All exams will have the same format, in three parts: single-answer questions, mini technical essay(s), calculation exercises. Even if experimental sessions are done in pairs, students must submit individual reports. The elements that contribute to the final course grade are shown below.

Item	No.	Weight
Experimental session reports	6	20%
Midterm exam 1	1	10%
Midterm exam 2	1	20%
Final exam	1	50%

Requirements to Pass

In order to pass the course, you must both:

- achieve an overall course grade of at least 50%, and
- achieve an average grade of at least 50% on the combined midterm and final exam grade (each weighted as shown above).