--- Syllabus ---

MECH 543: Acoustics and Noise Control

1. Overview

MECH 435 is a graduate-level introduction to the field of engineering acoustics and noise control, offered by way of lectures and experimental sessions. It shares these with MECH 405 with which it is cross-listed. MECH 543 students must, in addition, do an individual project.

2. Instructor/TA

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	Thurs 9:30-11:00	
	CEME 1215	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.

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
- Apply the conceptual, theoretical and experimental knowledge gained in the lectures and experimental sessions to execute an individual course project

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
Introduction to course and acoustics	Sep 6	No class (Imagine Day)	
	Sep 7	Course introduction	
	Sep 8	Sound wave, Fourier Theorem	
	Sep 13	Sound propagation; sound sources	
	Sept 14		Experiencing sound
	Sep 15	Acoustical parameters; the decibel	
	Sep 20	Frequency analysis	
	Sep 21		Sound level meter

2. Sound and	Sep 22	Human hearing, dBA		
people	Sep 27	Hearing loss; hearing protectors		
3. Evaluating sound	Sep 28		Industrial noise survey	
	Sep 29	Occupational noise regulations		
	Oct 4	Environmental noise; Articulation Index		
	Oct 5		Traffic noise survey	
	Oct 6	Community noise, bye-laws		
	Oct 11	Wave theory, characteristics		
	Oct 12		Midterm exam 1	
4: Sound sources	Oct 13	Real sound sources		
and waves	Oct 18	Transportation noise		
	Oct 19		Sound intensity measurement	
	Oct 20	Free-field sound propagation; source- sound-power determination		
5.0.11	Oct 25	Outdoor sound propagation		
5. Outdoor sound	Oct 26		Sound power measurement	
bound	Oct 27	Noise control by barriers, screens		
6. Sound in	Nov 1	HVAC-system noise		
ducts and pipes;	Nov 2		Midterm exam 2	
HVAC noise	Nov 3	Noise control by silencers		
	Nov 8	Introduction to sound in rooms		
	Nov 9	Diffuse-field theory		
Room acoustics	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		
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		

8 Individual course project

Students must execute an individual course project chosen from a list provided by the course instructor at the beginning of term. Students with their own ideas for projects should discuss their suitability with the course instructor. Course project apply experimental and/or theoretical methods to achieve the project's objectives. A final report on the project work is prepared and submitted for marking. Following is a list of recent projects:

- Scale-model investigation of the optimal baffle configuration in an open-plan office
- Measuring the speech intelligibility of ESL students by listening tests
- Spherical decoupling measurement of surface absorption in reverberant environments and application to suspended acoustical ceilings
- Optimal choice of parameters of the Attenborough model for predicting the desired sound absorption of materials

9 Evaluation and Grading Structure

Course evaluation will involve two midterm and one final exam, six experimental-session reports and the final course-project report. 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		Weight
Experimental session reports	6	10%
Course project	1	30%
Midterm exam 1	1	10%
Midterm exam 2	1	10%
Final exam	1	40%

Requirements to Pass

In order to pass the course, you must both:

- achieve an overall course grade of at least 60%, and
- achieve an average grade of at least 50% on the combined midterm and final exam grade (each weighted as shown above).