

MECHANICAL ENGINEERING PROGRAM

ABET COURSE SYLLABUS

ME 434 - Noise Control (3 credits): Elective Course

Course Description (2008-2010 Catalog):

Development and solution of one-dimensional wave equation for propagation of sound in air; one-dimensional plane and spherical sound waves; sound transmission phenomena; sound in enclosed spaces; sound propagation outdoors; and human responses to noise.

Prerequisite Course: MATH 431 and junior or senior standing

Prerequisite by Topic:

- **Mathematics for Engineers and Scientists I**

Textbook: Engineering Principles of Acoustics and Noise Control, Reynolds, Trafford Publishing

Other Reference Material: N/A

Course Coordinator: Douglas Reynolds, Professor

Course Learning Outcomes:

- (a) Have an understanding of physics associated with the propagation of sound in air, the physical variables used to describe this propagation, and some of the factors associated with human response to sound.
- (b) Have an understanding of the engineering guidelines associated with specifying the acoustic acceptability of indoor spaces based on their intended use and determining the acceptability or unacceptability of outdoor environmental noise based on government regulations.
- (c) Have an understanding of how to analyze the acoustic properties of small rooms, auditoria, and worship spaces.
- (d) Have an understanding of the physical characteristics of solid barriers and walls that enable them to effectively attenuate sound that is transmitted from one interior space in a building into another interior space.
- (e) Gain insights in to how to design indoor spaces so that they have acoustic characteristics that are compatible with their intended uses.

Relationship of Course to Mechanical Engineering Program Outcomes:

Educational Objective 1: Provide mechanical engineering graduates with technical capabilities.					Educational Objective 2: Prepare the mechanical engineering graduates to have effective workplace skills.				Educational Objective 3: Instilling a sense of responsibility as a professional member of society.			
1.a	1.b	1.c	1.d	1.e	2.a	2.b	2.c	2.d	3.a	3.b	3.c	3.d
H	H	M	M	H				M			L	

(L)ow (M)edium (H)igh

Topics Covered:

1. Acoustics, reasons for studying acoustics, sound and types of sound
2. Transmission of sound, source-path-receiver, analysis of sound
3. Development of the one-dimensional wave equation
4. General expression for one-dimensional sound waves
5. Solution to the wave equation - standing waves
6. One-dimensional spherical sound waves
7. Sound pressure, sound intensity, sound energy density, sound power
8. Levels, additive effects of sound sources
9. Effects of reflecting surfaces
10. Weighted sound levels, band sound levels, spectrum sound levels
11. General description and characteristics of the ear
12. Loudness calculations from sound measurements
13. Masking and speech interference
14. Speech intelligibility
15. Indoor noise criteria
16. Outdoor noise criteria, community reaction to sound, environmental noise criteria
17. Industrial noise regulations
18. Sound fields and design criteria in small rectangularly shaped rooms
19. Room equation for an ideal room
20. Room equation for real rooms
21. Reverberation time equations
22. Ray acoustics
23. Auditorium and worship space design
24. Sound transmission from one medium to another
25. Interaction of plan sound waves with a normally reacting surface
26. Sound transmission through thin massive panels
27. Sound transmission through a wall separating two rooms
28. STC rating of wall and floor/ceiling systems, IIC ratings of floor/ceiling systems
29. Field measurements of airborne sound insulation in buildings
30. Acoustical leaks and flanking sound transmission

Laboratory Projects: None

Class/Laboratory Schedule: 75 minute lecture two sessions per week

Assessment of Student Progress toward Course Objectives:

Take-home problem exercise, two laboratory exercises, design project

Class/Laboratory Schedule: MW 10:00-11:15 am (Spring Semester)

Contribution of Course for meeting Professional Component:

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| (a) Mathematics and basic sciences: | 2 credit |
| (b) Engineering Topics (Design/Science): | 1 credit |
| (c) General Education: | 0 credit |
| (d) Others: | 0 credits |

Prepared by:

Douglas Reynolds

Date:

December 16, 2009