

## **ME/AE 4760 Engineering Acoustics and Noise Control (Elective)**

**Catalog Description:** ME/AE 4760 Engineering Acoustics and Noise Control (3-0-3)

Prerequisites: Math 2403 Differential Equations

Crosslisted with AE and ME.

Study of acoustics related to noise and its control; acoustic terminology, wave propagation, wave equation solutions, instrumentation, data processing, room acoustics, noise control, hearing, noise legislation.

**Textbook:** Colin Hansen, *Noise Control: From concept to application*, Taylor and Francis, 2005.

**References:** Lawrence E. Kinsler, Austin R. Frey, Alan B. Coppens, and James V. Sanders, *Fundamentals of Acoustics*, 4th Edition, John Wiley and Sons, 2000.

### **Topics Covered:**

1. Introduction, scope of acoustics
2. Fundamentals of acoustics
3. Criteria, hearing, and hearing conservation
4. Sound generation and propagation
5. Noise control
6. Instrumentation

### **Course Outcomes:**

Outcome 1: To teach students the basic principles of acoustics.

- 1.1 Students will demonstrate knowledge of the fundamental assumptions related to the derivation of the wave equation.
- 1.2 Students will demonstrate knowledge of 1-D and 3-D solutions to the wave equation.
- 1.3 Students will demonstrate the ability to represent acoustic parameters in terms of decibel levels for pressure, power, intensity, impedance, equivalent level descriptors, and statistical level descriptors.

Outcome 2: To teach the students the use and application of acoustic analysis instruments.

- 2.1 Students will demonstrate knowledge of the basic instruments used to experimentally characterize acoustics fields.
- 2.2 Students will demonstrate knowledge of digital signal processing and related issues.

Outcome 3: To provide students an introductory exposure to noise control.

- 3.1 Students will demonstrate the ability to characterize treatment effectiveness in terms of insertion loss.
- 3.2 Students will demonstrate knowledge of rating systems and representations for noise control treatments.
- 3.3 Students will demonstrate the ability to select or design simple barrier and enclosure type noise control treatments given performance criteria.

Outcome 4: To make students aware of the human and regulatory issues related to noise exposure.

- 4.1 Students will demonstrate knowledge of the mechanism of human hearing and of noise-induced hearing damage.
- 4.2 Students will demonstrate the ability to assess the legality of a noise exposure history under OSHA regulations.
- 4.3 Students will demonstrate the ability to assess the suitability of a given noise environment to accepted usage practices.

**Correlation between Course Outcomes and Student Outcomes:**

<b>ME 4760</b>											
	<b>Mechanical Engineering Student Outcomes</b>										
<b>Course Outcomes</b>	<b>a</b>	<b>b</b>	<b>c</b>	<b>d</b>	<b>e</b>	<b>f</b>	<b>g</b>	<b>h</b>	<b>i</b>	<b>j</b>	<b>k</b>
Course Outcome 1.1	X		X		X						
Course Outcome 1.2	X				X						
Course Outcome 1.3	X										X
Course Outcome 2.1	X	X							X		X
Course Outcome 2.2	X									X	X
Course Outcome 3.1	X		X		X						X
Course Outcome 3.2	X								X		X
Course Outcome 3.3	X		X		X			X	X	X	X
Course Outcome 4.1	X							X	X	X	X
Course Outcome 4.2	X					X		X	X	X	X
Course Outcome 4.3	X				X	X		X	X	X	X

**GWV School of Mechanical Engineering Student Outcomes:**

- (a) an ability to apply knowledge of mathematics, science and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice