Course Outcomes  [Related ME Program Outcomes in brackets]

1. Provide a basic understanding of fundamental concepts in Engineering Noise Control.  [A2, A3]
2. Apply these concepts to the solution of practical problems.  [A2, A3, A5, A7]
3. Provide means to identify and correct potentially hazardous sound levels in the workplace.  [[A1, B1, C3]
4. Teach sound and vibration measurement techniques.  [A2, A3]
5. Develop problem solving, reporting, communications, and team working skills.  [A3, A7, B2, B3]

Analysis and design of mufflers/silencers

1. Sound transmission through an expansion chamber in a long pipe
2. Acoustic performance of mufflers/silencers: insertion loss, transmission loss and noise reduction

Fundamentals of Acoustics

1. Simple harmonic motion
2. Wave equation
3. Energy variables
4. Solution of 1-d wave equation: fluctuating pressure and density; particle velocity
5. Sound pressure, sound intensity and sound power levels
6. Decibels
7. Concept of spherical waves
8. Resonance
9. Duct acoustics - standing waves vs. traveling wave

Techniques of sound measurements

1. Introduction to digital Fourier analysis
2. Octave band analysis
3. Noise metrics: Leq, LDN, L10, L90, SEL, Lmax, Lmin
4. Sound level meters, microphones, accelerometers, tape recorders
5. Standing wave apparatus: acoustical characterization of sound absorption materials

Evaluation of noise impacts

1. Commonly used noise scales and indices
2. Metrics for assessment of environmental noise
3. Metrics for assessment of industrial noise
4. Case study: Boston Central Artery/ Tunnel project

Control of noise at workplace

1. Control of machinery noise
2. Control of flow noise
3. Basic principles of vibration isolation
4. Sound transmission through panels: resonant frequency and co-incidence frequency
5. Sound insulation by enclosures

Human Response to noise

1. Anatomy and operation of human ears
2. Threshold of hearing; equal loudness contours – MAP and MAF
3. Noise induced hearing loss
4. Speech interference and sound quality
5. Perceived noise level (PNL) and EPNL

Regulations

1. Noise regulating agencies
2. OSHA noise regulations
3. Other regulations for control of environmental noise

Understanding Noise Control - Course Outcomes
1. **COURSE NUMBER AND NAME:** ME 41300 Noise Control

2. **CREDITS AND CONTACT HOURS:** 3 credits
   - a. Lecture – 3 days per week at 50 minutes for 16 weeks

3. **COURSE COORDINATOR OR INSTRUCTOR:**
   - K.M. Li

4. **TEXTBOOK:**
   - Leo Beranek, *Noise & Vibration Control*, INCE

5. **SPECIFIC COURSE INFORMATION:**
   - Machinery noise: gear, bearing, fan, compressor, heating and ventilation system noise, automobile and aircraft noise.
   - Community reaction. Legal aspects. Design-oriented semester projects. Typically offered in the spring.
   - b. **Prerequisites:**
     - Differential Equations and Basic Physics
   - c. **Status:** Elective

6. **SPECIFIC GOALS FOR THE COURSE:**
   - a. **Course Outcomes**
     - [Related ME Program Outcomes in brackets]
     1. Provide a basic understanding of *fundamentals concepts* in engineering noise control. [A2, A3]
     2. Apply these concepts to the solution of *practical problems*. [A2, A3, A4, A5, A7]
     3. Provide means to identify and correct potentially *hazardous sound levels* in the workplace. [A1, B1, C3]
     4. Teach sound and vibration *measurement techniques* and *computer programming skills*. [A2, A3, A4]
     5. Develop *problem solving, reporting, communications and teamwork skills*. [A3, A7, B2, B3]
   - b. **Related ME Program Outcomes:**
     - [Related ABET Outcomes Listed in Brackets]
     A1. Engineering Fundamentals;  B3. Prof/Ethical Responsibility;
     A3. Experimental Skills;  B5. Life-Long Learning;
     A4. Modern Engr Tools;  C1. Leadership,
     A5. Design Skills;  C2. Global Engineering Skills;
     A6. Impact of Engr Solns;  C3. Innovation;
     B1. Communication Skills;  C4. Entrepreneurship
     B2. Teamwork Skills

7. **LIST OF TOPICS:** See following page.