

INDUSTRIAL and ENVIRONMENTAL ACOUSTICS AND VIBRATION

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Schedule: Tuesday, Thursday: 9:00-10:30 (lecture); Wednesday: 1:30-2:30 (lab)

Location: Lectures: LPC 325; Labs: LPC 325, 369 or TBA

Evaluation: Exercises 10% Assignments 15%
Lab reports 15% Term tests 20%
Final exam 40%

Course notes (**obligatory**): distributed by MH by email

Textbook (non-obligatory): Noise and Hearing Conservation Manual,
Berger et al. Eds., AIHA

Reference books:

Noise and Man, Burns (MH and Woodward)
Sound Analysis and Noise Control, Foreman (MH and Sedgwick)
Handbook of Acoustical Measurements and Noise Control, Harris (MH and Sedgwick)
Noise and Vibration Control Engineering, Beranek (MH and Sedgwick)
"Noise Control: Principles and Practice" (MH)
Shock and Vibration Handbook, Harris and Crede (MH and Main)
Handbook of Human Vibration, Griffin (MH and Woodward)
Vibration Effects of the Hand and Arm in Industry, Brammer and Taylor (Woodward)
Effects of Whole-Body Vibration, Dupuis and Zerlett (Woodward)

Reference journals:

Occupational Hygiene journals (SOEH and Woodward)
Canadian Acoustics (MH)
Noise Control Engineering Journal (MH and Main)
Applied Acoustics (MH)
Journal of the Acoustical Society of America (MH and Main)

Reference conference proceedings:

International Conference on Acoustics (MH and Main)
Inter-Noise Conference (MH and Main)
Noise-Con Conference (Main)

MECH 505 (Section 201): INDUSTRIAL & ENVIRONMENTAL ACOUSTICS & VIBRATION

Course Objective

The objective of this course is to give occupational hygiene students the basic knowledge required to measure, assess, analyze and solve noise and vibration problems in industrial situations, and to discuss such problems and their solutions with specialists in the field. Students are expected to acquire a knowledge of acoustical and vibration concepts, quantities and terminology and measurement techniques. They should achieve a basic understanding, and some hands-on experience, of the characteristics of sound waves, of the effects of sound and vibration on humans and how to mediate these effects, and of how sound propagates and is controlled. They should acquire a general understanding of measures available to control noise and vibration problems and of their cost-effectiveness. They should be capable of doing basic calculations to predict noise and vibration levels and reductions.

Course Outline

Acoustics:

- Sound waves, the decibel, frequency bands
- Hearing mechanism, response, damage, conservation
- dBA, Leq, dose, criteria, regulations
- Sound propagation in free field, outdoors, ventilation systems
- Sound in rooms, transmission between rooms
- Sound absorbing materials, partitions, enclosures
- Infra and ultra sound

Vibration:

- Concepts and quantities
- Single degree of freedom systems
- Noise and vibration control
- Whole-body vibration
- Kinetosis (motion sickness)
- Hand-arm vibration

Measurement of sound and vibration: equipment and procedures (lab sessions)