ME 249 (JAN) 3:0 Fundamentals of Acoustics

Fundamentals of vibration, vibrations of continuous systems (strings and rods), I-D acoustic wave equation, sound waves in ducts, standing waves and travelling waves, resonances, complex notation, harmonic solutions, concept of impedance. Kirchoff-Helmholtz Integral Equation, spherical coordinates, spherical harmonics, Green function (Dirichlet and Neumann), Sommerfeld radiation condition, sound radiation from simple sources, piston in a baffle, pulsating sphere, piston in a sphere, vibrating free disc, scattering from a rigid sphere. Near field and far field, directivity of sources, wave guides (phase speed and group speed), lumped parameter modeling of acoustic systems, sound in enclosures (rectangular box and cylinders), Laplace Transforms and PDEs, 1-D Green Function, octave bands, sound power, decibels. Brief introduction to diffraction, scattering, reflection, refraction.

Instructor: V. R. Sonti

References

1. Text Book: Fundamentals of Acoustics by Lawrence E. Kinsler, Austin R. Frey, Alan B. Coppens,and James V. Sanders
2. Instructor's notes.

Pre-requisites

A reasonable mathematical background that can be expected from an engineering undergraduate degree.

Additional information

This course is open to doctoral and master's students interested in wave motion (specially sound waves).

Course objectives

After taking this course, the students will be able to:

1. Find acoustic pressure solutions in standard geometries.
2. Formulate the problem and bring it down to a final integral in non-standard geometries.

Course website: to be announced