Master Syllabus Department of Physics and Astronomy



PHYC 346 Acoustics

Course Description

Elements of pure and applied acoustics. Topics include solutions to the wave equation, acoustic impedances, electro-mechanical-acoustic analogies, direct-radiator loudspeaker and enclosure theory, and a discussion of room acoustics.

Course Objectives

The objectives of this course are to provide the student with a basic understanding of the principles of pure and applied acoustics. This includes the mathematical theory of mechanical waves and their propagation in various media. Basic principles of applied acoustics are also covered including various analogies used in analysis and design of loudspeaker systems.

Course Rationale

This intermediate level acoustics course is offered for junior/senior physics majors and other students having the necessary prerequisite. It is a one-semester, three credit hour course. It provides an overview of the mathematics of waves, wave motion, acoustic analogies and sound propagation in rooms. This course is a not a prerequisite for any other physics courses. The problem solving and critical thinking skills developed in this intermediate course are, however, very helpful for success in other advanced level physics courses in which wave and wave motion physics is involved.

This intermediate acoustics course may be an elective course for physicists, chemists, engineers, high school physical science teachers, mathematicians and computer scientists having an interest in the subject and the necessary prerequisite.

Course Content, Format, and Bibliography

Content

Introduction and Terminology

The Wave Equation and Solutions

The Wave Equation

Solutions

Energy Density and Intensity

Electro-Mechano-Acoustical Circuits

Mechanical Circuits

Acoustical Circuits

Transducers
Circuit Theorems, Energy, and Power
Radiation of Sound
Directivity Patterns
Acoustic Components
Radiation Impedances
Acoustic Elements
Direct-Radiator Loudspeakers
Basic Theory
Loudspeaker Enclosures
Simple enclosures
Bass reflex enclosures
Sound in rooms
Sound fields in small regularly shaped rooms
Sound transmission through walls
Acoustic measurements
Hearing
Measurement of acoustic levels
Reciprocity calibration of Transducers

Format

Homework, examinations and presentations

This course is taught as a dual undergraduate/graduate course. Students will be required to complete activities appropriate for the level of the course in which they are enrolled. Student performance on homework, exams and/or labs will be evaluated using different standards for undergraduate and graduate students.

Bibliography

Fundamentals of Acoustics, 4th Ed. by Kinsler, Frey, et al., Wiley & Sons, 1999.

Foundations of Engineering Acoustics by Fahy, Academic Press, 2000.

High Performance Loudspeakers, 5th Ed. by Colloms, Wiley & Sons, 1999.

www.bsu.edu/physics