Syllabus

Course Name Acoustics II

Course Number ENG ME 720

Semester Spring 2021

Course Description Wave equation in cylindrical and spherical co-ordinate systems. Propagation in waveguides. Diffraction: the Rayleigh integral and the Helmholtz-Kirchhoff integral. Green's function and angular spectrum methods. Diffraction of sound beams: Gaussian beams, unfocused and focused sources, and arrays. Diffraction by apertures, discs and wedges. Scattering of sound; Rayleigh scattering, scattering cross-section, elastic scatters. Propagation in inhomogeneous media: rays, the eikonal equation, the Blokhintzev invariant and the acoustic field near caustics. Absorption and dispersion of acoustic waves. Transmission and reflection at a fluid-solid interface.

Prerequisite ENG ME 520

Required Course Materials *Fundamentals of Acoustics*, Fourth Edition, Lawrence E. Kinsler, Austin R. Frey, Alan B. Coppens, James V. Sanders.

Required Course Software Matlab

Recommended Course Equipment 0.9 mm Pentel GraphGear 500 Automatic Drafting Pencil Gray (PG529N) with 2B lead

Lectures

- Lectures are held in PHO 202 on Mondays and Wednesdays, 2:30 p.m. – 4:15 p.m.
- Physical attendance arranged through the LfA app.
- Lectures are live broadcast on Zoom and recorded for posting on Blackboard.

Instructor Professor J. Gregory McDaniel

Instructor Email `jgm@bu.edu`

Office Hours By appointment on Zoom. To arrange an appointment, email at least two suggested times and a summary of your questions.

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Course Average The numerical course average will be an average of 10 assignments.

Course Grade The letter grade for the course will be determined from the following chart:

Percent Range	Letter Grade
92.5–100	A
90.0–92.5	A-
87.5–90.0	B+
82.5–87.5	B
80.0–82.5	B-
77.5–80.0	C+
72.5–77.5	C
70.0–72.5	C-
60.0–70.0	D
50.0–60.0	F

Grading Concerns All grading concerns must be reported to the professor within one week of returning the graded work.

Collaboration Policy on Assignments Students are allowed to discuss the assignments with each other and help each other learn. However, each student must turn in a code that they wrote. Students are not allowed to share their code in any way.

- Code may not be electronically transmitted in any format.
- Code may not be posted online.
- Code may not be printed out and given to another person.
- Code may not be visually seen by another person, either on a screen or on paper.
- Code may not be read aloud to another person.

No portion of any assignment may be posted online. If identical portions of codes are found, that will be considered a violation of the academic conduct code and referred to the university for investigation.

Lecture Topics

7.1 Radiation from a Pulsating Sphere

7.2 Acoustic Reciprocity and the Simple Source

7.3 The Continuous Line Source

7.4 Radiation from a Plane Circular Piston

7.5 Radiation Impedance

7.6 Fundamental Properties of Transducers

8.1 Introduction to Absorption and Attenuation of Sound

8.2 Absorption from Viscosity

8.3 Complex Sound Speed and Absorption

8.4 Absorption from Thermal Conduction