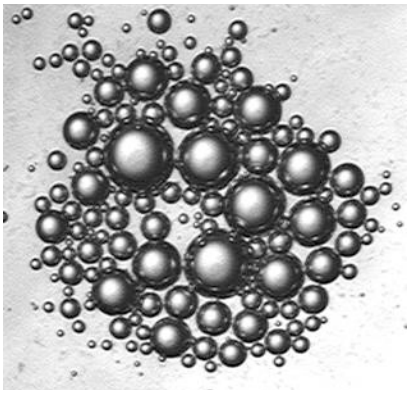
# *ME723: Waves in a Random Media: The Radiation and Scattering of Sound*



This is a special topics course covering the sound transmission and scattering in as random multiphase media. The topics covered in this course are directly related to medical diagnostic systems and ocean sciences. The scattering of bubble distributions in water and sedimentary materials will be a focus of the course. Sound scattering from rough surfaces and compact objects will be a secondary focus. The course requires a working knowledge of differential and integral calculus and is directed to those students specializing in acoustics and medical ultrasonics. The inhomogeneous wave equation will be developed with emphasis on the physical sources and scattering of sound. Physical acoustic quantities concerning wave motion, momentum and energy will be treated. Scattering from spheres and cylinders as well as from random distributions will be developed using the Born approximation. The relevance of multiple scattering will be discussed. Finally the problem of sound scattering from randomly rough surfaces will be developed with the Helmholtz-Kirchoff formulation.

## Course Topics

- Mathematical Review
- Inhomogeneous Wave Equation (Weq), Wave Motion, Energy and Momentum
- The stress and momentum tensors
- Sources and scatters of sounds
- The Greens function method and solutions to the inhomogeneous Weq
- Radiation and scattering from spheres and cylinders
- Scattering from bubbles and micro-bubble distributions in multiphase media
- Scattering from randomly rough surfaces and the Helmholtz-Kirchoff Formulation
- Correlation functions and partial coherence.

A research paper on a topic of interest to each student will be acceptable as a partial completion of the course requirements.

## Text and References

**1. Theoretical Acoustics,** P. Morse and K. Uno Ingard, McGraw Book Company
**2. Acoustics,** A. D. Pierce, Acoust. Soc. America
**3. Fundamentals of Waves and Oscillations**, K. Uno Ingard, Cambridge University Press.
**4. Selected reference material:** Materials from specialized texts and key papers will be made available to students.

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