

# MCEN GRADUATE SEMINAR

## **Bakhtier Farouk**

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### **Thermally Induced and Mechanically Generated Acoustic Waves in Gases and Supercritical Fluids: Recent Advances**

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#### **Abstract:**

The physics of the interaction of acoustic waves and the fluid medium in which they travel is a challenging problem. Pressure (acoustic) waves can be generated in a fluid either thermally or mechanically. Recent developments in the fundamental understanding of these interactions will be reviewed. Numerical investigations of the effects of thermally induced acoustic wave motion on the developing natural convection process in a compressible gas-filled square enclosure will be reviewed first. The generation and the short time behavior of thermally induced acoustic waves in an enclosure will be explored both for ideal gases and supercritical carbon dioxide. The acoustic wave induced mixing and transport in supercritical fluids are significant due to the vanishingly low thermal diffusivity of such fluids. Long time effects of these waves on the buoyancy induced flows will also be presented. The flow and heat transfer in an enclosure with a vibrating wall will be considered next. Here the acoustic field in the enclosure is explicitly computed along with the primary periodic flow field. Due to the interaction of the oscillating flow with fluid properties, steady secondary flow fields are generated in the enclosure (acoustic streaming). Both computational and experimental results will be presented which show the effects of the vibrating wall amplitude and frequency on the formation of this second order flow.

#### **Biography:**

Professor Bakhtier (Baki) Farouk received his BS degree in Mechanical Engineering from the Bangladesh University of Engineering and Technology in 1975. He received his MS and Ph.D. degrees in 1978 and 1981 respectively from the University of Delaware and thereafter joined the Mechanical Engineering and Mechanics department in Drexel University, Philadelphia, PA. His research and teaching interests include convective and radiative heat transfer, thermoacoustics, combustion and fires, transport processes in materials processing, multi-phase flows, plasma processing, microfluidics and computational fluid dynamics. He is a registered Professional Engineer and is a Fellow of the American Society of Mechanical Engineers.