2010 Mechanical Engineering
Distinguished Seminar Series

The Department of Mechanical Engineering is pleased to host

Patricia Davies, Ph.D.
Director, Ray W. Herrick Laboratories &
Professor of Mechanical Engineering
Purdue University

Predicting the Impact of Noise on People:
One Part of Perception-Based Engineering

Friday, April 23, 2010 | 2:00 pm | Pepco Seminar Room, Kim Engineering Building

Abstract: Psychoacoustics research has led to great advances in the understanding of how people perceive the level of a sound. Very accurate models of loudness have been developed that predict the loudness of both stationary sound and nonstationary sounds. The nonlinear behavior of the human auditory system including temporal and frequency masking is captured in these models. While not perfect, these models represent significant advances over weighted sound pressure levels as a means of quantifying loudness. Sound attributes other than loudness, e.g., tonalness and roughness, are also perceived and play a role in sound evaluation, such as how pleasing or annoying it is or its appropriateness in a particular setting. The goal in perception-based engineering is to develop methodologies to systematically integrate human response prediction into product design. The acoustical engineer/psycho-acoustician would develop acoustic source generation, propagation and transmission models to predict the sound that people are exposed to and then go beyond that to predict what people perceive and how they use that to make judgments about the sounds. One of the outcomes of this research is the development of more people-centric metrics that can be used to evaluate and optimize designs and to embed into controls systems. Another outcome is that by studying human perception and information processing, it may be possible to use the knowledge gained to create perceptive machines. To illustrate aspects of this research, some work on developing models of how aircraft noise affects people will be described.

Biography: Professor Davies received her B.Sc. in Mathematics from the University of Bristol in 1977, and her M.Sc. and Ph.D. in Sound and Vibration from the University of Southampton in 1981 and 1985, respectively. Her Ph.D. research was focused on time-domain modeling applied to acoustics and vibrations problems. She is currently a Professor of Mechanical Engineering at Purdue and teaches courses in measurements, controls, signal processing and mechanics. Dr. Davies is also the Director of the Ray W. Herrick Laboratories, where she conducts research in the areas of sound perception, signal processing, and nonlinear system identification. She co-founded a Perception-based Engineering research center which was formed from the collaborative research of a group of engineering and psychology professors at Purdue. Professor Davies is currently the President of the Institute of Noise Control Engineering.

Dr. Davies will be hosted by Assistant Professor Miao Yu (mmyu@umd.edu) of Mechanical Engineering.