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Acoustics laboratory experiments in the undergraduate curriculum FREE

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in our work and living environment. The promulgation of these laws extended the responsibility of engineers to include the welfare of those who operate the devices and processes they design or manage, who may be exposed to unwanted emission of health related by-products. Hence, public health and safety concerns should be fundamental to engineering education and engineering acoustics should, therefore, be a logical part of the undergraduate engineering curriculum. This paper addresses the difficulties and strategies for incorporating engineering acoustics in undergraduate curricula at a time when there exists an explosive rate of new technology, and ever increasing pressures to incorporate new course material in an already over-burdened engineering curriculm. These issues are discussed in the light of recent studies and reports which deal with engineering education, namely: (1) a report by a technical panel for the National Institute of Occupational Safety and Health (1984) which gives recommendation for improving engineering practice, education, and research as it relates to occupational safety and health; (2) a report sponsored by the National Research Council (1985) which looks at the state and future of engineering education and practice in the United States; and (3) the criteria for evaluating engineering curricula set forth by the Accreditation Board for Engineering and Technology (1985–86).

10:50

NN7. Strategies and struggles of incorporating acoustics in undergraduate curriculum. Ralph W. Plummer, Terrence J. Stobbe, and James Mogensen (Department of Industrial Engineering, West Virginia University, Morgantown, WV 26506-6101)

This paper relates the philosophy of the authors concerning the introducing of integration of basic acoustical principles into junior and senior level courses. The curriculum presents basic instruction in sound measurement, the effects of noise on human performance, and acoustical control in a junior level course and reinforces these concepts plus additional instruction in acoustics in a senior level course. The paper explains the strategy and reasoning of this approach, relating both strengths and weaknesses.

Contributed Papers

11:15

NN8. Acoustics in a school of music. Douglas H. Keefe (Systematic Musicology Division, School of Music, DN-10, University of Washington, Seattle, WA 98195)

While music students are commonly exposed to musical acoustics in a formal course, there is a trend for music schools to become increasingly active in research involving acoustics, with applications to relevant subdisciplines of music. Upper-level undergraduate courses in a music school have been designed for use also by graduate students in the following areas: a full-year sequence in music science, computer applications to music, and musical applications of digital signal processing. All have instructional components involving acoustics, and all make use of a microcomputer center comprised of six music workstations. Specialized peripherals and software demonstrate acoustical phenomena and serve as tools for work in musical acoustics, music perception and cognition, music engineering, computer music, and automated music transcription. One important benefit is that effective use of computers helps music students without extensive background in calculus or the physical sciences grasp technical concepts more readily.

11:30

NN9. Waves *á la* Fourier. R. Dean Ayers (Department of Physics-Astronomy, California State University, Long Beach, CA 90840)

A senior/graduate elective course on Fourier transforms and the physics of vibrations and waves has now been taught for 6 years. The textbook by Ronald Bracewell is used in the first half of the semester to lay the mathematical foundations: piecewise functions, convolution, generalized functions, the transform and the series, theorems on transform pairs, and techniques for evaluating transforms. The second half of the semester is devoted to physical applications, with relatively little time spent on vibrations or waveforms; the major focus is on the use of spatial transforms to describe basic processes of radiation and imaging. Examples are drawn from acoustics, optics, solid-state physics, and medical imaging. The emphasis throughout this course is on the unifying structure of this approach to linear physics. Computational techniques and applications involving statistics or noise are deliberately avoided. An optional laboratory allows the students to see the ideas of the lecture course illustrated in concrete examples. Several students have gone on to do master's theses in acoustics after taking this course, and others have commented on its usefulness to them in a variety of fields.

11:45

NN10. Acoustics laboratory experiments in the undergraduate curriculum. Thomas D. Rossing (Physics Department, Northern Illinois University, DeKalb, IL 60115)

It is impossible to overemphasize the importance of laboratory experiments to the student learning acoustics. We have developed an acoustics laboratory with a library of over 50 acoustics experiments, ranging from the introductory to the advanced undergraduate/graduate level. This laboratory serves our undergraduate physics curriculum in a variety of ways, by providing: (1) experiments for a one-credit acoustics laboratory course; (2) optional experiments and "experimental problems" for an intermediate course in waves and vibration, an advanced acoustics course, and other courses; (3) open-ended experiments for undergraduate research projects; (4) demonstration experiments for lectures in mechanics, acoustics, and other intermediate courses; (5) acoustics experiments for our intermediate laboratory course; and (6) (fortunately or unfortunately) a band of well-maintained loanable test equipment for other teachers. We have prepared an acoustics laboratory manual, which is now distributed commerically by Cenco. Several experiments will be described and demonstrated as time permits.