Structural Health Monitoring: with Piezoelectric Wafer Active Sensors

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Structural Health Monitoring (SHM) is the interdisciplinary engineering field devoted to the monitoring and assessment of structural health and durability. SHM technology integrates remote sensing, smart materials, and computer based knowledge systems to allow engineers see how built up structures are performing over time. It is particularly useful for remotely monitoring large infrastructure systems, such as bridges and dams, and high profile mechanical systems such as aircraft, spacecraft, ships, offshore structures and pipelines where performance is critical but onsite monitoring is difficult or even impossible. Structural Health Monitoring with Piezoelectric Wafer Active Sensors is the first comprehensive textbook to provide background information, theoretical modeling, and experimental examples on the principal technologies involved in SHM.

This textbook can be used for both teaching and research. It not only provides students, engineers and other interested technical specialists with the foundational knowledge and necessary tools for understanding modern sensing materials and systems, but also shows them how to employ this knowledge in actual engineering situations.

• Addresses the problem of aging structures and explains how SHM can alleviate their situation and prolong their useful life.
• Provides a step by step presentation on how Piezoelectric Wafer Active Sensors (PWAS) are used to detect and quantify the presence of damage in structures.
• Presents the underlying theories (piezoelectricity, vibration, wave propagation, etc.) and experimental techniques (E/M impedance, PWAS phased arrays, etc.) to be employed in successful SHM applications.
• Provides an understanding of how to interpret sensor signal patterns such as various wave forms, including analytical techniques like Fast Fourier Transform, Short-time Fourier Transform and Wavelet Transform.
• Offers comprehensive teaching tools (worked examples, experiments, homework problems, and exercises) and an extensive online instructor manual containing lecture plans and homework solutions.

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