UNIVERSITY OF GEORGIA
College of Engineering

2018-2019
Lecture Series

Mohammad Albakri, Ph.D.

Research Scientist

Virginia Tech

April 5, 2019

12:30 p.m.

Coverdell Center Auditorium

Design of a High-Pressure Jet-Stirred Reactor Facility for Gas-Phase Chemical Kinetics

ABSTRACT

In this talk, I will discuss recent advancements in vibration-based nondestructive evaluation (NDE) and quality control (QC). Two problems in this area are investigated: reference-free stress-state identification and vibration-based QC for additive manufacturing. The former problem addresses the use of the first anti-symmetric (A0) wave mode at low frequency for stress identification. While low-frequency A0 waves are highly sensitive to the waveguide's state-of-stress, their strong dispersive nature and large wavelength present challenges to measurement and data analysis efforts. To address these challenges, a new algorithm that integrates the acoustoelastic theory and the semi-analytical FEM in an optimization scheme is developed. A data-driven modeling approach for altering damping characteristics of the waveguide is also developed to attenuate reflections at low frequency. Numerical and experimental aspects of the developed technique are discussed along with some potential applications.

The second problem discussed in this talk addresses the challenge of NDE and QC for additive manufacturing. While additive manufacturing technology provides the capabilities to realize complex designs, the lack of reliable means for verifying the quality of printed parts is a significant barrier to the wide adoption of this technology. The potential of electromechanical impedance measurements to bridge existing gaps in current NDE and QC practices is first investigated. The sensitivity of electromechanical impedance measurements to a variety of defects commonly encountered in additive manufacturing is then evaluated. Being a functional-based technique, impedance-based NDE promises inspection-cost reduction and is well suited for inspecting parts of complex geometry and deeply embedded flaws.

BIO

Mohammad Albakri is a research scientist at the Department of Mechanical Engineering at Virginia Tech. His research interests are in the area of computational mechanics and structural dynamics with applications in structural health monitoring, advanced manufacturing, and smart structures. He received his Ph.D. degree in Engineering Mechanics from Virginia Tech in 2016 and his Master's degree in Mechanical Engineering from Masdar Institute of Science and Technology in 2011. His research has been supported by the National Science Foundation and the Federal Railroad Administration.