

Template for Proposed Workshop (Tutorial) On

Vibration-Control Systems

**ASME 2011 International Design Engineering Technical Conferences (IDETC) and
Computers and Information in Engineering Conference (CIE)**

August 28-31, 2011, Washington, DC, USA

Workshop/Tutorial Abstract:

During recent years there has been considerable interest in the design and implementation of a variety of vibration-control systems. Recent developments in multi-variable control design methodology and microprocessor implementation of modern control algorithms have opened a new era for the design of advanced vibration-control systems for use in a variety of applications. Observing these developments combined with the substantial ongoing advances in the micro and nanotechnology, this workshop presents the fundamental principles and theoretical concepts for vibration-control systems design and implementation, followed by an overview of recent developments and control techniques in this subject.

Presenter(s):

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Presenter(s) Biographical Sketch:

Dr. Nader Jalili joined the faculty of Northeastern University in September 2009 from Clemson University (Clemson, South Carolina) where he was a tenured Associate Professor and Assistant Professor since 2000. Dr. Jalili is currently an Associate Editor of *ASME Journal of Dynamic Systems, Measurement and Control*, the founding Chair of ASME Dynamic Systems and Control Division (DSCD) Technical Committee on Vibration and Control of Smart Structures. As a past Technical Editor of *IEEE/ASME Transactions on Mechatronics*, he is the author/co-author of more than 300 peer-reviewed technical publications including over 90 journal papers. He has received many national and international awards including the 2003 National Science Foundation CAREER Award, 2002 Ralph E. Powe Junior Faculty Enhancement Award from Department of Energy, 2009 Clemson University McQueen-Callebaum Faculty Achievement Award for exemplary leadership in the engineering profession, 2008 Murray Stokley Award for excellence in teaching, 2007 Collaboration Award for demonstrated exemplary and synergetic collaboration in research, 2007 Clemson University Outstanding Young Investigator of the Year, 2007 Clemson University Graduate Student Government Award as well as 2007 Eugene H. Bishop Award for excellence in teaching, and 2007 Ken Roby Advising Award for excellence in undergraduate advising. Dr. Jalili obtained his BS and MS degrees (both with First Class Honors) from Sharif Univ. of Technology (Tehran, Iran) in 1992 and 1995, respectively, and his Doctorate in Mechanical Eng. from Univ. of Connecticut (CT, USA) in 1998.

Expected Background of Participants:

Basic knowledge of dynamic modeling of rigid and flexible structures, mechanical vibrations, and linear controls.

Expected Audience:

This workshop (tutorial) is addressed to faculty, PhD students, MS students as well as engineers from industry having research interests in the area of vibration and control of systems.

Need for the Workshop:

Address the need for and the merit of the proposed workshop (tutorial).

Impact:

Address the impact of the proposed workshop (tutorial).

Course Outline:**Part 1: Theory of Vibration-Control Systems***Session 1A: Overview and Introduction*

Classifications of Vibration-Control Systems
Performance Characteristics of Vibration-Control Systems

Session 1B: Vibration-Control Systems

Passive, Active and Semi-Active Vibration Control
Adjustable Vibration-Control Elements
Other Variable Rate Elements

Session 1C: New Developments in Actuators and Sensors Technology

Piezoelectric-Based Actuators and Sensors
Nanomaterials-Based Actuators and Sensors

Part 2: Vibration-Control Systems Design and Implementation*Session 2A: Application of Vibration Absorbers*

Delayed-Resonator (DR) Vibration Absorbers
Active Resonator Absorbers (ARA)

Session 2B: Application of Vibration Controllers

Variable Structure Control (VSC) of Rotating Flexible Manipulators
Piezoelectric-Based Control of Translating Single Arm Robots
Application of Control Techniques in Vibration Control

Part 3: Real-Time Computer Interface Implementation*Session 3A: Matlab-Based Vibration Control Developments*

Matlab/Simulink-Based Control Implementation
Real-Time Simulation Configuration

Session 3B: Data Acquisition Structure and Hardware Architecture

Digital Signal Processing (DSP) Toolbox
Data Acquisition Handling and Processing

Sample