
**STEVENS INSTITUTE OF TECHNOLOGY**
**DEPARTMENT OF MECHANICAL ENGINEERING**

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**Carnegie Room 315, Time: NOON**

# *Passive and Active Vibration Control in Precision Machines*

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Vibration problems are becoming more important and challenging with the continuous improvement of machining accuracy, instrument resolution, and human protection. In this talk, I will present some new approaches to passive and active vibration control for precision machines and instruments. First, I will demonstrate how a single mass is used, for the first time, to damp six vibration modes in a nanolithography machine. A framework based on decentralized control is developed for the parameter optimization of such passive vibration systems. Then, I will examine a novel adaptive control strategy for active vibration isolation, which directly achieves the ideal skyhook dynamics without prior knowledge of the system parameters. Applications to the most challenging vibration control in the Caltech-MIT LIGO project will be included.

At the end of the presentation I will briefly talk about biopharmaceutical R&D process, and the design of automation systems and instruments to impact the biomedical devices and pharmaceutical industries.

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**Lei Zuo** graduated from MIT with a PhD degree (2005) in mechanical engineering and two MS degrees (2002) in both mechanical engineering and electrical engineering. He received a Bachelor's degree with honors in Automotive Engineering from Tsinghua University, China. He has been working in Abbott Laboratories since November 2004 as a Senior Research Scientist. He also worked in Caltech-MIT LIGO Scientific Collaboration and General Electric Global Research Center. Lei has over twenty publications in leading academic journals and conferences, and he was awarded two US patents. He has served as an active reviewer for several journals and a number of conferences, including IEEE Transactions on Control Systems Technology, ASME Journal of Vibration and Acoustics, Journal of Sound and Vibration, and IFAC Control Engineering Practice. His research interests include dynamic systems and control, mechatronic systems, passive and active vibration, biomedical instrumentation, and automation.

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