

CE 295 - RESEARCH SEMINARS in STRUCTURAL & GEOTECHNICAL ENGINEERING

SUPPLEMENTAL ADAPTIVE STIFFNESS SYSTEM WITH DAMPING FOR APPARENT WEAKENING AND SEISMIC PROTECTION

Date: Thursday, February 20th, 2014

Time: 4:00 – 4:50 pm

Room: EG - 3161 (Small Conference Room)

Guest Speaker: **Satish Nagarajaiah, Ph.D.**



Abstract:

Traditionally researchers have focused on supplemental damping systems for earthquake protection. Nagarajaiah's group has focused on the development of adaptive/variable stiffness systems and smart tuned mass dampers for dynamic response control. This seminar presents various stages of development of the concept of adaptive/variable stiffness structural systems.

Recently a team of researchers at Rice University, University at Buffalo, RPI & UCLA funded through the NSF NEES program have developed practical and true negative stiffness structural systems for seismic protection. The aim of the project was to develop a true negative stiffness system and mimic "yielding" while retaining the main structure either in the elastic range or in the mildly inelastic range with reduced inelastic excursions—leading to a new concept called "apparent weakening." The talk presents the invention of the Negative Stiffness Device (NSD) and process that lead to the invention of the NSD—a creative process of innovation by a team of researchers. The innovation of apparent weakening concept is presented. Detailed analytical and shake table test results are presented to show the effectiveness of the new and innovative concept of adaptive negative stiffness and apparent weakening for earthquake protection. Effectiveness of NSD in base isolated structures, inelastic single and multistory buildings, and based isolated bridges is demonstrated using experimental and analytical results obtained in the NEES-Adapt-Struct project.

Bio:

Dr. Satish Nagarajaiah is a Professor of Civil and Mechanical Engineering at Rice University, Houston, Texas. He obtained his Ph.D. (1987-1990) from University at Buffalo, where he was a post-doctoral researcher before he started his academic career in 1993. Satish Nagarajaiah's teaching and research interests are in the areas of structural dynamics; seismic protection; earthquake engineering; structural control, system identification; structural health monitoring; sensing using applied nanotechnology. His research is funded by the NSF, NASA, DOE, Air Force, Office of Naval Research and other State/Federal agencies, & Private Industries. NSF has awarded him the prestigious faculty early CAREER award for his research in Adaptive Stiffness Systems. He has published extensively and presented several keynote lectures at international conferences. For full details visit his web site satishnagarajaiah.rice.edu. Dr. Nagarajaiah currently serves as the managing editor of the journal of structural engineering [ASCE], editor of the structural control and health monitoring international journal [Wiley] and editor-in-chief (North America) of the structural monitoring and maintenance international journal [Techno-press]. He is an elected inaugural fellow of Structural Engineering Institute (SEI) of ASCE since 2012.

