The Electrical and Computer Engineering Program presents

ECEN Seminar Series

NeuroErgonomics Research at Texas A&M University, College Station

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12 – 1 PM

Lecture Hall 238

Ergonomics has long since moved from being a science of improving work efficiency to now being focused on enhancing well-being while improving systems performance. The primary goal of ergonomics is to ensure that work demands are always lower than operator capacity, and the conventional assessment of physical work demands include measuring biomechanical and physiological outcomes, such as joint torque, muscle activity, and heart rate, in laboratory and field settings. To effectively understand how humans interact with complex work systems, it is not only important to ask how well they perform, but also understand why they perform the way they do. The presentation will offer findings from different research projects in the NeuroErgonomics lab in determining the nature and extent to which complex human systems interactions impact worker fatigue and systems performance.

Fatigue is a complex, multifaceted phenomenon and the contributors to fatigue may be either physical or psychological and the occurrence site may be the brain or the body. Early work of the NeuroErgonomics Lab in this area successfully quantified the interactive effects of physical and non-physical (cognitive demands, distractors, stress) factors on worker capacity using traditional ergonomic assessments. However, examining the role of brain functioning during fatigue development is critical to extend our knowledge on the etiology and potential mechanisms of worker fatigue. What is the role of the brain in fatigue development? How does it affect downstream peripheral responses? What are the potential mechanisms through which stress, burnout, and other psychological symptoms, such as depression, increase fatigability? How does human and machines interact in hazardous environments when fatigue and/or stress is inevitable. Findings from these studies will be presented.

The increasing prevalence of obesity in the world has risen to an epidemic level, which is accompanied with a growing burden of physical disability, particularly in the elderly. While obesity is associated with structural changes, such as decreased white matter integrity, in the aging brain, it is unclear whether such changes impact cortical connectivity during neuromuscular control. Current basic research efforts on mapping functional connectivity between different motor-function related cortical regions in response to hand and leg motor actions to investigate the impact of obesity, stress, and aging on activities of daily living will be discussed. Establishing obesity-specific neural activation patterns responsible for motor performance under stress in older adults will facilitate development of novel and practical community-based interventions focused on improving brain function, and subsequent motor and cognitive functions, that are otherwise compromised with aging and obesity. Findings from a recently completed NIOSH-funded multi-site study will also be presented.

Discussions of several Research2Practice investigations will be provided. Recent efforts of the Lab in determining fatigue-related variability in oil and gas operator performance and health outcomes will be presented. The efforts toward development of assessment and mitigation tools will be discussed that have the potential to facilitate recommendations of strategies for accident prevention and containment in high-risk energy operations.

Ranjana Mehta, PhD, is Assistant Professor in the Departments of Environmental and Occupational Health and Industrial and Systems Engineering at the Texas A&M University and graduate faculty in the Texas A&M Institute for Neuroscience, director of the NeuroErgonomics Laboratory, and co-director of the Texas A&M Ergonomics Center, and graduate faculty with the Center of Remote Health Technologies and Systems. She received her Ph.D. in Industrial & Systems Engineering from Virginia Tech. Over the past five years, she has developed an independent research program focused on human factors and ergonomics to research, design, and implement engineered solutions to address burdening public health challenges, particularly as they relate to operator health and safety using multidisciplinary approaches. Research (both basic and applied) in her lab focuses on exploring the interactions of human physical and cognitive capabilities and limitations to improve systems performance and health in three synergetic research initiatives: 1) developing and employing health technologies to assess and mitigate worker fatigue and stress; 2) investigating the influence of the changing population demographics (age and obesity) on human systems integration; and 3) conducting Research2Practice efforts to improve worker health and safety in hazardous environments.

FOR MORE INFORMATION:

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