

**Educating the Future Engineer:**  
**Advanced Sliding Contact Interactions in Micro/Nanoscale Systems**

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**Seminar on September 8, 2015 at 11:00 am in 2004 Black**  
**Seminar host: Cris Schwartz**

**Abstract**

The first part of the talk will touch on some current issues in educating the future engineer, and outline some ideas that are currently explored. The second and main part of the presentation will focus on advanced sliding interactions in miniature systems. With current demand for decreased size of micro/nanoscale systems, critical understanding of the ensuing impact and sliding contact related behavior of thin films used in these systems is of critical. In modern micro/nanoscale technologies significant emphasis is placed on the design of thin-films, which can provide the required contact and scratch resistance. To aid this endeavor, scientific studies of the contact and scratch processes in these systems, both static and dynamic are needed to provide the tools necessary to help the advancement of these technologies. One such problem is the dynamic impact and sliding contact of the slider and disk in magnetic storage hard disk drives in the quest for ultra high recording densities, beyond 1 Terabit per square inch. In this presentation, we first present a specialized nanoindentation technique to directly measure the nanomechanical properties of nanometer thin-films on multilayer systems. Once the properties of the multilayer system are known, sliding contact on multilayer thin films specific to magnetic storage hard disk drives is presented. Such results shed light to the reliability and wear of contacting, sliding and impacting micro/nanoscale systems, where contact features are only few microns thick and thin film layers are as thin as few nanometers.

Dr. **Andreas A. Polycarpou** received his Ph.D. in Mechanical Engineering from the University at Buffalo, NY in 1994. Before joining Texas A&M in December 2012, he was the Wilkins Professor and Associate Department Head at the University of Illinois at Urbana-Champaign. He was also the Founding Department Chair of Khalifa University (Abu Dhabi) from 2011-2012, while on leave from the University of Illinois. Before that, he was a post-doctoral fellow at the Technion-Israel Institute of Technology (1995-97) and a staff scientist at Seagate Technology (1997-1999). Dr. Polycarpou's research interests include tribology, micro/nano tribology, nano mechanics, and advanced interface materials. Recent emphasis has been on micro/nanoscale contact problems with application to magnetic storage, as well as the tribology of devices for reduced energy and improved environmental-related impact, such as the use of carbon dioxide as a natural refrigerant and the use of surface treatments towards oil-les machine operation. Polycarpou is the author of over 150 archival journal papers, and numerous book chapters, volume proceedings, a dozen patents and conference papers. Polycarpou won numerous national and international awards, including the ASME Burt L. Newkirk Award, the National Science Foundation Faculty CAREER Award, the Xerox Award for Faculty Research, the STLE Edmond E. Bisson Award, a Fulbright Scholar, the ASME K.L. Johnson Best Paper Award and the STLE Walter D. Hodson Award. Polycarpou is active in the tribology and mechanics communities, where he served in many posts, including Chairing the ASME Tribology Division. He was also an Associate Editor for the ASME Journal of Tribology, serves on several Editorial Boards, has organized numerous conferences including being the Chair of the 2009 International Joint Tribology Conference. Dr. Polycarpou is currently serving on several honors and awards committees, as well as on the Executive committee of ASME's Department Heads Council.

**This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students. [www.me.iastate.edu](http://www.me.iastate.edu)**