TRIBOLOGY: FRICTION, WEAR, AND LUBRICATION

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Lead Instructors

Nannaji Saka
Nam Pyo Suh

COURSE DATES
June 26-30, 2017

COURSE LENGTH
5 days

COURSE FEE
$3,650

CEUs:
2.9

OVERVIEW

Waste of resources that results from high friction and wear alone has grown to over 6% of the Gross Natural Product, which is why the study of friction, wear, and lubrication—tribology—is crucial to minimizing costs, energy consumption, and environmental impact while prolonging the life of many mechanical, electromechanical, and biological systems such as toothed gears, silicone micrometers, or joint replacements in the human body.

This course will give you the current insights into tribology, focusing on fundamental concepts such as surface energy, elastic and elastoplastic deformation, micro-fracture, and surface interactions at the micro- and nano-scale. You’ll learn how to apply your knowledge and skills to control friction and wear behavior through lubrication and the selection of materials and coatings in practical, real-world situations.

Furthermore, you’ll learn about more modern experimental methods through the discussion of various case studies that illustrate how fundamental tribology knowledge can be applied in the design of tribological components and systems.

Takeaways from this course include:

- A foundation of the laws, mechanisms, and models of friction, wear, and lubrication — spanning nano, micro, meso, and macro scales
- A holistic understanding of the tribological properties and methodologies of design of a whole system, not just individual parts, in order to better troubleshoot problems
- Knowledge of the protocols and procedures of accelerated and long-term tribological testing
- A survey of the types of lubrication available (boundary, solid-film, hydrodynamic, and hydrostatic), testing devices, and the various modes of wear (adhesive, delamination, fretting, abrasive, erosive, corrosive, mild and severe oxidation, melt, and wear-mechanism maps)
- Critical examinations via case studies on the application of sliding contacts, rolling contacts, bearing design, coating selection, and lubrication

INSTRUCTORS

Dr. Nannaji Saka is a former Research Affiliate and Principal Research Scientist in the Department of Mechanical Engineering and the Laboratory for Manufacturing and Productivity at MIT. He holds a bachelor’s degree in Mechanical Engineering (First class Honors), a master’s degree in Metallurgical Engineering, and a Doctoral degree in Materials Science and Engineering.

Dr. Nam Pyo Suh was the 13th and 14th President of the Korea Advanced Institute of Science and Technology (KAIST). He is also the Ralph E. & Eloise F. Cross Professor, Emeritus, MIT.

Dr. Said Jahanmir is President and CEO of the MiTiHeart Corporation, a subsidiary of Mohawk Innovative Technology, Inc. (MiTi), where he serves as VicePresident for Biotechnology and leads efforts on implantable blood pumps.

Dr. Nicholas X. Randall is a Chartered Engineer (CEng MIM) and holds a BSc. in Materials Science from Brunel University (London, UK) 1994 and a PhD from Neuchatel University (Neuchatel, Switzerland) 1997.

Dr. Lavern Wedeven is the founder and President of Wedeven Associates, Inc. He received his BS degree from Calvin College, Grand Rapids, MI, and holds BS and MSME degrees from the University of Michigan. He received a PhD from Imperial College, London.

WHO SHOULD ATTEND

The program is intended for two kinds of participants: those who are active or intend to be active in research on some aspect of tribology, and those who have encountered practical friction and wear problems and wish to learn novel methods of solving them.

The course requires at least a bachelor’s degree in engineering or physical sciences, including basic courses in mathematics, applied mechanics, materials science, physics, and chemistry. Some lectures introduce advanced concepts in these areas and in physical chemistry and thermodynamics. These will be reviewed where necessary to provide the required background. Industrial experience is preferred.

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PARTICIPANTS’ COMMENTS

“A good practical overview of tribology. I didn’t expect it to be as practical / real-world / valuable as it was. I expected it to be “in-the-clouds” mysterious as other tribologists I have come across have acted. I like the courage of the presenters defining what is known, what is estimated, and what is unknown. It has improved my view of tribology’s legitimacy.” —Compressor Engineer, Thermoking Corporation

“Not only learned theories of tribology, but also the way of solving engineering problems. The instructors delivered very nice and well prepared talks. I would recommend this class to any of my colleagues in the tribological area.” —Engineering Specialist, Caterpillar Inc.

“The course was very good and well worth the cost and time to attend. The content was extensive and informative. The lecturers were impressive and highly knowledgeable in their fields. The social events (dinner and lunch) were superb and provided for wonderful personal and technical exchanges with the attendees and lecturers. I found the dialogue and questions in the classroom to be very interesting and engaging. The classroom accommodations were good and the refreshments provided were of good quality. The discussion of applications, case studies, and problem solving were of most interest.”
—Technical Consultant, Areva NP

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