LEHIGH UNIVERSITY

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DAN FRANGOPOL APPOINTED TO KHAN CHAIR

The Sears Tower (the tallest building in the United States, and the tallest in the world until 1996) and the 100-story John Hancock Center in Chicago are two of the many impressive structures Fazlur Rahman Khan designed during his short life (1929-1982). The Hajj Terminal at King Abdulaziz International Airport in Jeddah, Saudi Arabia, is a third.

Dan Frangopol

Lehigh endowed a chair in structural engineering and architecture in Khan's honor and appointed Dan M. Frangopol, an expert in structural reliability, optimization, and life-cycle engineering, as the university's first holder of the Khan Chair.

Frangopol, who came to Lehigh from the University of Colorado at Boulder, will set up new research directions in two areas for which he has a passion – life-cycle engineering and the maintenance and management of bridges and other structures. Life-cycle engineering, says Frangopol, optimizes the investment made in an individual structure or network of structures by considering multiple and conflicting objectives during a specified time horizon. It employs probability and statistics to account for the changes structures undergo during their lifetime. It provides decision makers different solution options from which the one that preferably balances structural performance enhancement and cost reduction can be selected.

"Our knowledge to model, analyze, design, maintain, manage and predict the life-cycle performance of civil infrastructure systems is continually growing. However, the complexity of these systems continue to increase and an integrated approach is necessary to understand the effect of technological, environmental, economical, social and political interactions on the life-cycle performance of engineering infrastructure. In order to accomplish this, methods have to be developed to systematically analyze structure and infrastructure systems, and models have to be formulated for evaluating and comparing the risks and benefits associated with various alternatives. We must maximize the life-cycle benefits of these systems to serve the needs of our society by selecting the best balance of the safety, economy and sustainability requirements despite imperfect information and knowledge."

"A structure should be planned and built for a life cycle of 50 to 100 years, or more," he says. During this time, structures may be exposed to abnormal loads of different types, ranging from natural hazards (such as earthquakes, floods, and hurricanes) to man-made disasters such as terrorist attacks, fires, or vehicular collisions). At the same, structural performance undergoes gradual deterioration due to material aging, harsh environmental conditions, and increasing loads. "From the beginning, you should estimate how much money you need to spend to optimize the cost of maintaining and repairing structures over their lifetime."

"Civil engineering structures react to a complex set of variables that change as a structure ages. In order to make smart decisions that optimize the safety, reliability and cost of these structures over their lifespans, we must apply resources in design, construction, maintenance and monitoring as effectively as possible. Civil engineering, information technology, and cost-risk analysis join to create a comprehensive approach to managing all the variables that impact the long-term health of a structure."

Frangopol is the Founding President of the International Association for Bridge Maintenance and Safety (IABMAS). He currently serves as the Chair of the Executive Board of the International Association for Structural Safety and Reliability (IASSAR), and Vice-President of the International Society for Structural Health Monitoring of Intelligent Infrastructure (ISHMII).

Frangopol is also the Founding Editor-in-Chief of *Structure and Infrastructure Engineering*, an international peer-reviewed journal dedicated to advances in maintenance, management and life-cycle performance of a wide range of infrastructures.

By:
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