

KAVANAGH LECTURE *Series*



**Risk, Resilience,
and Sustainability
of Civil
Infrastructure
in a Life-Cycle
Context**

Dr. Dan M. Frangopol

*The Fazlur R. Khan Endowed Chair of Structural
Engineering and Architecture at Lehigh University*

Thursday, April 5, 2018

7:30 p.m.

117 John Bill Freeman Auditorium at the
Hub-Robeson Center

Sponsored by: The Department of Civil and Environmental Engineering



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Risk, Resilience, and Sustainability of Civil Infrastructure in a Life-Cycle Context

ABSTRACT

Decisions regarding civil infrastructure systems should be supported by an integrated framework considering risk, resilience, and sustainability in a life-cycle context. This framework should take into account multiple objectives including, among other factors, the likelihood of successful performance and the total expected cost over the entire life-cycle of civil infrastructure. The primary objective of this lecture is to present a framework for risk-, resilience-, and sustainability-informed decision making for civil infrastructure systems and networks using a life-cycle multi-objective optimization approach. Risk-based performance metrics allow engineers to combine the probability of structural failure with the consequences corresponding to this event. The sustainability performance metric is established considering the risks associated with economic, social, and environmental impacts, utility theory, and the decision maker's risk attitude. Applications include time-variant reliability, risk, resilience, and sustainability of bridges, bridge transportation networks, and interdependent infrastructure systems under multi-hazards.

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The Thomas C. Kavanagh Memorial Structural Engineering Lecture is held annually during the spring semester, normally the first Thursday in April. In order to sustain the lecture in perpetuity, an endowment has been established. To contribute to this endowment, send a check, payable to The Pennsylvania State University, to:

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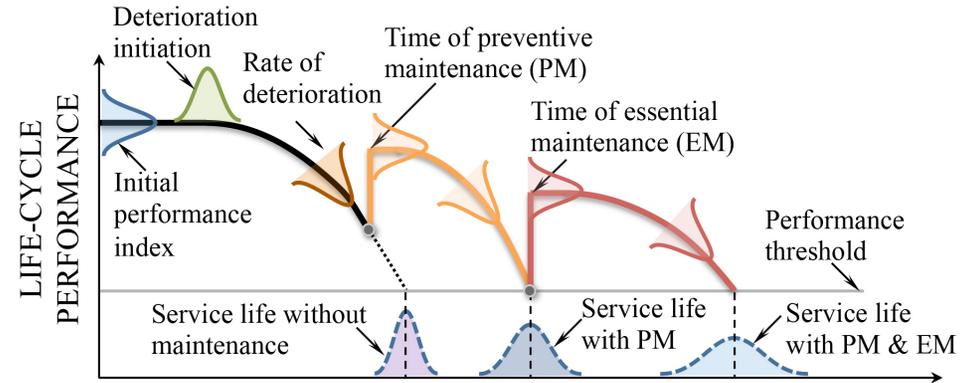
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BIOGRAPHY

Dr. Dan Frangopol is the inaugural holder of the Fazlur R. Khan Endowed Chair of Structural Engineering and Architecture at Lehigh University. Before joining Lehigh University in 2006, he was a professor of civil engineering at the University of Colorado at Boulder, where he is now professor emeritus. He is recognized as a leader in the field of life-cycle engineering of civil and marine structures. Frangopol is the founding president of the International Associations for Bridge Maintenance and Safety (IABMAS) and Life-Cycle Civil Engineering (IALCCE). He has authored/co-authored more than 40 book chapters and over 370 articles in archival journals including nine prize winning papers. He is the founding editor of Structure and Infrastructure Engineering and of the book series Structures and Infrastructures. Frangopol is the recipient of several medals, awards, and prizes, from ASCE, IABSE, IASSAR and other professional organizations, such as the OPAL Award, the Newmark Medal, the Alfredo Ang Award, the T.Y. Lin Medal, the F. R. Khan Medal, and the Croes Medal (twice), to name a few. He has served as a consultant or advisor to numerous companies. He holds four honorary doctorates and 12 honorary professorships from major universities. He is a foreign member of the Academy of Europe (London) and the Royal Academy of Belgium, an Honorary Member of the Romanian Academy, and a Distinguished Member of ASCE.

For additional information on Frangopol's activities, please visit www.lehigh.edu/~dmf206/.

THOMAS CHRISTIAN KAVANAGH
1912—1978



***THOMAS C. KAVANAGH MEMORIAL
STRUCTURAL ENGINEERING LECTURE***

The Kavanagh Lecture serves as a memorial to Dr. Thomas C. Kavanagh, who distinguished himself as a structural engineer and served as professor of civil engineering at Penn State from 1948 through 1952. During his teaching career at Penn State and other universities, Dr. Kavanagh earned the high regard and admiration of his many students, and his commitment and dedication to the profession of structural engineering serve as a standard for students and practitioners.

The Kavanagh Lecture is designed to bring a nationally or internationally prominent structural engineer to the Penn State campus on an annual basis to speak on a timely topic related to research in or the practice of structural engineering. Several engineering departments at the University, as well as many practicing engineers within central Pennsylvania, are engaged in structural engineering. The Kavanagh Lecture provides a mechanism to bring faculty, students, and practitioners together to strengthen the structural engineering community.

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