

Life-Cycle Reliability, Risk, Resilience, & Sustainability of Civil Infrastructure under Multi-hazards

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18th Dec 2023
3:00 pm to 4:00 pm



FIU Engineering Center (EC) 2300

Decisions regarding design, assessment and maintenance of structures and infrastructure systems should be supported by an integrated reliability-, risk-, resilience- and sustainability-based life-cycle multi-objective optimization framework by considering, among other factors, the likelihood of successful performance and the total expected cost accrued over their entire life. The primary objective of this lecture is to present a life-cycle multi-objective optimization framework for reliability-, risk-, resilience- and sustainability-informed decision making for structures and infrastructure systems under lifetime hazards including corrosion, earthquake and climate change. Several important performance indicators such as reliability, risk, resilience and sustainability necessary to be implemented in the design, assessment and maintenance of structures and infrastructure systems under single and multiple hazards are introduced. Bridges and bridge transportation networks are used to illustrate the application of the proposed approach.

"Frangopol's groundbreaking research into infrastructure from a holistic perspective has earned him a reputation in the civil engineering community" as the "Father of Life-Cycle Analysis." (ASCE) In 2023, ASCE established the DM Frangopol Medal for Life-Cycle Engineering of Civil Structures. According to ASCE "Dan M. Frangopol is a preeminent authority in bridge safety and maintenance management, structural systems reliability, and life-cycle civil engineering. His contributions have defined much of the practice around design specifications, management methods, and optimization approaches. From the maintenance of deteriorated structures and the development of system redundancy factors to assessing the performance of long-span structures, Dr. Frangopol's research has not only saved time and money but very likely also saved lives."



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