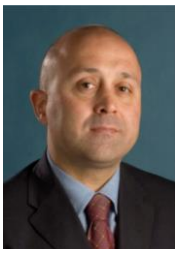
Life-Cycle Reliability, Robustness and Resilience of Aging Bridges and Bridge Networks



报告题目：Life-Cycle Reliability, Robustness and Resilience of Aging Bridges and Bridge Networks
报告人：Prof. Fabio Biondini, Politecnico di Milano
报告时间：11 月 13 日（周二）上午 9:30-11:30
报告地点：综合实验 3 号楼（建工学部办公楼）3 楼会议室

Abstract

Bridges, due to their inherent vulnerability, are at risk from aging, fatigue and deterioration processes due to aggressive chemical attacks and other physical damage mechanisms. The detrimental effects of these phenomena can lead over time to unsatisfactory structural performance under service loadings or accidental actions and extreme events, such as natural hazards and man-made disasters. These problems present a major challenge to bridge engineering, since the classical time-invariant structural design criteria and methods need to be revised to account for a proper modeling of the structural system over its entire life-cycle by taking the effects of deterioration processes, time-variant loadings, maintenance actions and repair interventions into account. Despite these needs and recent research advances, life-cycle concepts are not yet explicitly addressed in structural design codes and the target structural performance is usually specified with reference to structural safety and serviceability. However, when aging and deterioration are considered, the evaluation of the system performance under uncertainty should account for additional probabilistic indicators aimed at providing a comprehensive description of the life-cycle structural resources, including structural reliability and structural robustness. Moreover, system resilience has recently gained a prominent importance in design and assessment of transportation infrastructure networks exposed to extreme events, such as earthquakes. In this seminar, time-variant probabilistic performance indicators are defined and quantitatively evaluated for reinforced concrete bridges exposed to corrosion based on a methodology for life-cycle assessment of concrete structures in aggressive environment. The proposed approach is also applied to transportation road networks with multiple bridges. The results show the importance of a comprehensive description of the time-variant structural resources in a multi-hazard life-cycle-oriented approach to protect, maintain, restore and improve the time-variant performance of aging bridges and infrastructure networks.

Biography

Dr. Fabio Biondini is Professor of Structural Engineering and President of the Civil Engineering Degree Program at Politecnico di Milano. His education includes a 5yr Degree in Civil Engineering with honors from the University of Perugia (1993), a 2yr Master Degree (post-graduate Specialization) in Concrete Structures with full ranks

(1996) and a Ph.D. in Seismic Engineering (2000) both from Politecnico di Milano. He is an experienced researcher and consultant engineer for advanced structural analysis problems, including several forensic investigations related to structural failures of bridges, roof systems, breakwaters, and cranes. His main research areas are life-cycle civil engineering, structural reliability and risk, structural optimization, and earthquake engineering. Dr. Biondini is author or co-author of about 300 scientific publications, including book contributions, book chapters, journal articles, and papers in conference proceedings. He is also co-Editor of the volumes Life-Cycle Civil Engineering and Bridge Maintenance, Safety, Management, Resilience and Sustainability (CRC Press).
The scientific contributions of Dr. Fabio Biondini cover several topics, including life-cycle risk, reliability, robustness, redundancy, and resilience of deteriorating structural systems and infrastructure networks, with emphasis on the formulation of general methods and time-variant performance indicators for life-cycle seismic design and assessment of reinforced concrete structures exposed to corrosion. The methodologies developed by Dr. Biondini have been successfully applied in engineering practice to the assessment, repair and rehabilitation of existing structures such as cable-stayed bridges, arch bridges, and landmark buildings.