BILLIE F. SPENCER, JR.

In step with the abounding vitality of the time, structural engineer **Fazlur Rahman Khan** (1929-1982) ushered in a renaissance in skyscraper construction during the second half of the 20th century. Fazlur Khan was a pragmatic visionary: the series of progressive ideas that he brought forth for efficient high-rise construction in the 1960s and '70s were validated in his own work, notably his efficient designs for Chicago's 100-story John Hancock Center and 110-story Sears Tower -- the tallest building in the United States since its completion in 1974.

Fazlur Rahman Khan

Lehigh endowed a chair in structural engineering and architecture and has established this lecture series in Khan's honor. It is organized by **Professor Dan M. Frangopol**, the university's first holder of the Fazlur Rahman Khan Endowed Chair of Structural Engineering and Architecture, and sponsored by the Departments of Civil & Environmental Engineering, and Art, Architecture & Design.

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ATLSS

Fall 2022 Khan Distinguished Lecture Series

The Fazlur Rahman Khan Distinguished Lecture Series honors Dr. Fazlur Rahman Khan's legacy of excellence in structural engineering and architecture

Initiated and Organized by **PROFESSOR DAN M. FRANGOPOL**
The Fazlur Rahman Khan Endowed Chair of Structural Engineering and Architecture
Department of Civil and Environmental Engineering, ATLSS Engineering Research Center,
Lehigh University
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BILLIE F. SPENCER, JR.

Nathan M. & Anne M. Newmark Endowed Chair in Civil Engineering
Department of Civil and Environmental Engineering
University of Illinois at Urbana-Champaign

"Performance of Dynamically Excited Structures through Optimization and Monitoring"

Friday, November 18, 2022 – 4:30 pm

Location: Whitaker Lab 303, Lehigh University, 5 E. Packer Avenue, Bethlehem, PA

Lecture will also be live streamed, **(must REGISTER HERE for live stream link)**

Billie F. Spencer, Jr. received his Ph.D. in theoretical and applied mechanics from the University of Illinois at Urbana-Champaign in 1985. He worked on the faculty at the University of Notre Dame for 17 years before returning to the University of Illinois at Urbana-Champaign, where he currently holds the Nathan M. and Anne M. Newmark Endowed Chair in Civil Engineering and is the former Director of the Newmark Structural Engineering Laboratory. His research has been primarily in the areas of structural health monitoring, structural control, cyberinfrastructure applications, stochastic fatigue, stochastic computational mechanics, and natural hazard mitigation. He has directed more than $60M in funded research and published more than 700 technical papers/reports, including two books. He was the first to study and design magnetorheological (MR) fluid dampers for protection of structures against earthquakes and strong winds. He led NSF's George E. Brown Network for Earthquake Engineering Simulation (NEES) system integration project. Dr. Spencer has received numerous awards, including the ASCE Norman Medal, the ASCE Housner Structural Control and Monitoring Medal, and the ASCE Newmark Medal among others. He is a Fellow of ASCE, a Foreign Member of the Polish Academy of Sciences, a Foreign Member of the Engineering Academy of Japan, and a Foreign Member of the Chinese Academy of Engineering.

Performance of Dynamically Excited Structures through Optimization and Monitoring. This lecture provides an overview of two efforts directed toward assessing and improving the performance of structures conducted by researchers in the Smart Structures Technology Laboratory at the University of Illinois at Urbana-Champaign. The first focuses on topology optimization of structures subjected to random dynamic loads. A general topology optimization framework is presented to accommodate directly the random dynamic nature of the excitation and the responses. The proposed framework is illustrated for seismically excited and wind excited buildings, as well as bridges subjected to random traffic loading. The second part of the lecture discusses recent advances in computer vision techniques as they apply to the problem of civil infrastructure inspection and monitoring. Inspection applications presented include identifying context such as structural components, characterizing local and global visible damage, and detecting changes from a reference image, with focus on rapid structural condition assessment of buildings and bridges after disasters. Monitoring applications discussed include static measurement of strain and displacement, as well as dynamic measurements of displacement and modal analysis. This research will ultimately lead to more effective performance of our civil infrastructure.

FAZLUR RAHMAN KHAN (1929 - 1982) One of the foremost structural engineers of the 20th century, Fazlur Khan epitomized both structural engineering achievement and creative collaborative effort between architect and engineer. Only when architectural design is grounded in structural realities, he believed — thus celebrating architecture's nature as a constructive art, rooted in the earth — can "the resulting aesthetics … have a transcendental value and quality." His ideas for these sky-scraping towers offered more than economic construction and iconic architectural images; they gave people the opportunity to work and live "in the sky." Hancock Center residents thrive on the wide expanse of sky and lake before them, the stunning quiet in the heart of the city, and the intimacy with nature at such heights: the rising sun, the moon and stars, the migrating flocks of birds. Fazlur Khan was always clear about the purpose of architecture. His characteristic statement to an editor in 1971, having just been selected Construction's Man of the Year by *Engineering News-Record*, is commemorated in a plaque in Onterie Center (446 E. Ontario, Chicago): ***"****The technical man must not be lost in his own technology. He must be able to appreciate life; and life is art, drama, music, and most importantly, people."*

SEI ASCE STRUCTURAL ENGINEERING INSTITUTE Lehigh Valley Chapter

1 PDH will be awarded to eligible attendees for each lecture
(minimum webinar participation time of 55 minutes is required)

Please contact the Khan Chair office at 610-758-6123 or Email: infrk@lehigh.edu with any questions.