

**UNIVERSITY OF ARKANSAS, DEPARTMENT OF CIVIL ENGINEERING IN
COLLABORATION WITH ENGINEERING MECHANICS INSTITUTE (EMI) FLUID
DYNAMICS COMMITTEE SEMINAR**

**PHYSICAL SIMULATION AND MODELING OF WIND-STRUCTURE INTERACTION TO
STUDY AND MITIGATE NON-SYNOPTIC WINDSTORM HAZARDS TO STRUCTURES**

Thursday, November 21, 2024, 12:30 pm to 1:30 pm CST

Web access: [Join Zoom Meeting](#)

Presented by:

Prof. Partha P. Sarkar, Ph.D., F.ASCE, F.SEI
Iowa State University

Abstract: Non-Synoptic Windstorm (NSW) events (such as tornadoes, downbursts, gust-fronts, and others) cause severe structural damage resulting in numerous fatalities in the U.S. and property loss in excess of billions of dollars. These events of even moderate intensity can produce wind gusts exceeding 50 m/s, whereas tornadoes of highest intensity can produce wind gusts of 90 m/s or more. Damage to infrastructure is expected to increase with growing urbanization and increased intensification/frequency of such windstorms because of climate change. The velocity fields in the NSW phenomena are three dimensional and the structural loading they produce is transient in nature and larger in magnitude than those from straight-line atmospheric boundary layer (ABL) winds. The speaker has developed an ABL wind tunnel and NSW laboratory simulators (e.g. Tornado/Microburst Simulator) and various tools to assess structural loads, response, and damage, which has increased the understanding of near-ground wind in NSW events and their wind loading effects on structures. Examples of flow field and wind-structure interaction in NSW winds based on laboratory simulations will be presented. Further, the speaker will present salient features of an ongoing multi-million-dollar collaborative project, supported by the National Science Foundation (NSF) at Iowa State University that involves multiple universities, for designing a large university-based research facility (ISU), designated as NEWRITE - National Testing Facility for Enhancing Wind Resiliency of Infrastructure in Tornado-Microburst-Gust-front Events. This facility when built will allow testing of up to full-scale structures at a maximum wind speed of 200 mph for tornadoes and up to 80-100 mph in other NSW events. This facility will help researchers mitigate structural damage and losses from future NSW hazards.

Speaker's Bio: Partha P. Sarkar is a professor in the Department of Aerospace Engineering at Iowa State University (ISU). Prior to joining ISU as a Wilson and Miller Chaired Professor in 2000, he was a faculty in the Department of Civil Engineering at Texas Tech University. He has also served as his department's interim chair and research director, and currently serves as the director of the Wind Simulation and Testing Laboratory at ISU which he founded, and a multi-university collaborative project, NEWRITE. Sarkar holds a doctoral degree from Johns Hopkins University. Sarkar's research interests are in wind engineering and wind energy, mainly in the assessment of wind loads on buildings and flexible structures. Sarkar has been involved in 59 research projects that have been sponsored by federal/state agencies and private industries with a total budget of \$32 Million. His research has resulted in 235 peer-reviewed articles with a third in journals, four US patents on wind-loads mitigation and international/national collaborations. He has advised 33 graduate students, including 18 PhDs, and mentored several postdoctoral fellows, undergraduate student researchers (75+) and junior faculty. He served as the president of AAWE. Dr. Sarkar is a Fellow of the SEI and ASCE and the recipient of the 2023 ASCE Cermak Medal for his outstanding contributions to wind engineering.