LECTURE 30

Prof. Yukio Tamura

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- Professor Emeritus of Tokyo Polytechnic University (TPU), Japan
- Member of the Engineering Academy of Japan
  Foreign Fellow of the Indian and Chinese National Academy of Engineering
- Honorary Chairman of the International Thematic Group for Wind-Related Disaster Risk Reduction, United Nations Office of Disaster Risk Reduction
- President of the International Association for Wind Engineering (IAWE) from 2007 to 2015

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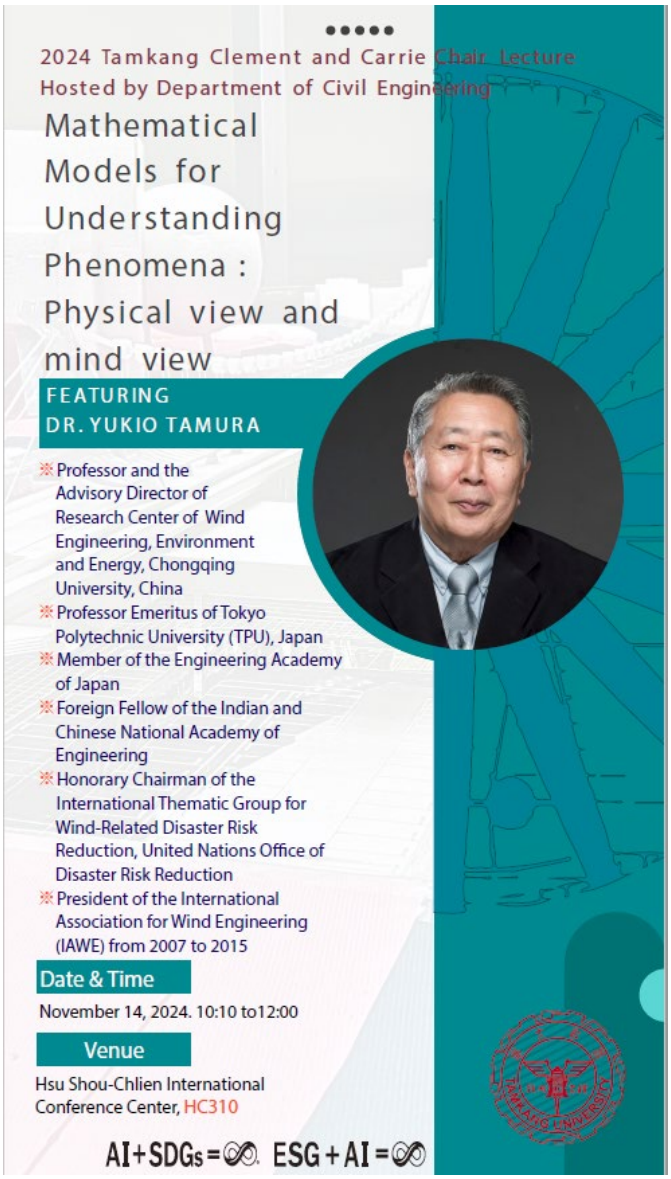

Speaker

Yukio Tamura is a Professor Emeritus of Tokyo Polytechnic (TPU), Japan , and the Honorary Director of the TPU Wind Engineering Research Center. He is also a professor of the School of Civil Engineering, Chongqing University, China, and he is also The Engineering Academy of Japan, Indian, and China.

Speaker Introduction

Professor Yukio Tamura has been dedicated to structural wind engineering research for many years. He has conducted long-term, systematic, and in-depth research in all aspects of wind-resistant design of building structures including basic theory of bluff body aerodynamics, rational determination of design wind speed, provision of structural wind loading and calculation of structural equivalent static wind loading, evaluation of structural aerodynamic stability, compilation, and revision of the wind resistant design code for building structures, wind hazard mitigation and so on. He has made creative contributions to reasonable wind resistant design of buildings. His outstanding achievements in engineering and technology are embodied in mathematical models, and quantification and analysis of wind loads on building structures. He has worked on the basic theory of wind effects on building structures and codification of wind resistant design methods, and has achieved leading and original research results, which makes him as a world-renowned expert in structural wind engineering. Professor Tamura has published more than 300 academic papers and nearly 40 books.

Topic: Mathematical Models for Understanding Phenomena: Physical View and Mind View

ABSTRACT

This lecture gives rather biased discussions emphasizing the importance of "understanding" of phenomena. This lecture's purpose is to inspire young researchers to taste the real charms of research by observing the process of development of mathematical models of vortex-induced vibration phenomena of cylinders for understanding their essential mechanism. Generally, research and studies in wind engineering are aimed at solving given problems caused by physical phenomena induced by winds. As such, they have direct and concrete aims such as observation of phenomena, prediction of phenomena, understanding of phenomena, and solution of problems. The last of these can be replaced by design practice. One of the important aims of research and studies is to "understand" phenomena. Simulation and prediction of phenomena can be done without understanding the phenomena. However, the discussions of this lecture focus on "understanding" of phenomena. It first discusses imperfect abilities of human beings in observation of phenomena and important aspects of research. Then, it emphasizes the close relation between understanding and mathematical models, and five conditions for a desirable mathematical model: simplicity; inclusion of all essential properties; possession of

physical meanings; wide scope of application; and possibility of development. A mathematical model based on the wake-oscillator, i.e. the Tamura model, applied for vortex-induced oscillation of circular cylinders is discussed as a sample. It refers to Birkhoff's wake-oscillator (1953), Funakawa's early-wake model (1969), Nakamura's 2DOF flutter model (1970), the Hartlen-Currie model (1970), the Iwan-Blevins model (1974), and Tamura's non-linear wake-oscillator model with a variable length (1979). Its development into a mathematical model for combined effects of vortex-induced oscillation and galloping phenomena of square prisms is also introduced, i.e. the Tamura-Shimada model (1987). Some recent developments of the Tamura-Shimada model are also introduced. Then, it discusses the necessity of accurate experimental capture of early-wake behavior and the aerodynamic properties of a target cylinder in each flow condition for further development of Tamura's model and the Tamura-Shimada model. It also emphasizes how the mathematical model can deepen understanding and elucidation of the mechanism of highly nonlinear complicated phenomena. Then, the necessity for efforts to understand phenomena are emphasized. Finally, especially for students, it discusses how to read textbooks and emphasizes the importance of finding out indirect messages hidden between lines.

TIME

November 14, 2024, Thursday / 10:10-12:00

PLACE

Hsu Shou-Chlien International Conference Center, HC310