This seminar will cover two recent research subjects conducted in his research laboratory at Shanghai Jiao Tong University (SJTU): 1) Influence of chord-to-thickness ratios on the characteristics of flow separation over a finite plate, the superimposed flow structures and their coupling with wall-pressure fluctuations. Three systems with different chord-to-thickness ratios were chosen for the comparison: L/D = 3, 6, and 9. The separated flow fields and wall-pressure fluctuations were measured using Particle Image Velocimetry (PIV) operating at 1K Hz and a microphone array sampling at 1K Hz, respectively. The PIV and surface pressure measurements were triggered by using the same trigger signal for accurate pairing of the measured velocity fields above the plate with the wall-pressure fluctuations on the plate’s surface. 2) Energy harvesting eel: a PVDF membrane placed behind a bluff body to harvest the energy from vortex shedding process. The flapping dynamics of the PVDF membrane placed behind a circular cylinder, which are closely related to its energy harvesting performance, were extensively studied near the critical regime by varying the distance between the cylinder and the membrane. Four different systems were used for the comparative study: a baseline system in the absence of the upstream cylinder, and three systems with different distances between the cylinder and the membrane (S/D = 0, 1, and 2). A joint POD analysis of the wall-pressure profile and the flow fields were performed on the paired measurement data set to elucidate the underlying physics.

Dr. Yingzheng Liu obtained his BS and PhD degrees in mechanical engineering from Shanghai Jiao Tong University (SJTU) in 1995 and 2000, respectively. Dr. Liu has been working as a faculty member in the Department of Power Machinery Engineering of SJTU after his graduation, and was promoted to the rank of full Professor in 2007. Dr. Liu has been served as the Associate Dean for International Affairs & Industrial Relations of SJTU School of Mechanical Engineering since 2009. Dr. Liu was a visiting scholar in Flow Control Lab in Korea Advanced Institute of Science and Technology (KAIST, South Korea) from 2002 to 2004. His research interests include flow separation and control; drag reduction and wake characteristics behind bluff bodies; advanced flow diagnostic techniques such as microphone arrays for wall pressure fluctuation measurements and time-resolved PIV techniques; advanced data processing techniques such as cross correlation, Wavelet, Proper Orthogonal Decomposition (POD), and Dynamic Mode Decomposition (DMD) for turbulent flow studies. Dr. Liu has published over 50 international journal papers, and 30 peer reviewed conference papers.