HKSTAM Hong Kong Society of Theoretical and Applied Mechanics 香港力學學會

香港科技大學 THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

Joint HKSTAM/MAE Distinguished Seminar

Simulation Tools for Aerospace Flexible Multibody Systems Dynamics

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Date: **18 October 2014 (Saturday)**
Time: **10:00 – 11:00 a.m.**
Venue: Mechanical Engineering Conference Room **2571 B** (via Lift 27/28, 2nd Floor), Academic Building Hong Kong University of Science and Technology
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ABSTRACT

In many aerospace flexible multibody systems, beam and shell models are often used to approximate structural components. Classical theories, such as Euler-Bernoulli or Kirchhoff-Mindlin theories, then form the basis of the analytical developments. The advantage of these approaches is that they lead to a very simple kinematic representation of the system. While these approaches are capable of capturing the kinetic energy of the structure accurately, they cannot represent the strain energy adequately. In this presentation, solutions of the theory of three-dimensional elasticity are developed based on a finite element discretization of the cross-section or normal material line for beams and plates, respectively. The problem is decomposed into an arbitrarily large rigid-section motion and a warping field. The sectional strains associated with the rigid-section motion and the warping field are assumed to remain small. As a consequence of this kinematic decomposition, the governing equations of the problem fall into two distinct categories: the nonlinear equations describing geometrically exact beams or plates and the linear equations describing local deformations, which provide the detailed distribution of three-dimensional stress and strain fields. The latter equations are particularly important when dealing with aerospace structures, which are often made of laminated composite materials. Within the stated assumptions, solutions of three-dimensional elasticity are obtained for beams and plates undergoing arbitrarily large motions.

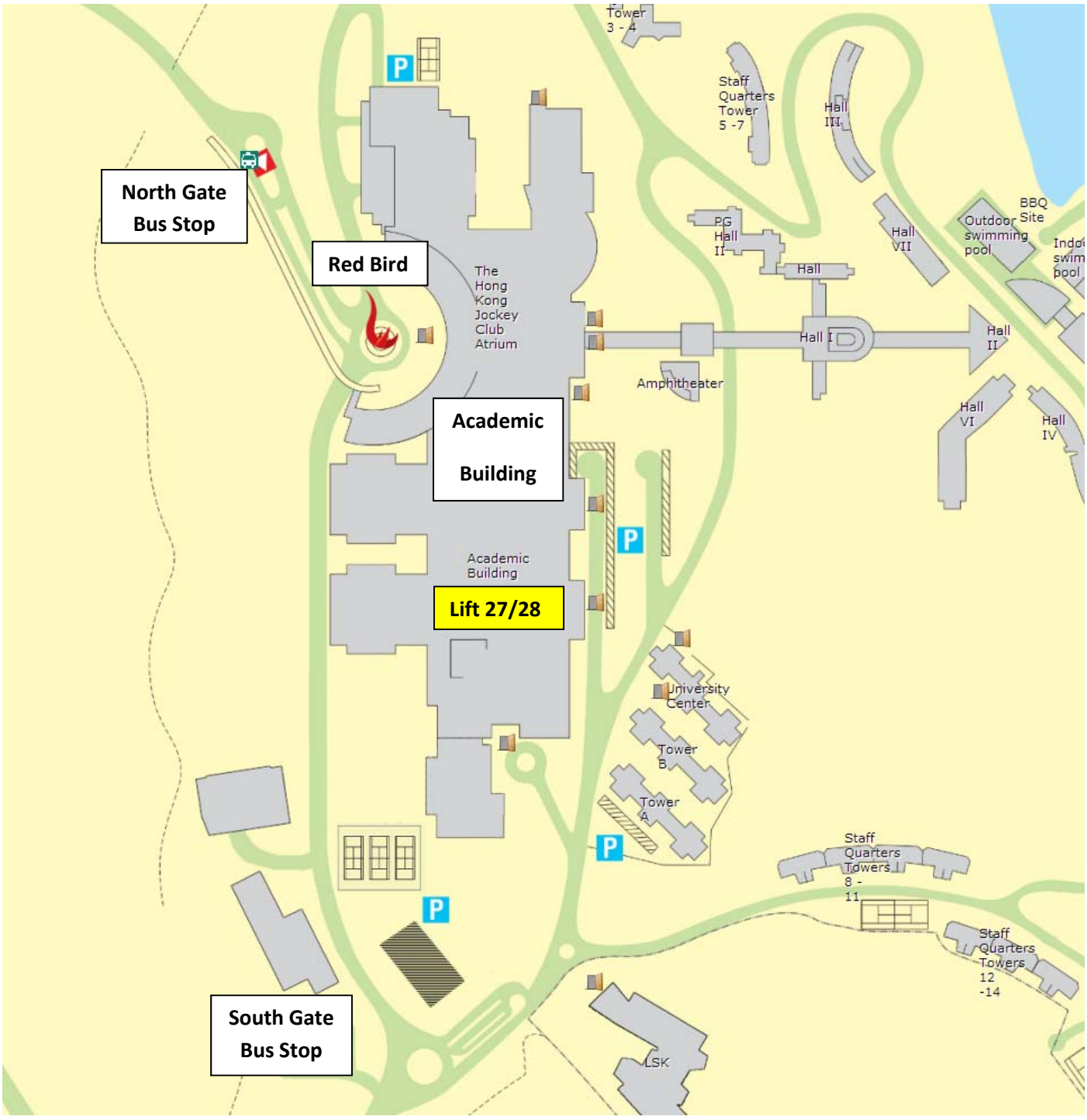
Biography of Speaker

Dr. Bauchau earned his B.S. degree in engineering from the State University at Liège, Belgium, and M.S. and Ph.D. degrees from the Massachusetts Institute of Technology. He is now professor at the Department of Mechanical and Aerospace Engineering at The Hong Kong University of Science and Technology. His fields of expertise include finite element methods for structural and multibody dynamics, rotorcraft and wind turbine comprehensive analysis, and experimental mechanics and dynamics. He is a Fellow of the American Society of Mechanical Engineers, senior member of the American Institute of Aeronautics and Astronautics,

and member of the American Helicopter Society. He is associate editor for the Journal of Computational and Nonlinear Dynamics, Multibody System Dynamics, the Journal of Multibody Dynamics, and the Journal of the American Helicopter Society. He has authored a book entitled “Flexible Multibody Dynamics,” which has won the 2012 Textbook Excellence Award from the Text and Academic Authors Association.

Map and Direction

(1) HKUST Campus map and Lift 27/28



(2) Public transport guide to HKUST https://www.ab.ust.hk/cso/transport_guide.htm