The 32nd & 33rd JUACEP Seminars

第 32&33 回 名古屋大学日米協働教育プログラムセミナー

Lecturer: Professor Shaker A. Meguid

Mechanics and Aerospace Design Laboratory, University of Toronto

BIOGRAPHY:
Professor Shaker Meguid obtained his Ph.D. in Applied Mechanics from UMIST, England. He taught different branches of Applied Mechanics in 4 continents: Europe (Oxford University, Cranfield University, UMIST, Milano Politecnico), North America (University of Toronto), Asia (Nanyang Technological University, Hunan University and Peking University) and Africa (Cairo University). His research activities have contributed significantly to the areas of aircraft design, nanocomposites, computational micro-nano--mechanics, multiscale modelling, advanced and smart composites, crashworthiness, fracture mechanics and failure prevention. Professor Meguid and his students won many awards including the recent innovation award in nanoengineering by ASME and the Ontario Professional Engineers Awards for Research and Development as well as the Robert Hooke's Award by the European Society for Experimental Mechanics for "Outstanding Contribution in the Field of Experimental Mechanics Applied to Mechanical Design and Materials".

Date: 7th September, 2015 (Mon)
Time: 13:30-14:30 (the 32nd Seminar), 15:00-16:00 (the 33rd Seminar)
Venue: Lecture Rm.222 (Rm. 246), Engg. Bldg. 2
***No registration required**

The 32nd Seminar (13:30-14:30)

"Computational Contact Mechanics Using Variational Inequalities: Theory and Applications"

ABSTRACT
Dynamic contact plays an important role in dictating the integrity, performance and safety of many engineering systems/components. Despite their importance, dynamic contact effects are frequently treated using oversimplifying assumptions, which neglect the main features of the problem. The reason is that modeling dynamic contact in solids poses mathematical and computational difficulties. With the application of loads to the bodies in contact, the actual surface on which these bodies meet, change with time, and the stresses at the surfaces are generally unknown and complex to determine. Analytical closed form solutions for contact problems were developed by Hertz in 1882. Hertz classical theory of contact was developed for elastic quasi-static frictionless bodies with the contact region being small compared with the dimensions of the contacting bodies. In spite of the fact that Hertz's theory of contact bas stood the test of time and has been a landmark in applied mechanics for many decades, it suffers from the above- mentioned severe restrictions.
In my presentation, three aspects of dynamic contact will be examined: (i) the development of appropriate dynamic variational inequalities expressions to accurately and consistently represent dynamic contact problems, (ii) the development of robust solution algorithms that guarantee the accurate imposition of the kinematic contact constraint and avoid interpenetration of the mating bodies, and (iii) evaluate the integrity of realistic engineering applications using the newly developed variational inequalities algorithms. These applications include crashworthiness, fretting damage in gas turbine engines and finger implants.

The 33rd Seminar (15:00-16:00)

"Multifunctional Nanocomposites: The Next Generation of Aircraft Composites"

ABSTRACT
Recent development in and utilization of materials, fillers, devices, and systems with dimensions on the order of 0.1 to 100 nanometres, exhibiting novel and significantly enhanced mechanical, physical, chemical, and biological properties, due to their nanoscale size, are attracting considerable attention from the scientific community. Fundamental understanding of synthesis, processing, and characterization of nano-tailored materials will render greater opportunities for their ultimate deployment in aerospace engineering. It is anticipated that the role-played by nanotechnology in developing multifunctional intelligent materials to be of major significance to the industrialized nations.The objective of this research is to provide greater understanding of the complex phenomena that take place at the nanoscale level in multifunctional nano-tailored composites. Specifically, attention will be given to the research activities and achievements in my laboratory in developing multifunctional nano-tailored adhesive bonds for aerospace applications. In particular, we introduce this multifunctionality, and a certain level of intelligence, by homogeneously dispersing carbon nanotubes, and other nanofillers, into high strength thermoset epoxy adhesives. Application of molecular dynamics and atomistic based continuum techniques to treat this class of intelligent multifunctional materials will be discussed and their viability for in-situ diagnostics examined.

Inquiry: JUACEP Office, Mech. Sci. Eng. (Ext. 2799)
問合せ：工学研究科JUACEP事務局 (内2799)

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