MATH-IMS Joint Pure Mathematics Colloquium Series
The Chinese University of Hong Kong

This Colloquium Series in Pure Mathematics is organized by the Department of Mathematics and the Institute of Mathematical Sciences (IMS) at The Chinese University of Hong Kong. The series focuses on all areas of pure mathematics together with theoretical developments and applications.

Date: December 2, 2022 (Friday)
Time: 9:30AM-10:30AM (Hong Kong Time)
Zoom Link: https://cuhk.zoom.us/j/98846779826

Capillary Gravity Water Waves Linearized at Monotone Shear Flows: Eigenvalues and Inviscid Damping

Speaker: Professor Chongchun Zeng
Georgia Institute of Technology

Abstract: We consider the 2-dim capillary gravity water wave problem -- the free boundary problem of the Euler equation with gravity and surface tension -- of finite depth $x_2 \in (-h,0)$. linearized at a uniformly monotonic shear flow $U(x_2)$. Our main focus are eigenvalue distribution and inviscid damping. We first prove that in contrast to finite channel flow and gravity waves, the linearized capillary gravity wave has two unbounded branches of eigenvalues for high wave numbers. They may bifurcate into unstable eigenvalues through a rather degenerate bifurcation. Under certain conditions, we provide a complete picture of the eigenvalue distribution. Assuming there are no singular modes (i.e. embedded eigenvalues), we obtain the linear inviscid damping. We also identify the leading asymptotic terms of velocity and obtain stronger decay for the remainders. This is a joint work with Xiao Liu.

Bio: Professor Zeng is a Professor of Mathematics at the Georgia Institute of Technology. He received his Ph.D. in mathematics at Brigham Young University in 1997. Before joining GIT in 2005, he spent 3 years as a Courant Instructor at the Courant Institute and 5 years as an Assistant Professor at the University of Virginia. Prof. Zeng works in dynamical systems and PDEs, including the regularity and dynamics of nonlinear PDEs and the general theory of infinite dimensional dynamical systems.