THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

DEPARTMENT OF APPLIED MATHEMATICS
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**The Hong Kong Polytechnic University**
**Department of Applied Mathematics**

**Colloquium**

# A decoupled, linear, and unconditionally energy stable finite element method for a two-phase ferrohydrodynamics model

**By**

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**Abstract**

In this talk, we present numerical approximations of a phase-field model for two-phase ferrofluids, which consists of the Navier-Stokes equations, the Cahn-Hilliard equation, the magnetostatic equations, as well as the magnetic field equation. By combining the projection method for the Navier-Stokes equations and some subtle implicit-explicit treatments for coupled nonlinear terms, we construct a decoupled, linear, fully discrete finite element scheme to solve the highly nonlinear and coupled multi-physics system efficiently. The scheme is provably unconditionally energy stable and leads to a series of decoupled linear equations to solve at each time step. Through numerous numerical examples in simulating benchmark problems such as the Rosensweig instability and droplet deformation, we demonstrate the stability and accuracy of the numerical scheme.

**Date: 21 February 2022 (Monday)**
**Time: 10:00-11:00 (Hong Kong Standard Time GMT +8)**
**Venue: Online Talk via Zoom (Meeting ID: 923 3837 0974)**
**Speaker: Prof. Xiaoming He, Missouri University of Science and Technology**
**Host: Prof. Zhonghua Qiao, The Hong Kong Polytechnic University**
**Click to join:**
**https://polyu.zoom.us/j/92338370974?pwd=N0NVbE1POWMzWUxKS3VRZCtDd1Q4dz09**

Click to join

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