



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

## **PHD STUDENT SEMINAR**

# **Kinetic model and multiscale simulation method of radiation plasma system**

By

**Miss Mingyu QUAN**

### Abstract

In this presentation, a kinetic model for the radiation plasma system is introduced, which couples the evolution of radiation, electron, and ion. The coupled system is solved by the gas-kinetic scheme (GKS), a hydrodynamic solver, for the electron and ion flow and the unified gas-kinetic scheme (UGKS), a multiscale solver, for the non-equilibrium radiative transfer, together with the momentum and energy exchange between these three phases. Due to the significant variation in fluid opacity across different regions, the radiative transfer process is simulated by UGKS, which can correctly model the photon transport, encompassing both free streaming and diffusive wave propagation. For the coupled system, the current scheme can recover the equilibrium diffusion limit for interaction between electron and radiative field. The proposed models and the numerical methods adopted compute several test cases, including radiative transfer in kinetic and diffusion regime, Marshak wave, radiative shock, and two-dimensional Sedov blast wave problem.

**Date : 9 May 2024 (Thursday)**

**Time : 11:30am**

**Venue : Room 4582 (Lifts 27-28)**

*All are Welcome!*