THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON APPLIED MATHEMATICS

Development of simplified kinetics models of the hydrocarbon fuel for oblique detonation wave phenomena based on detailed mechanism and shock tube data

By

Prof. Yang-Yao NIU
Department of Aerospace Engineering
Tamkang University

Abstract

This study develops simplified chemical kinetics mechanisms of the hydrocarbon fuel to efficiently, and robustly, simulate the flow problems induced by the oblique detonation waves (ODW). The mechanisms demonstrate that the controlling ignition delay time and heat release, based on the Chapman–Jouguet (CJ) condition, is the key to successfully simulating oblique detonations. Additionally, it was found that the size of the computational mesh influences whether the cellular structure is stably generated at a certain position or shifts downstream over time. This work highlights potential challenges in the ODW simulations, particularly the influence of intermediate species and fuel-air ratio on the formation of the CJ plane, which impacts detonation energy and stability. Furthermore, the proposed ATM reconstruction method, combined with AUSM+, effectively simulates discontinuities. The findings aim to support future researches in rapidly optimizing the design of oblique detonation wave engines (ODWE).

Date : **19 June 2025 (Thursday)**
Time : **11:00a.m.-12:00noon**
Venue : **Room 4504 (Lift 25/26)**

All are Welcome!