

# IOWA STATE UNIVERSITY

Mechanical Engineering

Translational AI Center

Richard and Carol Pletcher Seminar Series

## Non-intrusive Coupling Strategies for Multiphysics Simulations

**Prof. Lucy Zhang**

Department of Mechanical, Aerospace and Nuclear Engineering  
Rensselaer Polytechnic Institute

Faculty host: Anwesha Sarkar

**March 8, 2024 at 12:00 PM in 2206 SICTR**

### Abstract

In this talk, I will discuss computational strategies for multiphysics systems. Multiphysics involve multiple physical behaviors to be coupled for inter-related responses. To obtain stable, effective, and accurate coupled numerical solutions is not trivial. Traditional methods that are available in commercial software often generate numerical instabilities. I will present immersed computational technique for multiphysics modeling and as a numerical framework. Immersed methods allow for multiple discretized meshes to co-exist and overlap within one computational domain. It also provides the versatility in coupling multiple solvers that govern different physics. Finally, I will demonstrate its capability by show casing several energy and biomedical applications involving fluid-structure interactions, solid-solid interactions involving high impacts, and acoustics-fluid-structure interactions.

**Prof. Lucy Zhang** is a Professor at the Department of Mechanical, Aerospace & Nuclear Engineering at Rensselaer Polytechnic Institute (RPI). She is now serving as a Program Director in the Mechanics cluster: Mechanics of Materials and Structures (MoMS) and Biomechanics & Mechanobiology (BMMB) programs within the CMMI Division at NSF. She is a Fellow of ASME. She received her B.S. from Binghamton University in December of 1997, obtained her M.S. and Ph.D. from Northwestern University, IL, respectively. She joined Rensselaer Polytechnic Institute in 2006 and was later promoted to Associate Professor and Professor. Her research interests are building advanced and robust computational tools and software for accurate and efficient multiphysics and multiscale simulations that can be used for engineering applications in biomechanics, micro and nano-mechanics, medicine, and defense projects involving impacts. Her pioneer work in developing the Immersed Finite Element Method (IFEM) had been and is still being widely used in academic engineering and scientific communities. She is also the co-host of “This Academic Life” podcast series.

***This seminar counts towards the ME 600 seminar requirement for Mechanical Engineering graduate students.***

<https://www.me.iastate.edu/>

<https://trac-ai.iastate.edu/>