COLLEGE OF ENGINEERING
MECHANICAL ENGINEERING
UNIVERSITY OF MICHIGAN

Mechanical Engineering Seminar Series

# Mesomechanics experimental mechanics: dual beam-shear differential interference contrast microscopy


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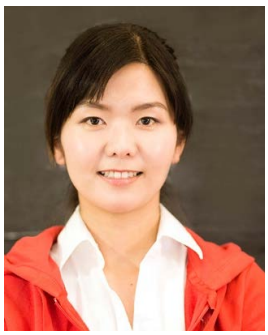

Tuesday, October 29, 2019
4:00 p.m.
2147 GG Brown


**Abstract**

Fast, precise, and cross-scale measurement of deformation underlies the foundation of modern experimental mechanics. Together with microstructure observation, it plays an irreplaceable role in a wide variety of interdisciplinary research, especially for functional materials having properties closely related to their microstructures and coherent finite strains. While we have outstanding methods for the determination of surface deformation such as digital image correlation, the fine microstructures can barely be observed simultaneously due to the blocking of speckle patterns. While we have excellent methods for the precise determination of surface topography such as atomic force microscopy, the in situ characterization of the dynamics within a sufficiently large area of interest is limited by the speed of probe. In this talk, I will introduce an optical method, which delivers the quantitative micrography with an in situ mechanical characterization by the dual beam-shear differential interference contrast (dual DInC) technique. It uses the

optical path gradient to mimic the fundamental definition of deformation gradient, and directly gives the u3,1 an u3,2 components of the displacement field. As a complement of digital image correlation, we implement the 4D (spatial plus time) measurement for 1. Stress-induced phase transformation of polycrystalline NiTi; 2. Thermal-induced phase transformation of CuAuZn and 3. Micro-ribbon buckling.

**Bio**

Professor Xian Chen is currently an Assistant Professor in the department of Mechanical and Aerospace Engineering at the Hong Kong University of Science and Technology. She received her Ph.D. and M.S. in Solid Mechanics from the department of Aerospace Engineering and Mechanics, University of Minnesota, United States. Afterwards, she worked at Lawrence Berkeley National Lab as the ALS Postdoctoral Fellow. Prof Chen was working at the Department of Mechanical and Civil Engineering, Caltech from 2015 to 2016 as a visiting faculty. The research of Prof Chen's group integrates the theories of mechanics of crystalline solids with advanced structural characterization methods and algorithms. Her group is also interested in the development of various new experimental approaches for nano- to meso-scale mechanics characterizations. In 2015, Prof Chen received the Early Career Award of Hong Kong.

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