Mechanical and Aerospace Engineering Seminar

Dr. Tariq Khraishi University of New Mexico (UNM)

Will present a talk titled:

Discrete Dislocation Dynamics (DDD) Simulations. What is it? And Why it Matters?

Abstract: Dislocations are the termed the "carriers of plasticity" for they are mainly responsible for plasticity accumulation in crystalline materials (single or poly-crystalline, also called multi-grain materials). Dislocations produce plastic strain through their movement which is induced by external loads or forces. The dislocations are a type of crystalline defects termed "line defects" and their motion in a crystal is not only affected by external loading but also by other defects and micro-constituents in the crystal. In order to explicitly capture these complex dynamics and directly account for the ensued plasticity, the DDD method was developed.

In this presentation, Prof. Tariq Khraishi, will present fundamentals related to the DDD method as well as its applications. First, the history of the method and its length and time scales will be discussed. Second, the link of this method to crystal plasticity through dislocation motion and interaction will be presented. Third, the numerics behind the method will be shown. After that, several examples demonstrating the power of this inherently multi-scale method will be presented. The examples span topics such as composite materials, free surface effects, irradiated materials, solid solution strengthening, etc.

Date: September 23, 2022 Location: CAMP 176 Time: 11:00 am

Join Zoom Meeting https://clarkson.zoom.us/j/99234191973?pwd=MkcvM1ZKYW85cWZrN0FOM31Tc3Vx QT09



Bio: Tariq Khraishi is originally from Jordan. He finished his B.S. (in 1994) and M.S. (in 1996) in Mechanical Engineering from the University of Idaho in Moscow, Idaho. His M.S. research focused on computational fluid dynamics studies of blood flow in a human abdominal aortic aneurysm. He then moved West seven miles across the Idaho-Washington state border to

join a PhD program in Mechanical Engineering at Washington State University in Pullman,

Washington. His PhD work, completed summer 2000, focused on dislocation theory and modeling (namely 3D discrete dislocation dynamics). His general area of expertise is in solid mechanics and computational materials science with particular emphasis on understanding structure-property relationships. Some of his areas of expertise relate to nanocomposites, biomechanics, eigenstrain theory and computations, finite-element modeling of solids and fluids, additive manufacturing, metamaterials, epitaxial growth of materials, and irradiated metals.

His work as a professor has been supported by NSF, DoD, NASA, two national laboratories (LLNL and SNL), and companies. He is well-published with over 150 refereed publications, many in top journals like Nature. He is on the editorial board for several journals, e.g. the ASME JEMT (Journal of Engineering Materials and Technology) and was a Founding Editor for the International Journal of Theoretical and Applied Multiscale Mechanics. He is currently serving on the National Board of Directors for ASEE (American Society for Engineering Education). He has won many awards for research and teaching. He has advised dozens of PhD and MS students. He is currently a Professor of Mechanical Engineering at the University of New Mexico.