Mechanical and Aerospace Engineering Seminar

Dr. Hesam Askari

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Will present a talk titled:

Strain engineering of 2D van der Waals materials for nano-electronic and quantum devices

Abstract: Strain engineering has been a prominent factor in industrial CMOS production since early 2000's. Many of the same concepts that drove this industry can be applied to 2D van der Waals materials to engineer new quantum materials. In particular, the change of properties due to applied mechanical strain provides a mechanism for tunable electronic and optical properties. 2D materials display many fascinating properties that arise from the confinement of electrons within their layers and how this confinement is strongly correlated with the periodicity of atoms and inter-layer interactions. This is an additional opportunity to manipulate atomic configurations and form with unique stacking that control overall properties of 2D materials.

In this talk, I present how exotic electronic and optical properties in 2D materials are related to their atomic configurations and how modifying interlayer/intralayer interactions drives reconstruction of atoms and bring about new properties. We use atomistic-level analyses to identify local regions and track their formation and evolution with strain using interpretive and fundamental physical measures. In addition, first principles are used to measure the phonon-related effects and interpret their electrical and optical properties. The data presented in this talk will cover 2D Metal Dichalcogenides (TMD), bilayer graphene (BLG) and Twisted Bilayer Graphene as specific material systems and assist in improving our understanding of the interplay between local and global properties in twistronics applications.

Date: September 9, 2022
Location: CAMP 176
Time: 11:00 am

Bio: Hesam Askari is an Assistant Professor of Mechanical Engineering at the University of Rochester. His research group focuses on computational and analytical approaches to study structure-property relationships in ordered crystalline materials, granular systems, and complex media. His group develops multiscale analytical and computational methods to investigate intrinsic and induced properties of materials to incorporate them more efficiently in engineering applications. Before joining UR in 2016, he received his Ph.D in Mechanical Engineering from Washington State University in 2014 and completed his postdoc training in the Department of Mechanical Engineering at Massachusetts Institute of Technology. His ongoing research is funded by National Science Foundation, NASA.