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Seminar Series

Multiscale Mechanics and Materials Research for Energy Efficiency and Extreme Environments

Hussein M. Zbib, Ph.D.
Professor, School of Mechanical and Materials Engineering
Washington State University

Thursday, April 20, 2017
9:30 AM ◆ CSF Darwin Room (1007)

Dr. Zbib's research expertise is in the area of thermo-mechanical behavior and properties of solids, and he is recognized for his work on the theory of dislocation dynamics and defects in metals. His other mechanics and materials interests include multiscale modeling, numerical analysis, plasticity, composites, materials instabilities, damage and fracture, dislocation theory, dislocation dynamics, crystal plasticity, defects, radiation effects, and nanomaterials. Dr. Zbib currently is a Fellow of the American Association for the Advancement of Science and American Society of Mechanical Engineers. He earned his Ph.D. in Mechanical Engineering and Engineering Mechanics from Michigan Technical University.

Efficient use of energy resources and development of alternative energy sources depend on new technologies that require designing new classes of materials with superior properties. This includes developing materials that possess a high degree of material reliability, energy efficiency (lightweight), structural stability, mechanical strength, high ductility, toughness, and resistance to fracture and fatigue for use in emerging technologies, such as next-generation airplanes and automobiles, fuel cell technologies, and new-generation nuclear reactors.

Dr. Zbib's presentation will provide an overview of research activities in these areas, focused on a multiscale experimental and computational predictive capability that enables fundamental insight into the performance of such materials. To illuminate the predictive capability of the multiscale approach, three cases will be highlighted: 1) design of a new class of nanoscale multilayer metallic/ceramic composites for use in extreme environments, 2) design of gradient nano-microstructures for superior strength-ductility, and 3) modeling and simulation of mechanical behavior of materials in irradiated environments.

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