Northeastern University
College of Engineering

February 18, 2026 | 108 Snell Engineering Center | 12:00PM

Distinguished Seminar Speaker

Realizing emergent properties in functional composite from directed assembly at the micro-scale

Prof. Randall Erb

Dept. of Mechanical & Industrial Engineering | Northeastern University | Boston, MA

Abstract: In this talk, I will present my labs recent work on directing the assembly of nano- and micron- scale colloidal ceramic particles within composite materials. Through our approach, we are able to tailor the internal microstructure of composite materials and drive meaningful changes to extrinsic properties ranging from mechanical to thermal. In the mechanical realm, fiber orientation is a dominate factor in anisotropic property outcomes. We leverage colloidal forces ranging from shear alignment to magnetic alignment to control particle orientation. We have determined routes for applying these colloidal forces in situ to additive manufacturing. In this way, we can construct objects that have control over complexity from the macroscale down to the micron scale. We highlight examples from bioinspired structures to theory-inspired structures to hinder crack propagation and substantially increase fracture toughness. Within the thermal realm, we have investigated routes for controlling particle percolation pathways within thermal composites to program thermal conductivity pathways within manufactured materials. We have also pushed the limits of percolation through both volume fraction and post-sintering processes. During these studies we've stumbled across a new family of ceramics that are thermoformable (similar to metals and plastics). This thermoformability is reliant on the underlying microstructure which can be set into the ceramic material with new additive manufacturing processes developed in our lab.

Biography: Randy Erb is a Full Professor and Associate Chair of Research of Mechanical and Industrial Engineering and the Head of the DAPS Laboratory and the RF and Thermal Laboratory at Northeastern University. Randy's research group focuses on multiscale synthesis and characterization of functional composite materials to impact diverse fields from structural composites to energy storage to thermal management. Randy's research group has developed new forms of AM including 3D magnetic printing, 3D mineralization printing, and vibration-assisted, tape-casting DLP printing. He has received a Northeastern Translation award for converting fundamental scientific breakthroughs into successful companies. Randy has co-authored ~50 journal publications, is co-inventor on 18 pending or issued patents, and is a co-founder of Fortify, Boston Materials, and Fourier.

Department of Chemical Engineering
201Cullinane Hall
Northeastern University
360 Huntington Avenue
Boston, MA 02115