

Department of Mechanical Engineering Seminar Series #1

11:30 am – 12:30 pm

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Engineering Technology Center Q207

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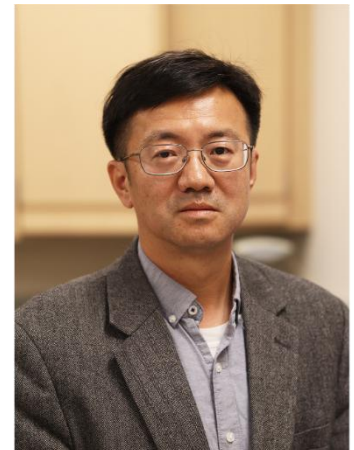
Multimaterial Additive Manufacturing for Shape-Morphing Structures and 4D Printing

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3D printing (additive manufacturing, AM), where materials are deposited in a layer-by-layer manner to form a 3D solid, has seen significant advances in recent decades. Multimaterial 3D printing has attracted significant research efforts in recent years. It offers the advantage of placement of materials with different properties in 3D space with high resolution, or controllable heterogeneity. In this talk, we present our recent progress in developing multimaterial additive manufacturing methods. In the first approach, we present a new development where we integrate two AM methods, direct-ink-write (DIW) and digital light processing (DLP), into one system. In this system, the DLP can be used to print complex bulk parts while DIW can be used to print functional inks, such as conductive inks and liquid crystal elastomers. In the second approach, we recently developed a grayscale DLP (g-DLP) 3D printing method where we use light intensity to control local properties and thus create structures with gradient material properties. We further investigate how to use machine learning to help the inverse design of 4D printing of shape-morphing structures with multimaterial additive manufacturing.

Dr. H. Jerry Qi is the Woodruff Professor in the George W. Woodruff School of Mechanical Engineering at Georgia Institute of Technology and is the site director of NSF IUCRC on Science of Heterogeneous Additive Printing of 3D Materials (SHAP3D). He received his undergraduate and graduate degrees from Tsinghua University and a ScD degree from MIT. After one-year postdoc at MIT, he joined the University of Colorado Boulder in 2004 and moved to Georgia Tech in 2014. Prof. Qi's research is in the broad field of nonlinear mechanics of polymeric materials and focuses on developing fundamental understandings of multi-field properties of active polymers through experimentation and constitutive modeling, then applying these understandings to application designs. He has been working on a range of active polymers, including shape memory polymers, light-activated polymers, and covalent adaptable network polymers, for their interesting behaviors such as shape memory, light actuation, healing, reprocessing, and recycling. In recent years, he has been working on integrating active materials with 3D printing. He and his collaborators pioneered the 4D printing concept. He is a recipient of NSF CAREER award (2007), Sigma Xi Best Faculty Paper Award (2018), Gerhard Kanig Lecture by the Berlin-Brandenburg Association for Polymer Research (2019), the James R. Rice Medal from Society of Engineering Science (2023), the T. H. H. Pian Award from International Conference on Computational & Experimental Engineering and Sciences (2024), and the ASME Warner T. Koiter Medal (2024). He was listed as one of the highly cited researchers by Clarivate in 2024 and 2025.



Coffee and light refreshments will be served