



**Kaushik Bhattacharya, Caltech**

Wednesday, May 8 | 8:10 - 8:50 a.m.

**“A Complete Thermo-Mechanical Model for Shape-Memory Alloys”**

Aaron Stebner, Tim Voss, Zach Brunson, Harshad Paranjape, Alex Kelly, Ryan Buessler, Kaushik Bhattacharya

The growing complexity of shape-memory alloy devices calls for a high fidelity material model that can be used for the design of such devices. Such a model should address all aspects of SMA behavior including the shape-memory effect, super-elasticity as well as permanent plastic deformation in a range of thermal and mechanical loading histories, including cyclic histories. Further, such a model should be amenable to use in standard commercial finite element packages. This talk will describe such a model. A salient aspect of the model is that it is formulated at the application scale, but implicitly incorporates the microscopic and microstructural physics using an internal variable thermodynamic framework. The talk will provide the background and insights that led to the model, an experimental approach that can be used to calibrate the model, describe its implementation in commercial finite element packages, and demonstrate its ability through selected examples.

**Keynote Biography**

Kaushik Bhattacharya is Howell N. Tyson, Sr., Professor of Mechanics and Professor of Materials Science as well as the Vice-Provost at the California Institute of Technology. He received his B.Tech degree from the Indian Institute of Technology, Madras, India in 1986, his Ph.D from the University of Minnesota

in 1991 and his post-doctoral training at the Courant Institute for Mathematical Sciences during 1991-1993. He joined Caltech in 1993. He has received the von Kármán Medal of the Society of Industrial and Applied Mathematics (2020), Distinguished Alumni Award of the Indian Institute of Technology, Madras (2019), the Outstanding Achievement Award of the University of Minnesota (2018), the Warner T. Koiter Medal of the American Society of Mechanical Engineering (2015) and the Graduate Student Council Teaching and Mentoring Award at Caltech (2013).