SHORT COURSE on Discrete and nonlocal structural mechanics

Noël Challamel, Professor, University of South Brittany, France

9am – 12pm, Tuesday June 6, 2023 (tentative, location TBD)
3 Professional Development Hours (PDHs)

Description: This course deals with the fundamental link between two branches of mechanics, discrete and continuous mechanics, mostly applied to structural mechanics problems. Bridging discrete and continuous mechanics is of crucial importance to better understand the behavior of matter at different scales, both for elastic and inelastic constitutive laws. One dimensional lattices such as discrete strings, discrete rods or discrete beams are considered, and are then generalized to two-dimensional media such as lattice plates or even three-dimensional lattices. The course will focus in details on discrete rods, also referred as Hencky-Bar-Chain, as introduced by Hencky at the beginning of the last century, with a particular emphasis of discrete and continuous instabilities. The nonlocal or gradient-type laws which emerge from a continualization procedure of such structural lattices are used for analysing the stability and the vibration of these so-called microstructured systems. Geometrical and material non-linearities may be also accounted for at the micro scale, thus generating some nonlinear nonlocal or higher-order gradient laws at the macroscopic scale. The course will end with differential and fractional nonlocality built from lattice mechanics.

Noël Challamel is a Professor at University of South Brittany (Université de Bretagne Sud – Lorient, France). He is the head of a research team in Civil Engineering and Multiscale Mechanics. His research at University of South Brittany mainly concerns civil engineering, theoretical and applied mechanics problems, with a particular emphasis on scale effects, structural mechanics, stability, vibrations and material modeling (Continuum Damage Mechanics and Plasticity). He is the co-author of several books in the field of mechanics and civil engineering. He has published over a hundred papers in high standard journals. He is often consulted as a referee in more than 50 international journals in Civil Engineering, Physics or Mechanics. He is member of the editorial board of a dozen of international journals, and is associate editor of the Journal of Engineering Mechanics (ASCE). He is also editor and head of the collection « Solid Mechanics and Mechanical Engineering » published by ISTE Wiley.