

DEPARTMENT OF MECHANICAL & AEROSPACE ENGINEERING

WILLIAM MAXWELL REED SEMINAR SERIES

“Experimental-Numerical analysis of anisotropic ductile fracture of stainless steel under biaxial loading”

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Abstract:

It is well known that metals experience ductile fracture and the loss of load-carrying capacity when plastic deformation reaches a certain limit. The prediction of ductile fracture in materials has real-world importance in the design and optimization of processes and products, leading to development of safer industrial components and materials. This talk will discuss the recent advancements in the study of ductile fracture using hybrid experimental-numerical method. The material of study is an austenitic, low-carbon stainless steel SS-304L, received in the tubular form (2.38 mm diameter and 0.15 mm thickness). The experiments are conducted by bursting the tubes under axial force and internal pressure along various proportional paths by controlling the force/pressure ratio. The results are used to calibrate a non-quadratic yield criterion to represent the anisotropic plastic behavior. The material model is employed in the finite element simulation of the tube experiments to probe the fracture parameters inside the tube wall where fracture is likely to initiate. A modified anisotropic ductile fracture criterion is proposed to capture the observed fracture anisotropy and the fracture forming limit curve of the material. The findings of this work are expected to establish a framework to reliably design processes and products with significant fracture anisotropy.

Speaker Bio:

Dr. Baral is an Assistant Professor in the Department of Mechanical and Aerospace Engineering at the University of Kentucky - Paducah campus. Before joining UK, he was a postdoctoral researcher at the John Olson Advanced Manufacturing Center at University of New Hampshire. He received his Ph.D. and M.S. in Mechanical Engineering from University of New Hampshire in 2020 and 2015, and received his B.S. in Mechanical Engineering and Nuclear Engineering (Double Major) from Idaho State University in 2013. His research and teaching interests include mechanics of forming processes (plasticity, constitutive modeling, finite element modeling, ductile fracture) and manufacturing process innovation (sheet stamping, tube hydroforming, and acoustic emissions).

Date: Friday, October 20, 2023
Place: Whitehall Classroom Building 110

Time: 3:00 PM EST
Contact: Dr. Jonathan Wenk

Attendance open to all interested persons