

## Midwest Mechanics Seminar Series



**Dr. Arun Shukla**  
Professor

**University of Rhode Island**  
Department of Mechanical,  
Industrial & Systems  
Engineering

**Thursday,**  
**November 21, 2019**  
**2:10 p.m.**  
**1235 Howe**  
**Iowa State University**

Open to all Iowa State  
faculty, staff, students,  
postdoctoral researchers,  
scientists and the public.

## Dynamic Instability & Fluid Interaction in Underwater Structures under Complex Loading Conditions

**Abstract:** This talk will present recent experimental results on the dynamic collapse of designed composite cylinders under complex loading conditions. Experiments are conducted to study the mechanics of implosion of single hull and double hull structures with and without confining conditions. Experiments are also performed to investigate sympathetic implosions and interaction of an imploding cylinder with a nearby structure. State of the art pressure vessel facilities are used to study the implosion process. These pressure vessels are outfitted with several windows to allow the use of the 3D Digital Image Correlation (DIC) technique. The pressure histories generated by the implosion event are captured from dynamic pressure transducers mounted close to the specimen in all the experiments. These pressure histories are then related to real time deformations and velocities occurring on the shells. High speed images are captured for better understanding of the deformation mechanisms and collapse modes of the structures during the experiments. 3D-DIC technique is utilized in conjunction with high speed photography to get quantitative information on the deformation of the collapsing cylinders. Displacements, velocities, and variations in the pressure profile are correlated to key stages of the collapse event to improve understanding of the failure process during the implosion of underwater structures.

**Biography:** Dr. Shukla is the Simon Ostrach Professor of Mechanical Engineering at the University of Rhode Island. He also serves as the Co-Director of the National Institute for Undersea Vehicle Technology (Collaborative Center). Dr. Shukla was elected to the Russian Academy of Engineering in 2015 and the European Academy of Sciences and Arts in 2011. He is a Fellow of the American Society of Mechanical Engineers, Fellow of the American Academy of Mechanics, and Fellow of the Society for Experimental Mechanics (SEM). He received the M.M. Frocht Award from SEM for "outstanding achievements as an educator in the field of experimental mechanics" and the B.J. Lazan Award from SEM for "outstanding technical contributions to the understanding of dynamic phenomena in engineering materials and structures." He received the Taylor Award and the Tatnall Awards from SEM in 2012. Dr. Shukla presented the prestigious Murray Lecture at the 2011 SEM conference. In 2003 he served as the President of SEM. He has served as the Technical Editor of the international journal Experimental Mechanics and currently serves on the Editorial Boards of key engineering journals. He has also served on the National Research Council on the United States National Committee on Theoretical and Applied Mechanics. Dr. Shukla has received the Distinguished Alumnus Award from his alma mater, IIT Kanpur. Recently, he also served as the chair of the Executive Committee of the Applied Mechanics Division of ASME. Along with his many Ph.D. and M.S. students, he has published more than 350 papers in refereed journals and proceedings. Dr. Shukla has authored and edited 10 books, and has delivered numerous plenary and keynote lectures.