



Indian Institute of Technology Kanpur

C. N. R. Rao Lecture Series

January 31, 2025 (Friday) | 5.00 pm | L - 16

Speaker: Prof. Bishakh Bhattacharya

Dept. of Mechanical Engineering

Talk Title

Smart Structures Unleashed: Innovating Intelligent Autonomous Systems (IAS)

In this talk, the speaker begins with their journey at the SMSS lab, IIT Kanpur on the application of piezoelectric and magnetostrictive materials for active shape and vibration control of simple smart structural elements resulting complex application potentials in the field of flexible manipulators and rotors. The talk will then focus on some important field-robot applications with uncertain environments such as Pipe Health Monitoring for the transportation of natural gas and fault inspection of power-substations, where through the use of standard rigid mobile robots empowered with embedded intelligence provided by multiple sensory system, they have been able to monitor the environment with limited success.

Subsequently, he will discuss about the application of smart materials in more flexible and adaptive autonomous systems such as Reconfigurable Space Antenna and Bionic Arm for prosthesis by using distributed actuation system. Finally, the speaker will talk on embedding further physical intelligence into smart structures using metamaterials and metastructures. He will conclude with their future vision of developing hybrid intelligent systems with the help of such smart structures and their possible application in extreme mechanical systems such as ocean bottom seismometers.



Prof. Bishakh Bhattacharya is a distinguished faculty member in the Department of Mechanical Engineering, IIT Kanpur. He holds his Ph.D. from the Indian Institute of Science (IISc) Bangalore. At IIT Kanpur, Prof. Bhattacharya has held several key positions, including serving as the Head of the Design Programme and Cognitive Science Programme. He is currently coordinating the Space Technology Cell and the Imagi-neering Lab at the Institute. His research interests encompass active and passive vibration control, structural health management, robotics and automation, intelligent system design, and child-robot interaction. Prof. Bhattacharya has been a visiting professor at the University of Sheffield, collaborating on structural health monitoring of complex autonomous systems, and at IPS-Waseda University in Japan, where he co-developed pipe health monitoring robots. He is also working with the Kyushu Institute of Technology collaborating on child-robot interaction studies. Prof. Bhattacharya's extensive experience and contributions have significantly advanced the fields of smart structures and intelligent system design, both in India and internationally.

About C.N.R Rao endowed Lecture Series

This lecture series was made possible by a generous donations by Prof. C.N.R. Rao, Linus Pauling Professor at JNCASR, Bangalore. The objective is to give one faculty member of the IIT Kanpur, each year, the honor of delivering a lecture to the institute's community, sharing the excitement of his/her research with them. Prof. Rao was a Professor of Chemistry at IIT Kanpur from 1963-76. During this period, he served as the Dean of Research and Development. Prof. Rao also served as the chairman of BoG at IIT Kanpur from 2003 to 2006. Prof. Rao completed his Ph.D. from Purdue University in 1958 and became a research chemist at the University of California at Berkeley. During 1984-89, he served as the Director of IISc Bangalore. He was the founder president of Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR), Bangalore. He received Bharat Ratna, the highest civilian award in India in the year 2014. He is the recipient of most of the major scientific awards and is a member of all major scientific organizations. He is a foreign member of the US National Academy of Sciences, American Academy of Arts and Sciences and also a Fellow of the Royal Society (London).

Office of Dean Research & Development