



**Auckland University of
Technology
New Zealand**



**SPARC Workshop
on**

The Role of Tribology in Industry 4.0

September 06 & 07, 2025

**Venue: Department of Mechanical Engineering,
Indian Institute of Technology (BHU) Varanasi**

About SPARC:

The Scheme for Promotion of Academic and Research Collaboration (SPARC) aims at improving the research ecosystem of India's Higher Educational Institutions by facilitating academic and research collaborations between Indian institutions and the best institutions in the world from 28 selected nations to jointly solve problems of national and/or international relevance.

Programme Overview:

Tribology is the science that addresses the fundamental problems of friction, wear, and lubrication, all of which are critical to the performance and reliability of machines. These three phenomena are directly linked to surface degradation, which can lead to reduced efficiency, increased downtime, and ultimately mechanical failure. As an inherently interdisciplinary field, tribology draws upon physics, chemistry, mathematics, materials science, and mechanical engineering, bridging the gap between fundamental research and applied industrial practices. While the term itself is modern, tribological principles have been in use since ancient times, long before the formal rise of industry. Throughout history, tribology has been intrinsically tied to industrial development. Each industrial revolution has brought new materials, technologies, and processes, along with fresh tribological challenges. Now, as we enter the era of Industry 4.0, tribology remains as relevant as ever. The current demand for energy-efficient, high-performance, and long-lasting components makes tribology essential not only in machine design but also in real-time condition monitoring, such as online lubricant diagnostics, which help extend component life. Tribological innovations have driven progress in industrial technology, just as technological progress has introduced new tribological problems. This dynamic interaction ensures that tribology continues to be a core enabler of industrial advancement.

Workshop objectives and topics to be covered

The workshop aims to disseminate knowledge in the critical domain of tribology, a scientific and engineering discipline with far-reaching implications for the economy, environment, and overall quality of human life. It also serves as a platform to foster interactions within the broader scientific community, promoting collaborative research and innovation. The workshop will focus on a wide range of contemporary themes, including tribology in manufacturing, energy conservation, maintenance, monitoring and diagnostics, advanced engineering technologies and materials, bio-tribology, high-temperature tribology, coating systems, biomimetic cartilage implants, nano-tribology, triboelectric nanogenerators for energy harvesting, metamaterials with tailored frictional properties, and self-lubricating materials.

Resource persons / Speakers

Subject experts are from *AUT, New Zealand* and various IITs, CSIR Laboratory and R&D Labs.

- Prof Zhan Wen Chen, AUT, New Zealand
- Prof. M S Bobji, Department of Mechanical Engineering, IISc, Bangalore
- Prof Raj Kumar Pandey, Department of Mechanical Engineering, IIT Delhi
- Prof M F Wani, Department of Mechanical Engineering, NIT Srinagar
- Dr. Harish C. Barshilia, CSIR-National Aerospace Laboratories, Bangalore
- Dr. Manjesh Kumar Singh, Department of Mechanical Engineering, IIT Kanpur
- Dr. Anup Kumar Keshri, Metallurgical and Materials Engineering, IIT Patna
- Dr. Kartik Pondicherry, Anton Paar in Graz, Austria.

About International Expert Prof. Zhan Wen Chen, and AUT, New Zealand

Prof. Zhan Wen Chen is a leading academic in Materials and Manufacturing Engineering at Auckland University of Technology, New Zealand. He holds a Ph.D. and M.Eng. from the University of Auckland and a B.Eng. in Materials Engineering from Central South University, China. With over 30 years of research and teaching experience, he has made significant contributions to additive manufacturing, friction stir welding, and the mechanical behaviour of advanced alloys. Prior to joining AUT, he held senior research

roles at CSIRO and Pasminco Ltd in Australia. At AUT, he has served as Head of Research and Head of Doctoral Studies, playing a pivotal role in boosting the school's research output and doctoral enrolments. Prof. Chen has published widely in top-tier journals and co-edited the authoritative book *"Friction Stir Welding—from basics to applications."* He is renowned for bridging advanced materials research with industrial applications and mentoring emerging scholars.

About the Indian Institute of Technology (BHU) & Department of Mechanical Engineering

Indian Institute of Technology (BHU) Varanasi is one of the 23 IITs established as Centres of Excellence for education, research, and innovation in science, engineering, and technology in India. The institute traces its roots to the merger of three historic colleges of Banaras Hindu University—BENCO, MINMET, and TECHNO—into the Institute of Technology (IT-BHU) in 1968. Since 1972, it has admitted students through the prestigious IIT Joint Entrance Examination (JEE) and has consistently ranked among the top engineering institutions in the country. In 2012, IT-BHU was conferred IIT status by an Act of Parliament and recognized as an Institution of National Importance. The Institute currently comprises 11 engineering departments, 3 science departments, 3 interdisciplinary schools, and a department of humanities. Its alumni have made significant contributions worldwide across industry, academia, administration, politics, and social service.

Department of Mechanical Engineering

The Department of Mechanical Engineering is equipped with state-of-the-art research infrastructure in areas such as surface coatings, metal matrix composites, tribology, bio-tribology, lubricant evaluation, and galling assessment. It has executed numerous sponsored projects funded by national agencies like DST, DRDO, BRNS, and AICTE. The faculty actively collaborates with top universities and research organizations across the globe, advancing both fundamental research and industry-relevant innovation.

Who will benefit from the workshop?

The workshop will be conducted in face-to-face (offline) mode only. Faculty members, students (UG/PG), research scholars from all disciplines, industry professionals, and participants from R&D organizations are invited to attend the workshop at the Department of Mechanical Engineering, Indian Institute of Technology (BHU), Varanasi. There is no course or registration fee to attend the workshop. However, all interested participants must complete the registration form to confirm their interest. Efforts will be made to provide hostel accommodation for student participants, subject to availability. Participants wishing to stay at the IIT(BHU) Guest House can be accommodated on a payment basis, and they are requested to inform us well in advance. The number of participants is limited to 40, and shortlisting will be done on a first-come, first-served basis. All participants will receive a certificate of participation upon successful completion of the workshop.

About Varanasi

Varanasi, often regarded as the oldest living city in the world, is revered as the spiritual capital of India. Situated on the sacred banks of the River Ganges, the city holds immense historical, cultural, and religious significance. Renowned for its ancient temples dedicated to Lord Shiva, the holy site of Sarnath associated with Lord Buddha, and the revered Sankat Mochan Temple, Varanasi is a confluence of diverse spiritual traditions. A premier centre for oriental learning, Varanasi has also embraced modern education and research, creating a unique blend of tradition and progress. Its rich cultural heritage, spiritual depth, and vibrant intellectual atmosphere draw scholars, pilgrims, and visitors from around the globe, making it a truly magnetic and transformative destination.

Course Coordinators:

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Registration Link



<https://forms.gle/7zAbFnFoerjPrxQA7>