ME Seminar

The Importance of Multidisciplinarity in Engineering Interfaces – from Fundamentals to Applications

Prof. Daniele Dini, Vice-Dean (Research) of Faculty of Engineering, and Professor of Tribology, Imperial College, London, UK

ABSTRACT

The talk will cover recent advances in modelling aspects of a variety of problems where the behaviour of surfaces and interfaces controls the performance of engineering systems. It will start with an overview of the modelling tools developed to study interfacial and rheological phenomena as well as the origin of damage and wear phenomena across the scales, specifically looking at the interplay between different mechanisms and at how to use physics-based and data-driven models to provide fast and accurate solutions that can be used to place interfaces at the centre of our design strategies. I will then move onto demonstrating how in-silico experiments can be used to shed light on physical, chemical and mechanical phenomena that affect frictional interactions, damage initiation and engineering performance in several applications in the energy sector, including electric vehicles (EVs) and triboelectric nanogenerators (TENGs), biomedical applications, consumer goods, and functionalized and hierarchical materials and surfaces.

ABOUT THE SPEAKER

Professor Daniele Dini FREng is Vice-Dean (Research) for the Faculty of Engineering and a Professor in Tribology at Imperial College London. He is internationally recognised as a leader in the development and application of computational methods for studying applied mechanics, materials biomechanics and tribological problems. His group is at the forefront of the development of multiscale and multidisciplinary high-fidelity approaches that capture the physics of critical interfaces, from the underlying molecular scale to the macroscale seen by engineer and clinicians as performance, e.g. energy efficiency, longevity and reliability. He is currently a Shell/RAEng Research Chair in Complex Engineering Interfaces, and his group has developed many advanced modelling tools for the design of new materials, biomedical and engineering solution. These scientific breakthroughs have also been recognised by the prestigious inaugural Peter Jost Tribology Award in 2021 and the Tribology Trust Silver Medal in 2022, as well as several other personal and group awards. His group performs fundamental research, while successfully supporting the application of tribology in industry; the strong links with industrial partners have led to the Imperial President's Award and Medal for Excellence in External Collaboration and Partnerships (2017). Professor Dini has written more than 400 journal articles and has delivered more than 50 invited and keynote/plenary talks to discuss his innovative research in the last 10 years.

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