Preface

Understanding how materials perform under stress, degrade over time, and interact with their environment is at the heart of modern mechanical engineering, etc. This special edition unites studies devoted to the mechanical behaviour, durability, and surface performance of advanced structural materials—highlighting both fundamental principles and practical ways for analysis and structural protection that support safety and durability.

Chapter 1: Cracks and Failures in Laminates and Hybrid Materials investigates the mechanisms of damage initiation and propagation in composite materials and structures. It presents analytical, numerical, and experimental approaches to understanding fracture behaviour, interfacial bonding, and fatigue in layered and hybrid composites—materials increasingly vital to aerospace, automotive, and structural engineering.

Chapter 2: Strength of Materials, Corrosion and Tribology focuses on the interplay between mechanical integrity, chemical stability, and surface wear. The studies explore how stresses, corrosive environments, cavitation erosion and frictional processes influence material lifetime and performance, providing strategies for improving resilience and reliability through design optimisation and protective treatments.

The presented research results illustrate the continuous effort to connect theory with practice in the study of material degradation and mechanical performance. This special edition aims to serve as a valuable reference for engineers and researchers seeking to advance the strength, safety, and sustainability of modern structural materials.