

BRIDGING PHYSICS AND DATA: EXPERIMENTAL, ANALYTICAL, NUMERICAL, AND AI APPROACHES TO COMPOSITE FATIGUE AND FRACTURE

Special Session organised by the
TC03 Fatigue of Engineering Materials and Structures of the European Structural Integrity Society (ESIS)

Fatigue and fracture of composite materials present great challenges to reliability and durability of engineering structures. The combined interplay among microstructural mechanisms, environmental conditions, and loading histories necessitates approaches that combine conventional physics and modern data-driven techniques.

This Special Session aims to bring together researchers and engineers from academia and industry to explore novel means for modelling, testing, and predicting fatigue and fracture behaviour in composites. We welcome contributions in the form of experimental studies, analytical and numerical modelling, or the use of artificial intelligence and machine learning in areas such as data interpretation, model calibration or enhancing designs.

Topics - but are not limited to:

- Experimental methods for fatigue and fracture in composite materials
- Numerical simulations and multi-scale modelling
- Analytical and probabilistic approaches
- Physics-informed and AI-driven predictive models
- Data acquisition, fusion, and digital twins for damage monitoring
- Applications in aerospace, automotive, marine, and renewable energy sectors

Session Chairs

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