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STATIC AND DYNAMIC ANALYSIS OF BEAM-LIKE STRUCTURES TRACK 900

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ABSTRACT

Beam theories have been used to model structures across different length scales. Examples include carbon nanotubes at the nanoscale (with bond lengths in the order of $1\,\text{Å} = 10^{-10}\,\text{m}$) to long pipelines at the macro scale (exceeding hundreds of meters). Studies include the phenomena of instability and resonance observed at different scales, which can threaten the safety of engineering systems, provide opportunities for new generations of energy harvesters and nano-sensors, offer powerful interpretations of biomechanical functions, etcetera.

A vast body of technical literature exists in which the mechanical properties of beam-like structures (BLS's) are lumped at their centroidal axis (e.g. the Euler-Bernoulli and Timoshenko beams), neglecting slippage between adjacent fibres. Little attention has been comparatively paid to the effects of partial interaction between individual components in a composite system, e.g. multiple slender elements connected through deformable layers, although such arrangements can play a fundamental role in some static configurations and vibrational regimes. Possible examples at different scales are grouted connections at the transition piece in offshore wind turbines and Van der Waals interactions between molecular chains.

The proposed minisymposium aims to bring together researchers working on analytical and numerical methods for the static and dynamic analysis of BLS's at different scales, including (but not limited to):

- Composite BLS's made of multiple continuous strands with distributed connections;
- BLS's with nonlocal elasticity and non-viscous damping;
- Application of BLS's models to study stability and vibration problems at different scales;
- Propagation of model uncertainties;
- Beam theory at the nano-scale;
- Application of beam dynamics such as nano-mechanical sensors, vibration energy harvesters, vibration of slender towers;
- Comparisons with experimental studies;
- Advanced analytical methods;
- Combined vibration and buckling problems.