

## Fuzzy Set Approach to Modelling Composite Mechanical Properties

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Abstract In the analysis of engineering problems three different approaches are used depending on the nature and extent of uncertainty by the introduction of the uncertainty triangle: probabilistic methods, a fuzzy set approach and an anti-optimisation. In the paper we intend to present qualitative and quantitative differences of results (understood in the sense of composite mechanical properties) comparing two models: a deterministic and the second, which is based on the fuzzy, set approach. They are used in the description of two composite materials – a unidirectional and a textile (a twisted yarn composite). In both cases, the fuzziness of variables is expressed by the triangular membership function. The variability (understood as the fuzziness) of material and geometrical parameters is taken to be equal to  $\pm 10\%$ , whereas the nominal (average) values correspond to  $\alpha=1$  and are equivalent to the deterministic description. The vertex method associated with the  $\alpha$ -cuts representation of the membership functions is used to derive the upper and lower bounds of fuzzy output variables.

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