

Teacher: Prof. Marcin Kamiński

Łódź University of Technology, Poland

Department of Structural Mechanics

Faculty of Civil Engineering, Architecture and Environmental Engineering

6 Politechniki Street

93-590 Łódź, Poland

<https://p.lodz.pl/en/research/most-prominent-scientists/professor-marcin-kaminski>
marcin.kaminski@p.lodz.pl

Title of Seminar 2: Probabilistic entropies in structural dynamics

Abstract: This seminar is devoted to an introduction of probabilistic entropy and distance. Their applicability and significance in uncertainty quantification and reliability assessment for linear and nonlinear structural dynamics are discussed. An implementation and application of the Finite Element Method together with some numerical difference approaches is demonstrated. The FEM examples include the studies delivered in two commercial systems – ROBOT and ABAQUS. Numerical analysis includes first of all a comparison of the basic probabilistic characteristics of the dynamic response of the Newmark method with the Hilber-Hughes-Taylor approach. The basic sources in uncertainty quantification are geometrical features of different structures, their geometrical imperfections, and of course also environmental actions on the slender structures. Determination of the Shannon entropy in this context together with the additional computational implementation in the system MAPLE will be shown. A collection of different relative entropy models and their significance in the dynamic reliability analysis would be demonstrated from both mathematical and numerical point of view. Some fundamental engineering case studies related to steel cables, frames, plates, masts and towers will be discussed in detail, where a contrast of the traditional reliability indices with these coming from relative entropy apparatus will be demonstrated.