

# Einladung zum Seminarvortrag im Aachener Mechanik & Statik Kolloquium

11. Januar 2018 | 10:00 – 12:00 Uhr

LuF Kontinuumsmechanik; Kackertstraße 9 | Seminarraum C 301



## „Probabilistic modeling of structural failures for a prediction of mechanical engineering elements reliability”

**Prof. Dr. Eng. Sc. Oleksiy Larin**

**National Technical University**

**“Kharkiv Polytechnic Institute” (NTU KhPI)**

**Department of Dynamics and Strength of Machine | UKRAINE**

The presentation describes a problem of the development of computational methods of determination of mechanical engineering elements life-time with random material characteristics and load. A general theoretical formulation of the reliability analysis and probabilistic engineering modeling is shown as well as some practical applications.

The problem of the analysis of the reliability of corroded steel pipelines is discussed as one of practical example. A usage of polymer bandage for their repair is discussed.

As one of the other important practical aspect of the probabilistic modeling it is shown the problem of estimation of the life-time of rubber elements based on creation of probabilistic mathematical models describing fatigue damage accumulation. The work presents improved probabilistic models of the fatigue damage accumulation in the subject materials under cyclic deformation with finite strain amplitudes in the framework of continuum damage mechanics. The appropriate models take into account a random scatter of the material fatigue resistance characteristics, along with simultaneous stochastic processes of material properties degradation caused by natural aging. The approaches have been developed for determination of the probability characteristics of the machine elements fatigue damage and life-time considering presence of possible operational random variation of the characteristics of the deformed state. New analytical formulations have been obtained for the determination of a one-dimensional probability density function or the process of damage fatigue accumulation basing on the offered mathematical models. A relation between the characteristics of the classical S-N curve and parameters of a fatigue damage kinetic equation within the offered model has found. It allows to determine the required damage parameters basing on the known experimental data.

Results of series of experimental researches are analyzed for a typical rubber materials and textile reinforced rubber composites. The study has been performed for specimens before and after artificial aging. A problem of material self-heating due to the cyclic load is discussed.

**Prof. Dr.-Ing. M. Itskov, Lehr- und Forschungsgebiet für Kontinuumsmechanik, RWTH Aachen**

**Prof. Dr.-Ing. habil. S. Klinkel, Lehrstuhl für Baustatik und Baudynamik, RWTH Aachen**

**Prof. Dr.-Ing. B. Markert, Institut für Allgemeine Mechanik, RWTH Aachen**

**Prof. Dr.-Ing. S. Reese, Institut für Angewandte Mechanik, RWTH Aachen**

**Prof. K. Veroy-Grepl Ph.D., AICES, RWTH Aachen**