

Department of Mathematical Sciences
Colloquium

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**OVERVIEW OF THE METHODS FOR SOLUTION
OF THE EQUATIONS WITH INTERVAL PARAMETERS
AND ITS APPLICATIONS IN STRUCTURAL MECHANICS**

Many engineering problems (e.g. buildings, bridges, towers, machines, cars, planes, geotechnical problems, oil engineering problems, heat transfer etc.) can be described by the equations of continuum mechanics. From mathematical point of view this is usually system of partial differential equations.

$$A(x, u) = b(x) \quad \text{for } x \in \Omega \quad (1)$$

Today, many efficient systems exist for the solution of these mathematical problems (e.g. ANSYS, ABACUS, ADINA, NASTRAN etc.) which are currently used to the solution of real world engineering problems.

In order to describe mathematical problem precisely it is necessary to know the exact value of the geometrical parameters (height, width etc.), material parameters (Young modulus, Poisson number etc.) and loads (point loads, distributed loads etc.). Unfortunately, in many practical situations exact values of such parameters are not known exactly, and very often it is not possible to get appropriate reliable probabilistic characteristics. In such cases, in order to describe the value of the parameters p_i it is convenient to apply the imprecise probability. In the simplest case we can assume that the parameters p_i belong to the intervals $p_i \in [\underline{p}_i, \bar{p}_i]$. In such case the solution of the equations of structural mechanics is a set which can be described in the following way

$$\tilde{u}(x) = \left\{ u(x, p) : A(x, u, p) = b(x, p), p \in [\underline{p}, \bar{p}] \right\}. \quad (2)$$

There are many methods for the calculation of the set $\tilde{u}(x)$. In this presentation an overview of the efficient methods for the solution of the interval equation (2) will be presented. The set valued solution $\tilde{u}(x)$ can be applied in the design process. In the presentation the concept of the interval limit state function will be presented.

Friday, September 11, 2009 at 3 pm in Bell Hall 143
The University of Texas at El Paso

Refreshments will be served in front of the colloquium room,
15 minutes before the start of the colloquium.