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RELIABILITY ANALYSIS IN STRUCTURAL MECHANICS

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Abstract. An introduction to some basic aspects of reliability analysis in structural mechanics is presented. A first part dealing with reliability analysis of reinforced concrete structures considering stochastic fields is developed. Classical methods, such as FORM and Monte Carlo Methods with Importance Sampling, are employed. Viscoelastic (with aging) as well as corrosion (due to carbonation) effects on the structural behavior are also analyzed. Reliability Analysis and Reliability Based Design Optimization (RBDO) of laminated composite material structures are presented in a second part. As in the first part, FORM and Monte Carlo Methods with Importance Sampling, are also employed. Finite Element Method (FEM), Artificial Neural Networks (ANNs) and Genetic Algorithms (GAs) are used. Two types of Artificial Neural Networks with supervised training and feed-forward architecture are employed (Multilayer Perceptron Neural Networks and Neural Networks with Radial-Basis Functions). Artificial Neural Networks are useful to reduce substantially the computational processing time. Genetic Algorithms are a suitable technique to optimize laminated composite material structures taking into account some problem characteristics such as discrete variables and non-smooth responses, avoiding stagnation in points with local minimums (Genetic Algorithms do not use variable gradients like deterministic optimization methods). Finally, some conclusions and remarks are summarized.