

Random vibrations and Monte Carlo simulations (2CFU 16h)

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Often in dynamic analysis of complex structures, when several variables must be taken into account, a non-deterministic approach is needed. In this context, an important issue is related to the well-known random vibrations. This stochastic behavior occurs in several mechanical problems, specifically, some structural systems are forced by an external loads that must be modeled as random processes. In this manner the structural displacements are random as well, and the dynamic analysis must be driven with the aid of proper tools of the stochastic mechanics. In this regards, an important approach is based on Monte Carlo simulations. This method allows us to obtain a complete characterization of the structural response in terms of output process defining its statistical parameters. The present course aims to provide some useful concepts related to this kind of stochastic analysis providing some advanced mathematical tools. These concepts may be useful in the solution of advanced problems in civil and mechanical engineering. Dynamic analysis of continuous and lumped parameters structural models forced by stochastic loads will be performed. Numerical applications will be also presented and solved with the aid of specific calculus tools (Matlab and Mathematica).