INTRODUCTION AUX VIBRATIONS ALÉATOIRES

INTRODUCTION TO RANDOM VIBRATIONS

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| Lecturers : 12.0 | TC : 8.0 | PW : 8.0 | Autonomy : 0.0 | Study : 4.0 | Project : 0.0 | Language : AN

Objectives

Many mechanical engineering problems concern the vibratory response of mechanical structures subjected to random forces. Examples include slender structures excited by wind, offshore platforms excited by wave action, road-excited vehicles, buildings subjected to earthquakes, frictional noise induced by roughness, aircraft fuselages excited by a turbulent boundary layer, etc. The objective of this course is to provide the student with elements of random vibrations. We will introduce the concepts of random signals and their spectral properties and provide methods for estimating the probabilistic

Keywords : Vibration, linear systems, stochastic process, spectral properties

Programme	Chapter 1 Stochastic processes Generalities of probability, random variable, random vector, stochastic process, spectral analysis, continuity, derivation, integration Chapter 2 Vibrations in small deformations 1 degree of freedom oscillator, n degree of freedom systems, deformable solids Chapter 3 Spectral Response of Linear Systems Presentation of the problem, average, correlation and spectrum of the response, correlation and spectrum between excitation and response Chapter 4 Threshold and Maximum Probability
Learning outcomes	• Know how to calculate and interpret the power spectral densities of random signals • Know how to calculate the frequency response functions of simple mechanical systems • Know how to estimate the spectral quantities of the responses of linear systems excited by random signals
Independent study	Objectifs : This activity is not concerned with framed autonomy activities outside personal work. Méhodes : This activity is not concerned with framed autonomy activities outside personal work.
Core texts	A. LE BOT, *INTRODUCTION AUX VIBRATIONS ALÉATOIRES.* , DUNOD, 2019 A. LE BOT *FOUNDATION OF STATISTICAL ENERGY ANALYSIS IN VIBROACOUSTICS.* , Oxford University Press, 2015 G. FLEURY*ANALYSE SPECTRALE - MÉTHODES NON-PARAMÉTRIQUES ET PARAMÉTRIQUES.* , Ellipses,, 2001
Assessment	How to do (practical activities) : 50% Initial knowledge (final test) : 50 %