

THE THIRD LECTURE ON NONLINEAR AND STOCHASTIC VIBRATIONS

SUBHARMONIC RESPONSE OF A VIBROIMPACT SYSTEM TO NARROW -BAND RANDOM EXCITATION

MICHAEL F. DIMENTBERG,

Professor Dimentberg will give his third lecture of the series on nonlinear stochastic mechanics on

MONDAY, JUNE 14 from 13:15-14:00 in room T6

Topics to be covered in the third lecture:

A vibroimpact system under narrow-band random excitation is considered. The model of sinusoidal temporal variations with random phase modulation is used for the excitation as considered in some details in the second lecture. The original strongly nonlinear system is reduced by using change of variables described in the first lecture. The resulting quasilinear system is analyzed by averaging over the period for the resonant case where mean excitation frequency is close to an integer multiple of the system's natural frequency in the absence of barrier. The method of moments is applied then to obtain explicit expression for mean square response amplitude for an arbitrary order of subharmonic. This result highlights importance of a fundamental parameter – excitation/system bandwidth ratio; in particular, even slight imperfection in periodicity of the excitation is shown to lead to large decrease in peak response amplitudes. Certain comments are also given on the nonresonant case which is known for potential chaotic response in case of perfect periodicity. Direct numerical studies show that imperfect periodicity may completely destroy chaos – once again depending on the excitation/system bandwidth ratio.