Recent Developments in Stability, Vibration and Control of Mechanical Structures

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This talk is devoted to the applications of the stability theory and modern control techniques to understand and to control the nonlinear behavior of a class of conservative, nonconservative, and time varying mechanical structures. To that end we first study the control problem of a spinning satellite in a gravitation field, then we study the full nonlinear behaviour of a pipe conveying fluid. Here we use the computed torque method to control the divergence, flutter and chaotic instabilities of this fluid-solid system. We will demonstrate that the fluid flow here can be used both for shape control and vibration control of a continuum. The last part of the talk is devoted to the long standing problem of periodic time varying systems. This has been a chalenge for more than a century since the time of Mathieu, Floqueut, Hill, Rayleigh, Lyapunov, and Poincare. The lecture is blended with some videos of recent experimental work to support theoretical results.

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