

# Lecture Notes in Engineering

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M. G. Donley, P.D. Spanos

Dynamic Analysis  
of Non-Linear Structures  
by the Method of Statistical  
Quadratization



Springer-Verlag

# Dynamic Analysis Of Non Linear Structures By The Method Of Statistical Quadratzation

**Yu-Kweng Lin, Isaac Elishakoff**



## **Dynamic Analysis Of Non Linear Structures By The Method Of Statistical Quadratzation:**

*Dynamic Analysis of Non-Linear Structures by the Method of Statistical Quadratzation* M.G. Donley, Pol Spanos, 2012-12-06

1 Introduction As offshore oil production moves into deeper water compliant structural systems are becoming increasingly important Examples of this type of structure are tension leg platform TLP s guyed tower platform compliant tower platform and floating production systems The common feature of these systems which distinguishes them from conventional jacket platform is that dynamic amplification is minimized by designing the surge and sway natural frequencies to be lower than the predominant frequencies of the wave spectrum Conventional jacket platform on the other hand are designed to have high stiffness so that the natural frequencies are higher than the wave frequencies At deeper water depths however it becomes uneconomical to build a platform with high enough stiffness Thus the switch is made to the other side of the wave spectrum The low natural frequency of a compliant platform is achieved by designing systems which inherently have low stiffness Consequently the maximum horizontal excursions of these systems can be quite large The low natural frequency characteristic of compliant systems creates new analytical challenges for engineers This is because geometric stiffness and hydrodynamic force nonlinearities can cause significant resonance responses in the surge and sway modes even though the natural frequencies of these modes are outside the wave spectrum frequencies High frequency resonance responses in other modes such as the pitch mode of a TLP are also possible

*Nonlinearity in Structural Dynamics* K Worden, G.R Tomlinson, 2019-04-23 Many types of engineering structures exhibit nonlinear behavior under real operating conditions Sometimes the unpredicted nonlinear behavior of a system results in catastrophic failure In civil engineering grandstands at sporting events and concerts may be prone to nonlinear oscillations due to looseness of joints friction and crowd movements

Nonlinear Stochastic Mechanics Nicola Bellomo, Fabio Casciati, 2012-12-06 The Symposium held in Torino ISI Villa Gualino July 1 5 1991 is the sixth of a series of IUTAM Symposia on the application of stochastic analysis to continuum and discrete mechanics The previous one held in Innsbruck 1987 was mainly concentrated on qualitative and quantitative analysis of stochastic dynamical systems as well as on bifurcation and transition to chaos of deterministic systems This Symposium concentrated on fundamental aspects stochastic analysis and mathematical methods on specific applications in various branches of mechanics engineering and applied sciences as well as on related fields as analysis of large systems system identification earthquake prediction Numerical methods suitable to provide quantitative results say stochastic finite elements approximation of probability distribution and direct integration of differential equations have also been the object of interesting presentations Specific topics of the sessions have been Engineering Applications Equivalent Linearization of Discrete Stochastic Systems Fatigue and Life Estimation Fluid Dynamics Numerical Methods Random Vibration Reliability Analysis Stochastic Differential Equations System Identification Stochastic Control We are indebted to the IUTAM Bureau for having promoted and sponsored this Symposium and the Scientific Committee for having

collaborated to the selection of participants and lecturers as well as to a prompt reviewing of the papers submitted for publication into these proceedings A special thank is due to Frank Kozin the organization of this meeting was for him ery important he missed the meeting but his organizer ability was present *Applied Mechanics Reviews* ,1992

*Multifaceted Uncertainty Quantification* Isaac Elishakoff,2024-09-23 The book exposes three alternative and competing approaches to uncertainty analysis in engineering It is composed of some essays on various sub topics like random vibrations probabilistic reliability fuzzy sets based analysis unknown but bounded variables stochastic linearization possible difficulties with stochastic analysis of structures *Proceedings of the ... International Conference on Offshore Mechanics and Arctic Engineering* ,1996 *Journal of Engineering Mechanics* ,2003 The Cumulative Book Index ,1991 A world list of books in the English language Abstract Journal in Earthquake Engineering ,1993 **New practical applications** Yu-Kweng Lin,Isaac Elishakoff,1991 Very Good No Highlights or Markup all pages are intact **Zeitschrift für angewandte Mathematik und Mechanik** ,1991 International Journal of Offshore and Polar Engineering ,1997 *Who's Who in Science and Engineering 2008-2009* Who's Who Marquis,Marquis Who's Who,2007-12 **Transactions of the American Society of Civil Engineers** American Society of Civil Engineers,1992 Vols 29 30 contain papers of the International Engineering Congress Chicago 1893 v 54 pts A F papers of the International Engineering Congress St Louis 1904 **Mathematical Reviews** ,1993 *Who's who in America* Harriet L. Tiger,1995 **Random Vibration and Statistical Linearization** John Brian Roberts,Pol D. Spanos,1990 Interest in the study of random vibration problems using the concepts of stochastic process theory has grown rapidly due to the need to design structures and machinery which can operate reliably when subjected to random loads for example winds and earthquakes Maritime Information Review ,1994 ASCE Combined Index American Society of Civil Engineers,1997 Indexes materials appearing in the Society s Journals Transactions Manuals and reports Special publications and Civil engineering **International Books in Print** ,1979

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