Anuncio de conferencia

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Actualmente, su investigación abarca ecuaciones diferenciales no lineales, integrabilidad y solitones, física matemática y análisis.

"Travelling waves of a highly nonlinear fourth-order wave equation"

Lunes, 16 de octubre de 2017
A las 10:30 h.
Sala académica Prof. Antonio Aizpuru. Facultad de Ciencias, torre centro, segunda planta.
Campus de Puerto Real.

Abstract:

A highly nonlinear, fourth-order wave equation that models the continuum theory of long wavelength pulses in weakly compressed, discrete, homogeneous chains with a general power-law contact interaction is studied:

$$c^{-2}u_{tt} = u_x^{k-1}u_{xx} + \alpha u_x^{k-3}u_{xx}^3 + \beta u_x^{k-2}u_{xx}u_{xxx} + \gamma u_x^{k-1}u_{xxxx}, \quad k > 1.$$

For this wave equation, all solitary wave solutions and all nonlinear periodic wave solutions, along with all conservation laws, are derived. The solutions are explicitly parameterized in terms of the asymptotic value of the wave amplitude in the case of solitary waves and the peak of the wave amplitude in the case of nonlinear periodic waves. All cases in which the solution expressions can be stated in an explicit analytic form using elementary functions are worked out. In these cases, explicit expressions for the total energy and total momentum for all solutions are obtained as well. The derivation of the solutions uses the conservation laws combined with an energy analysis argument to reduce the wave equation directly to a separable first-order differential equation which determines the wave amplitude in terms of the travelling wave variable. This method can be applied more generally to other highly nonlinear wave equations.