Presentation of the book
NONLINEAR WAVES: AN INTRODUCTION

Petar Popivanov, Angela Slavova

ABSTRACT

This book deals with equations of mathematical physics as the different modifications of the KdV equation, the Camassa-Holm type equations, several modifications of Burger's equation, the Hunter-Saxton equation, conservation laws equations and others. The equations originate from physics but are proposed here for their investigation via purely mathematical methods in the frames of university courses. More precisely, we propose classification theorems for the traveling wave solutions for a sufficiently large class of third order nonlinear PDE when the corresponding profiles develop different kind of singularities (cusps, peaks), existence and uniqueness results, etc. The orbital stability of the periodic solutions of traveling type for mKdV equations are also studied. Of great interest too is the interaction of peakon type solutions of the Camassa-Holm equation and the solvability of the classical and generalized Cauchy problem for the Hunter-Saxton equation. The Riemann problem for special systems of conservation laws and the corresponding δ-shocks are also considered. As it concerns numerical methods we apply the CNN approach.

The book is addressed to a broader audience including graduate students, Ph.D. students, mathematicians, physicist, engineers and specialists in the domain of PDE.

Keywords: equations of mathematical physics, KdV equation, Camassa-Holm type equations, Burger's equation, Hunter-Saxton equation, conservation laws equations, traveling wave solutions, nonlinear PDE, periodic solutions of traveling type for mKdV equations, generalized Cauchy problem, Riemann problem, CNN approach

2010 Mathematics Subject Classification: 35-02, 35Q15, 35Q53

Petar Popivanov, Angela Slavova
Institute of Mathematics and Informatics
Bulgarian Academy of Sciences, Bulgaria
Bl. 8, Acad. G. Bonchev Str.
1113 Sofia, Bulgaria
e-mail: popivano@math.bas.bg, slavova@math.bas.bg