Introduction to Nonlinear Dispersive Equations (Universitext)

By Felipe Linares, Gustavo Ponce

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This textbook introduces the well-posedness theory for initial-value problems of nonlinear, dispersive partial differential equations, with special focus on two key models, the Korteweg–de Vries equation and the nonlinear Schrödinger equation. A concise and self-contained treatment of background material (the Fourier transform, interpolation theory, Sobolev spaces, and the linear Schrödinger equation) prepares the reader to understand the main topics covered: the initial-value problem for the nonlinear Schrödinger equation and the generalized Korteweg–de Vries equation, properties of their solutions, and a survey of general classes of nonlinear dispersive equations of physical and mathematical significance. Each chapter ends with an expert account of recent developments and open problems, as well as exercises. The final chapter gives a detailed exposition of local well-posedness for the nonlinear Schrödinger equation, taking the reader to the forefront of recent research.

The second edition of *Introduction to Nonlinear Dispersive Equations* builds upon the success of the first edition by the addition of updated material on the main topics, an expanded bibliography, and new exercises. Assuming only basic knowledge of complex analysis and integration theory, this book will enable graduate students and researchers to enter this actively developing field.

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Editorial Review

Review

"This is the second edition of a self-contained graduate level introduction to the results and methods in the well-posedness theory for initial-value problems of nonlinear dispersive equations with special focus on the nonlinear Schrödinger and Korteweg de Vries equations. … I strongly welcome this updated version and I can only recommend it warmly to anybody (both students and teachers) interested in this central area of analysis." (G. Teschl, Monatshefte für Mathematik, Vol. 180, 2016)

From the Back Cover

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About the Author

Felipe Linares is a Researcher at the Instituto Nacional de Matemática Pura e Aplicada (IMPA) in Rio de Janeiro, Brazil.

Gustavo Ponce is a Professor of Mathematics at the University of California in Santa Barbara.

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