

# Preface

This book is the second edition of the book *Lectures on nonlinear evolution equations. Initial value problems* [150] from 1992. Additionally, it now includes a new Chapter 13 on *initial-boundary* value problems for waveguides, addressing more advanced students and researchers.

Several people contributed helpful comments on the first edition and on the new Chapter 13. In particular I would like to thank Dipl.-Math. Karin Borgmeyer, Dr. Michael Pokojovy, Dipl.-Math. Marco Ritter, and Dipl.-Math. Alexander Schöwe. For typing Chapter 13 I thank Gerda Baumann. I am obliged to Birkhäuser, in particular to Clemens Heine, for the interest in publishing this book.

Konstanz, April 2015

Reinhard Racke

## Preface to the first edition:

The book in hand is based on lectures which were given at the University of Bonn in the winter semesters of 1989/90 and 1990/91. The aim of the lectures was to present an elementary, self-contained introduction into some important aspects of the theory of global, small, smooth solutions to initial value problems for nonlinear evolution equations. The addressed audience included graduate students of both mathematics and physics who were only assumed to have a basic knowledge of linear partial differential equations. Thus, in the spirit of the underlying series, this book is intended to serve as a detailed basis for lectures on the subject as well as for self-studies for students or for other newcomers to this field.

The presentation of the theory is made using the classical method of continuation of local solutions with the help of a priori estimates obtained for small data. The corresponding global existence theorems have been proved mainly in the last decade, focussing on fully nonlinear systems. Related questions concerning large data problems, the existence of weak solutions or the analysis of shock waves are not discussed. Also the question of optimal regularity assumptions on the coefficients is beyond the scope of the book and is touched only in part and exemplarily.

Most of the material presented here has only been previously published in original papers, and some of the material has never been published until now. Therefore, I hope that both the interested beginner in the field and the expert will benefit from reading the book. In addition, a long list of references has been included, although it is not intended

to be exhaustive. Of course the selection of the material follows personal interests and tastes.

Several colleagues and students helped me with their comments on earlier versions of this book. In particular I would like to thank R. Arlt, S. Jiang, S. Noelle, P. P. Schirmer, R. P. Spindler, M. Stoth and F. Willems. Special thanks are due to R. Leis who also suggested writing first lecture notes in 1989 (SFB 256 Vorlesungsreihe Nr. 13, Universität Bonn (1990), in German). I am obliged to the Verlag Vieweg and to the editor of the “Aspects of Mathematics”, K. Diederich, for including the book in this series. The major part of typing the manuscript was done by R. Müller and A. Thiedemann whom I thank for their expert work. Last, but not least, I would like to thank the Deutsche Forschungsgemeinschaft, Sonderforschungsbereich 256, for generous and continuous support.

Bonn, August 1991

Reinhard Racke

Lectures on Nonlinear Evolution Equations  
Initial Value Problems

Racke, R.

2015, VIII, 306 p. 13 illus., Hardcover

ISBN: 978-3-319-21872-4

A product of Birkhäuser Basel