Contents

Introduction 1

1 Global solutions to wave equations — existence theorems 7

2 $L^p$–$L^q$-decay estimates for the linear wave equation 15

3 Linear symmetric hyperbolic systems 21
   3.1 Energy estimates 22
   3.2 A global existence theorem 28
   3.3 Remarks on other methods 31

4 Some inequalities 34

5 Local existence for quasilinear symmetric hyperbolic systems 57

6 High energy estimates 78

7 Weighted a priori estimates for small data 82

8 Global solutions to wave equations — proofs 89
   8.1 Proof of Theorem 1.1 89
   8.2 Proof of Theorem 1.2 93

9 Other methods 104

10 Development of singularities 108

11 More evolution equations 112
   11.1 Equations of elasticity 114
      11.1.1 Initially isotropic media in $\mathbb{R}^3$ 114
      11.1.2 Initially cubic media in $\mathbb{R}^2$ 121
   11.2 Heat equations 137
   11.3 Equations of thermoelasticity 144
   11.4 Schrödinger equations 177
   11.5 Klein–Gordon equations 182
   11.6 Maxwell equations 191
   11.7 Plate equations 197

12 Further aspects and questions 207
13 Evolution equations in waveguides 221
  13.1 Nonlinear wave equations ..................................... 222
    13.1.1 Linear part ............................................. 222
    13.1.2 Nonlinear part ......................................... 238
  13.2 Schrödinger equations ......................................... 240
  13.3 Equations of elasticity and Maxwell equations ............... 243
  13.4 General waveguides ........................................... 254

Appendix 271
  A Interpolation ................................................. 271
  B The Theorem of Cauchy–Kowalevsky .............................. 278
  C A local existence theorem for hyperbolic-parabolic systems ... 282

References 289

Notation 302

Index 304
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