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Nota di contenuto	- 1. Introduction -- Part I: The Sobolev Spaces and the Boundary Value Problems -- 2. Main notations and basic formulas -- 3. Overview of measure theory and functional analysis -- 4. Notes on the distribution theory and Fourier transform -- 5. The Sobolev spaces -- 6. The boundary value problems for second–order elliptic equations and the Dirichlet to Neumann map -- Part II: Cauchy Problem for PDEs and Stability Estimates -- 7. The Cauchy problem for the first–order PDEs -- 8. Real analytic functions -- 9. The Cauchy problem for PDEs with analytic coefficients -- 10. Uniqueness for an inverse problem -- 11. The Hadamard example. Solvability of the Cauchy problem and continuous dependence by the data -- 12. Ill–posed problems. Conditional stability -- 13. The John stability Theorem for the Cauchy problem for PDEs with analytic coefficients -- Part III: Carleman Estimates and Unique Continuation Properties -- 14. Carleman estimates: a first look with simple examples and basic applications -- 15. Carleman estimates and the Cauchy problem for operators with coefficients in the principal part -- 16. Carleman estimates for reduced regularity coefficients -- 17. Carleman estimates for second–order operators with real coefficients in the principal part -- 18. Optimal three sphere and doubling inequality for second–order elliptic equations -- 19. Miscellanea.

Sommario/riassunto

This book provides a comprehensive and self-contained introduction to the study of the Cauchy problem and unique continuation properties for partial differential equations. Aimed at graduate and advanced undergraduate students, it bridges foundational concepts such as Lebesgue measure theory, functional analysis, and partial differential equations with advanced topics like stability estimates in inverse problems and quantitative unique continuation. By presenting detailed proofs and illustrative examples, the text equips readers with a deeper understanding of these fundamental topics and their applications in mathematical analysis. Designed to serve as both a learning resource and a reference, this book is particularly suited for those pursuing research in mathematical physics, inverse problems, or applied analysis.