1. Record Nr. UNINA9911003689203321

Autore	Taira Kazuaki
Titolo	Nonlinear Functional Analysis with Applications to Combustion Theory / / by Kazuaki Taira
Pubbl/distr/stampa	Cham : , : Springer Nature Switzerland : , : Imprint : Springer, , 2025
ISBN	9783031857577
Edizione	[1st ed. 2025.]
Descrizione fisica	1 online resource (XV, 269 p. 65 illus.)
Collana	Applied Mathematical Sciences, , 2196-968X ; ; 221
Disciplina	515.7
Soggetti	Functional analysis Mathematical physics Chemometrics Functional Analysis Mathematical Physics Mathematical Applications in Chemistry Combustió Anàlisi funcional Anàlisi funcional no lineal Estadística matemàtica Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Preface -- Introduction and Main Results -- Part I. A Short Course in Nonlinear Functional Analysis -- Elements of Degree Theory -- Theory of Positive Mappings in Ordered Banach Spaces -- Elements of Bifurcation Theory -- Part II. Introduction to Semilinear Elliptic Problems via Semenov Approximation -- Elements of Functions Spaces -- Semilinear Hypoelliptic Robin Problems via Semenov Approximation -- Spectral Analysis of the Closed Realization A -- Local Bifurcation Theorem for Problem (6.4) -- Fixed Point Theorems in Ordered Banach Spaces -- The Super-subsolution Method -- Sublinear Hypoelliptic Robin Problems -- Part III. A Combustion Problem with General Arrhenius Equations and Newtonian Cooling -- Proof of Theorem 1.5 (Existence and Uniqueness) -- Proof of Theorem 1.7 (Multiplicity) --

Proof of Theorem 1.9 (Unique solvability for sufficiently small) -- Proof of Theorem 1.10 (Unique solvability for sufficiently large) -- Proof of Theorem 1.11 (Asymptotics) -- Part IV. Summary and Discussion -- Open Problems in Numerical Analysis -- Concluding Remarks -- Part V Appendix -- A The Maximum Principle for Second Order Elliptic Operators -- Bibliography -- Index.

Sommario/riassunto

Explore the fascinating intersection of mathematics and combustion theory in this comprehensive monograph, inspired by the pioneering work of N. N. Semenov and D. A. Frank-Kamenetskii. Delving into the nonlinear functional analytic approach, this book examines semilinear elliptic boundary value problems governed by the Arrhenius equation and Newton's law of heat exchange. Key topics include: Detailed analysis of boundary conditions, including isothermal (Dirichlet) and adiabatic (Neumann) cases. Critical insights into ignition and extinction phenomena in stable steady temperature profiles, linked to the Frank-Kamenetskii parameter. Sufficient conditions for multiple positive solutions, revealing the S-shaped bifurcation curves of these problems. Designed for researchers and advanced students, this monograph provides a deep understanding of nonlinear functional analysis and elliptic boundary value problems through their application to combustion and chemical reactor models. Featuring detailed illustrations, clearly labeled figures, and tables, this book ensures clarity and enhances comprehension of complex concepts. Whether you are exploring combustion theory, functional analysis, or applied mathematics, this text offers profound insights and a thorough mathematical foundation.