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Record Nr.	UNINA9910983371503321
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Titolo	Introduction to Mathematical Methods in Population Theory / / by Jacek Banasiak
Pubbl/distr/stampa	Cham : , : Springer Nature Switzerland : , : Imprint : Springer, , 2025
ISBN	9783031654916
	9783031654909
Edizione	[1st ed. 2025.]
Descrizione fisica	1 online resource (621 pages)
Collana	Springer Undergraduate Mathematics Series, , 2197-4144
Disciplina	304.6015118
Soggetti	Mathematics
	Differential equations
	Geography - Mathematics
	Social sciences
	Applications of Mathematics
	Differential Equations
	Mathematics of Planet Earth
	Mathematics in the Humanities and Social Sciences
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	1 Mathematical modelling -- Part I Unstructured Models -- 2 Models with discrete time -- 3 Models with continuous time -- 4 Qualitative theory for a single equation -- Part II Models with discrete structure -- 5 Linear models with discrete structure -- 6 Continuous time non-linear models for interacting species and age-structured populations -- 7 Discrete time non-linear models for interacting species and structured populations -- 8 Positivity in natural science models -- Part III Models with continuous age structure -- 9 McKendrick–von Foerster model -- 10 Basic nonlinear models. Part IV Appendices -- A Spaces, norms and order -- B Differential equations and systems -- C Linear algebra tools -- D First order partial differential equations and the method of characteristics.
Sommario/riassunto	This textbook provides an introduction to the mathematical methods used to analyse deterministic models in life sciences, including

population dynamics, epidemiology and ecology. The book covers both discrete and continuous models. The presentation emphasises the solvability of the equations appearing in the mathematical modelling of natural phenomena and, in the absence of solutions, the analysis of their relevant properties. Of particular interest are methods that allow for determining the long-term behaviour of solutions. Thus, the book covers a range of techniques, from the classical Lyapunov theorems and positivity methods based on the Perron–Frobenius theorem, to the more modern monotone dynamical system approach. The book offers a comprehensive presentation of the Lyapunov theory, including the inverse Lyapunov theorems with applications to perturbed equations and Vidyasagar theorem. Furthermore, it provides a coherent presentation of the foundations of the theory of monotone dynamical systems with its applications to epidemiological models. Another feature of the book is the derivation of the McKendrick–von Foerster equation from the discrete Leslie model and the analysis of the long-term behaviour of its solutions. Designed for upper undergraduate courses and beyond, this textbook is written for students and researchers looking to master the mathematics of the tools commonly used to analyse life science models. It therefore goes somewhat deeper into mathematics than typical books at this level but should be accessible to anyone with a good command of calculus with elements of real and complex analysis and linear algebra; the necessary concepts are collected in the appendices.