

**F. C. Hoppensteadt**

*Cambridge Studies in Mathematical Biology*

# **Mathematical methods of population biology**



# Mathematical Methods Of Population Biolo

**Frank Charles Hoppensteadt**



## **Mathematical Methods Of Population Biolo:**

**Mathematical Methods of Population Biology** Frank Charles Hoppensteadt, 1982-02-26 An introduction to mathematical methods used in the study of population phenomena including models of total population and population age structure models of random population events presented in terms of Markov chains and methods used to uncover qualitative behavior of more complicated difference equations      Mathematical Methods of Population Biology William Brandon, 1976

**Introduction to Mathematical Methods in Population Theory** Jacek Banasiak, 2024-12-20 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      *Statistical and Mathematical Methods in Population Dynamics* R. Cavalloro, 1984-06-01 Modelling and estimation of pest population Data collection and analysis in pest control Methods for pest control Pest management systems

**An Introduction to Structured Population Dynamics** J. M. Cushing, 1998-01-01 Interest in the temporal fluctuations of biological populations can be traced to the dawn of civilization How can mathematics be used to gain an understanding of population dynamics This monograph introduces the theory of structured population dynamics and its applications focusing on the asymptotic dynamics of deterministic models This theory bridges the gap between the characteristics of individual organisms in a population and the dynamics of the total population as a whole In this monograph many applications that illustrate both the theory and a wide variety of biological issues are given along with an interdisciplinary case study that illustrates the connection of models with the data and the experimental documentation of model predictions The author also discusses the use of discrete and continuous models and presents a general modeling theory for structured population

dynamics Cushing begins with an obvious point individuals in biological populations differ with regard to their physical and behavioral characteristics and therefore in the way they interact with their environment Studying this point effectively requires the use of structured models Specific examples cited throughout support the valuable use of structured models Included among these are important applications chosen to illustrate both the mathematical theories and biological problems that have received attention in recent literature

### **Advanced Mathematical Methods in Biosciences and Applications**

Faina Berezovskaya, Bourama Toni, 2019-09-19 Featuring contributions from experts in mathematical biology and biomedical research this edited volume covers a diverse set of topics on mathematical methods and applications in the biosciences Topics focus on advanced mathematical methods with chapters on the mathematical analysis of the quasispecies model Arnold's weak resonance equation bifurcation analysis and the Tonnelier Gerstner model Special emphasis is placed on applications such as natural selection population heterogeneity polyvariant ontogeny in plants cancer dynamics and analytical solutions for traveling pulses and wave trains in neural models A survey on quasiperiodic topology is also presented in this book Carefully peer reviewed this volume is suitable for students interested in interdisciplinary research Researchers in applied mathematics and the biosciences will find this book an important resource on the latest developments in the field In keeping with the STEAM H series the editors hope to inspire interdisciplinary understanding and collaboration

### **Mathematical Methods in Medical and Biological Sciences** Harendra Singh, Hari M Srivastava, 2024-11-05

Mathematical Methods in Medical and Biological Sciences presents mathematical methods for computational models arising in the medical and biological sciences The book presents several real life medical and biological models such as infectious and non infectious diseases that can be modeled mathematically to accomplish profound research in virtual environments when the cost of laboratory expenses is relatively high It focuses on mathematical techniques that provide global solutions for models arising in medical and biological sciences by considering their long term benefits In addition the book provides leading edge developments and insights for a range of applications including epidemiological modeling of pandemic dynamics viral infection developments cancer developments blood oxygen dynamics HIV infection spread reaction diffusion models polio infection spread and chaos modeling with fractional order derivatives Presents the mathematical treatment of a wide range of real life medical and biological models including both infectious and non infectious diseases Provides in depth analysis of the spread of Covid 19 polio and HIV including discussion of computational methods and applications Includes computational modeling methods along with their practical applications providing the basis for further exploration and research in epidemiology and applied biomedical sciences

*Integral Methods in Science and Engineering* Barbara S Bertram, Christian Constanda, Allan A. Struthers, 2019-05-20 Based on proceedings of the International Conference on Integral Methods in Science and Engineering this collection of papers addresses the solution of mathematical problems by integral methods in conjunction with approximation schemes from various physical domains Topics and applications include

wavelet expansions reaction diffusion systems variational methods fracture theory boundary value problems at resonance micromechanics fluid mechanics combustion problems nonlinear problems elasticity theory and plates and shells

*Mathematical Modeling* Ellis Cumberbatch, Alistair Fitt, 2001-10 This volume presents thirteen different case studies ranging from cooking of cereal to the analysis of epidemic waves in animal populations     Positive Dynamical Systems in Discrete Time Ulrich Krause, 2015-11-27 This book provides a systematic rigorous and self contained treatment of positive dynamical systems A dynamical system is positive when all relevant variables of a system are nonnegative in a natural way This is in biology demography or economics where the levels of populations or prices of goods are positive The principle also finds application in electrical engineering physics and computer sciences The author has greatly expanded the field of positive systems in surprising ways Prof Dr David G Luenberger Stanford University USA

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