Nonlinear dynamics and chaos strogatz pdf

PHY 342: Nonlinear Dynamics (January -April, 2020) This is the first course in nonlinear dynamics. Course Contents: Linear and nonlinear systems in 1DBifurcations in 1DFlows on a linear and nonlinear circular system in 2DBifurcations in the 2DSymbolicCharacterisation sequence of chaoschaos In 1D maps and flowsMeasures of chaos and paths to chaosHamiltonian chaosDimensions, fractals and exotic book absorbers: (reference number listed late refers to these books.) 1. Nonlinear dynamics and chaos by Steven Strogatz (classic introductory text for students from any science background.) 2. Chaos: An Introduction to Dynamic Systems by K. T. Alligood, T. D. Sauer and J. A. York (This textbook has a mathematical taste to it.) 3. Chaos in Dynamic Systems by Edward Ott (Chaos Textbook for Physicists. A little too dense and fast-paced.) 4. Nonlinear Chaos and Dynamics: An Introduction to Scientists and Engineers by Robert Hilborn (a good nonlinear dynamics textbook for physicists. good for those looking for physical intuition and explanations.) 5. Introduction to Nonlinear Physics by Liu Lam (a good nonlinear dynamics textbook at the introductory level.) Evaulation : Class tests / Seminar / Assignments : 30 % Midsem : 30 % Final : 40 % Test 1 : Question paper Solutions to Test 1 Midsem exam on 19.2.2020. Everything taught in class up to 11.2.2020 will be a part for this exam. This is almost what is covered in Chapters 1-8 of Strogatz's book. External Sources: Chaos Period of Professor Michael Cross Midsem Test: Question Solution Paper to Mid-Note Lecture: 21.4.2020 Maps 1D (Part 1) 21.4.2020 Maps 1D (Part 2) (Ref [2], section 1.8 fories) 24.4.2020 Defining chaos Supplementary material for those interested (but not necessary for the course): On defining chaos 24.4.2020 chaos in maps ▶ An Aside : Epidemics, coronavirus and chaos (additional materials for those who are interested but not necessary for the period) Chamber epidemic models are a set of dialujial equations related to the number of susceptible, infected and recovered parts of the population in a community. While chaos is generally not a major feature in such models, it is known that periodic mandatory epidemic models create irregular dynamics. Such irregular patterns were observed in the spread of measles. Here are four articles that study the chaos in the same class of models that can also describe the spread of the coronavirus as well. These articles use more advanced techniques than we encountered in our period. Nevertheless, they give a taste of what it plays. A newspaper article (popular level) about epidemic models is given here, and another one here. 27.4.2020 Approach to Chaos on the Logistics Map (opens on an external web page) (you can From animations on this website to see bifurcations and chaos on the logistics map.) 27.4.2020 Video presentation on the logistics map by none other than Steven Strogatz. 27.4.2020 Reference and notes for logistics map and approach to chaos: Read from Ref [1], Part 10.2 to 10.5. 30.4.2020 Iconic Shift and Dynamics Map (Ref [2], Part 3.2 and Sections 3.3) 4.5.2020 2D Maps (Ref [4], Part 5.10) 8.5.2020 Symbolic Dynamics, Counting Circuit and Chaos 11.5.2020 Feigenbaum Scaling (Ref [1], Sections 10.5 and 10.7) 11.5.2020 A further lecture note on scaling Feigenbaum (optional) Additional reading : About Pi, G and Delta ▶ Lorenz Model: (Attracting the iconic Lorenz. Image Source: Wikipedia.) 14.5.2020 Reference and notes for the Lorenz model: Read from Ref [1] (Strogatz Books, Sections 9.2 and 9.3). 14.5.2020 Notes on the Lorentz model (pages 1 to 17 only) 14.5.2020 Try Lorenz attracting online ▶ real-life applications of chaos: (It's optional for reading, not mandatory for periods.) 19.5.2020 Applications of chaos for detail, consult Chapter 9 of the text book : Turbulent Dynamics: An Introduction based on Classical Mechanics by Tamas Tell and Marton Gruiz. 22.5.2020 Reference and notes for fractals: Read from Ref [1] (Strogatz's Book, sections 11.0 to 11.5). ▶ Fractals: (Koch Snowflake. Image Source: pngflow.com.) 26.5.2020 Introduction to fractals (This additional reading from an external website) 26.5.2020 Types of fractals 2.6.2020 Next Correlation 2.6.2020 Reference for Baker Map: Read from Ref [1] (1) Strogatz's book, secton 12.1) 2.6.2020 for experimental realisations of strange attractors: Read from Ref [1] (Strogatz' book, sections 12.4 and 12.5) 9.6.2020 Review of ideas beyond the course. Some useful references are listed below. ▶ pointer to what lies beyond: (additional material for Interest 2 but not necessary for the course) What topics do we cover in this period? a lot . Here are some links to ideas based on the nonlinear dynamics that we discussed in this period. Many of them are active research areas of contemporary interest. This is not a comprehensive set of pointers. If you are interested, you should follow up on literature in your spare time. Back home October 26, 2014 October 26, 2014 / ScienceSites This textbook is aimed at newcomers to nonlinear dynamics and chaos, especially students taking a first course in subject matter. Presentation emphasizes analytical methods, concrete samples, and geometric intuition. This theory has been systematically developed, starting with first-class DDDL equations and their defurks, followed by analysis of aircraft phase, Their cycles and defusions culminated with lorenz equations, chaos, repeated maps, period doubles, reormalization, fractals, and strange absorbers. A unique feature of the book is its emphasis on applications. These vibrations include mechanical vibrations, lasers, bio-rhythms, superconducting circuits, insects, chemical oscillators, genetic control systems, turbulent blue wheels and even a technique for using chaos to send secret messages. In each case, the scientific background is explained at the elementary level and is closely integrated with mathematical theory. In the 20 years since the first edition of the book appeared, ideas and techniques of nonlinear dynamism and chaos have found applications in exciting new fields such as systems biology, evolutionary game theory, and the physics community. This second version includes new exercises in these cutting-edge developments, on topics as the curiosities of visual perception and the dynamics of vague love gone in with the wind are different.Questions and answers about the second version are incredibly well written. Time after time, Strogatz explains the concepts that are among the most transparent I have ever read ... One of the best introductions to nonlinear dynamics is now available. — SIAM Reviews my impressed samples with their subtleness and cutting. Important and subtle distinctions and exceptions are outstanding and accessible. — Today's physics is more than any undergraduate book I've seen in recent years, this book can lure students into the mathematical sciences, make them want to change their major, and spark in them some real intellectual curiosity. — UMAP Journal October 26, 2014/ ScienceSites/ Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering, Steven H. Strogatz, Westview Press, 2015. 2nd ed. $60.00 paper (528 pp.). ISBN 978-0-813-34910-7 Buy at AmazonIt's clear from the books he has written that Steven Strogatz—a prolific and able writer and a professor of applied mathematics at Cornell University—has broad interests and knowledge in many scientific fields, including physics: In 2014 he was elected an American Physical Society Fellow. For popular audiences, he has fascinating works such as Sync: How Order Emerges from Chaos in the Universe, Nature, and Daily Life (Hachette Books, 2003) and The Joy of x: A Guided Tour of Math, from One to Infinity (Houghton Mifflin, 2012). Strogatz's latest book, Nonlinear Dynamics and Chaos (Second Edition), is widely aimed at scientists and engineers and is suitable as an undergraduate or graduate textbook. This is no coincidence since much of the book's content, and the first edition (Westview Press, 1994), originated from a period when Strogatz taught at IT and Cornell. The new version has a friendly yet clear technical style; It Like concepts, not only printed on the page, but also with the reader. Strogatz enhances his already fascinating tune with historical notes and nods to things that are not yet understood, in the same way a good lecturer lives class talk. A course based on this book can be a great choice in a physics department; it may even draw students from other STEM backgrounds due to the inherent interest of materials or the usefulness of its techniques. In presenting the subject, the author draws from the past 30 years of developments that further our understanding of dynamics beyond linear examples—for example, harmonic oscillators—that address current physics curricula. Advances came from theoretical and computational researchers, and the book does a great job of acknowledging them. The methods and techniques that make up much of the book's content use useful concepts—defurkations, phase-space analysis, and fractals, for multiple names—widely adopted in physics, biology, chemistry, and engineering. One of the book's biggest strengths is that it explains the core concepts through practical examples drawn from different backgrounds and from real-world systems; Images, in particular, have been enhanced in the new version. The techniques needed to understand the behavior of nonlinear systems are inherently mathematical. Fortunately, the author's excellent use of geometric and graphical techniques greatly clarifies what can be surprisingly complex behavior. In detailed work through the development and behavior of lorenz equations, for example, Strogatz introduces a simple blue wheel machine as a model to help define idioms and tie key concepts such as fixed points, dufourection, chaos, and fractals. The emotional reader for science gets behind the differential D equations. Also, for every concept, mathematics is associated with bright faces and simply raised student exercises. It's fast becoming a major book among nonlinear dynamic doctors. Both my theory and empirical colleagues often recommend it to their students. Other books in the same genre are worth noting: Edward Ott's Chaos in Dynamic Systems (second edition, Cambridge University Press, 2002) is an excellent postgraduate introduction, and Robert Hilborn's Chaos and Nonlinear Dynamics: An Introduction to Scientists and Engineers (Second Edition, Aford University Press, 2001) is quite reader-friendly. This second version of nonlinear dynamics and chaos is a great addition to our shared book shelf. It serves a wide range of uses and will be of interest to audiences with diverse backgrounds and levels of expertise. Please note: The number of views showing full text views from December 2016 to The article's views were not included before December 2016. Includes.