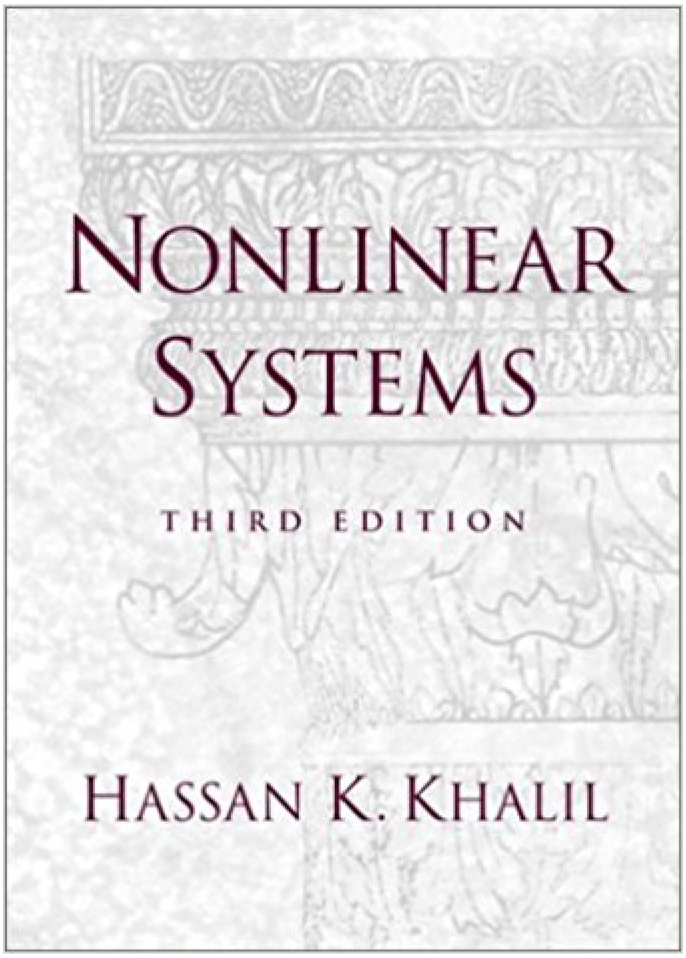
Nonlinear Systems (3rd Edition)



Synopsis

This book is written is such a way that the level of mathematical sophistication builds up from chapter to chapter. It has been reorganized into four parts: basic analysis, analysis of feedback systems, advanced analysis, and nonlinear feedback control.   Updated content includes subjects which have proven useful in nonlinear control design in recent yearsâ ”new in the 3rd edition are: expanded treatment of passivity and passivity-based control; integral control, high-gain feedback, recursive methods, optimal stabilizing control, control Lyapunov functions, and observers.   For use as a self-study or reference guide by engineers and applied mathematicians.

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Customer Reviews

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This text is intended for a first-year graduate-level course on nonlinear systems or control. It may also be used for self study or reference by engineers and applied mathematicians. It is an outgrowth of my experience teaching the nonlinear systems course at Michigan State University, East Lansing. Students taking this course have had background in electrical engineering, mechanical engineering, or applied mathematics. The prerequisite for the course is a graduate-level course in linear systems, taught at the level of the texts by Antsaklis and Michel 9, Chen 35, Kailath 94), or Rugh 158. The linear systems prerequisite allowed me not to worry about introducing the concept of "state" and to refer freely to "transfer functions," "state transition matrices," and other linear system concepts. The mathematical background is the usual level of calculus, differential equations, and matrix theory that any graduate student in engineering or mathematics would have. In the Appendix, I have collected a few mathematical facts that are used throughout the book. I have written the text in such a way that the level of mathematical sophistication increases as we advance from chapter to chapter. This is why the second chapter is written in an elementary context. Actually, this chapter could be taught at senior, or even junior, level courses without difficulty. This is also the reason I have split the treatment of Lyapunov stability into two parts. In Sections 4.1 through 4.3, I introduce the essence of Lyapunov stability for autonomous systems where I do not have to worry about technicalities such as uniformity, class k functions, etc. In Sections 4.4 through 4.6, I present Lyapunov stability in a more general setup that accommodates nonautonomous systems and allows for a deeper look into advanced aspects of the stability theory. The level of mathematical sophistication at the end of Chapter 4 is the level to which I like to bring the students, so that they can comfortably read the rest of the text. There is yet a higher level of mathematical sophistication that is assumed in writing the proofs in the Appendix. These proofs are not intended for classroom use. They are included to make the text on one hand, self contained, and, on the other, to respond to the need or desire of some students to read such proofs, such as students continuing on to conduct Ph.D. research into nonlinear systems or control theory. Those students can continue to read the Appendix in a self-study manner. This third edition has been written with the following goals in mind: * To make the book (especially the early chapters) more accessible to first-year graduate students. As an example of the changes made toward that end, note the change in Chapter 3: All the material on mathematical background, the contraction mapping theorem, and the proof of the existence and uniqueness theorem have been moved to the Appendix. Several parts of the books have been rewritten to improve readability. * To reorganize the book in such a way that makes it easier to structure nonlinear systems or control courses around it. In the new organization, the book has four parts, as shown in the flow chart. A course on nonlinear systems analysis will cover material from Parts 1, 2, and 3, while a course on nonlinear control will cover material from Parts 1, 2, and 4. * To update the material of the book to include topics or results that have proven to be useful in nonlinear control design in recent years. New to the third addition are the: expanded treatment of passivity and passivity-based control, integral control, sliding mode control, and high-gain observers. Moreover, bifurcation is introduced in the context of second-order systems. On the technical side, the reader will find Kurzweil's converse Lyapunov theorem, nonlocal results in Chapters 10 and 11, and new results on integral; control and gain scheduling. * To update the exercises. More than 170 new exercises have been included.

Paperback version is cheaper, but missing chapter 14 (Nonlinear design tools), appendices, notes and references, and bibliographies. I did not know that.

This book has everything a one semester graduate course in nonlinear control would generally cover and much more. Despite the presence of other good books, most notably those by Vidyasagar and Sastry, this will definitely be the first book one will turn to in case of a doubt.The book is very readable even though it has a lot of jargon (read heavy mathematics). The author starts off with an introduction to nonlinear systems, then moves on to phase portraits for 2-D systems, before moving on to advanced concepts of stability theory and feedback linearization. My favorite was the third chapter which had a neat collection of mathematical results, with quite a few of the proofs pushed to the appendices.Exercises are fun to solve, has a lot of application based problems, and pretty comprehensive.The only negative - I feel he could have dealt with bifurcations and describing functions a little more in detail.

Pretty Good Book. You'll need extensive knowledge of linear control system theory. Usually two undergraduate classes and a graduate class. Some of the math is tough, even for an electrical engineer. The set theory stuff will take a while to figure out. Overall, a good book though.

This is the one textbook any engineer in advanced control systems needs to own. Each chapter is perfectly constructed to build a foundation that expertly leads into next. The book culminates in a series of simulations, using systems from previous chapters to explore and reinforce concepts presented. This is the text you need if you want to call yourself a master of control systems.

The book is great, just make sure you get the paperback. It's showed up with several covers, and I can't figure out which is which, but make sure you're not spending hundreds on this. It can be had for far cheaper.

Quality of print not that good, but what can you expect for that price ;)

The book "Nonlinear System" I ordered was good except one thing that last chapter was excepted. And I appreciated for very fast delivery!

Used this for a Nonlinear Control Theory Class. It was a little short on Control Theory (didn't include much adaptive control etc) but has such good coverage of nonlinear stability theory that it is extremely applicable for a Control Theory class. Does a great job explaining complicated ideas, and does a spectacular job providing references for more information.This book won the IFAC Control Engineering Textbook Prize in 2002, but its greatness can more accurately be established by simply noting that it is used as THE nonlinear controls textbook by many engineering departments.