

# Digital Control System Design The Oxford Series In Electrical And Computer Engineering

Digital Control Systems  
 Modern Digital Control Systems  
 Introduction to Control System Design (First Edition)  
 Applied Digital Control  
 Digital Control Systems  
 Digital Control System Design  
 Digital Control Systems  
 Modern Control System Theory and Design  
 An Optimal Digital Control System Design  
 Discrete-Time Control System Design with Applications  
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## RYAN CLARENCE

*Digital Control Systems* Oxford University Press, USA  
 This book presents comprehensive coverage of linear control systems along with an introduction to digital control systems. It is designed for undergraduate courses in control systems taught in departments of electrical engineering, electronics and instrumentation, electronics and communication, instrumentation and control, and computer science and engineering. The text discusses the important concepts of control systems, transfer functions and system components. It describes system stability, employing the Hurwitz-Routh stability criterion, root locus technique, Bode plot, and polar and Nyquist plots. In addition, this student-friendly book features in-depth coverage of controllers, compensators, state-space modelling and discrete time systems. KEY FEATURES •Includes a brief tutorial on

MATLAB in an appendix to help students learn how to use it for the analysis and design of control systems. •Provides an abundance of worked-out examples and review questions culled from university examination papers. •Gives answers to selected chapter-end questions at the end of the book.

**Modern Digital Control Systems** PHI Learning Pvt. Ltd.  
 Mathematical Preliminary - Development of Block Diagrams for Control Systems - Quantitative and Qualitative Analyses of Control Systems - Computer Simulation and Realization - Design Criteria, Constraints, and Feedback - The Root-Locus Method - Frequency-Domain Techniques - The Inward Approach--Choice of Overall Transfer Functions - Implementation--Linear Algebraic Method - State-Space Design - Discrete-Time System Analysis - Discrete-Time System Design - PID Controllers.  
*Introduction to Control System Design (First Edition)* CRC Press, Taylor & Francis Group, CRC Press is  
 This text's contemporary approach focuses on the concepts of linear control systems, rather than computational mechanics.

Straightforward coverage includes an integrated treatment of both classical and modern control system methods. The text emphasizes design with discussions of problem formulation, design criteria, physical constraints, several design methods, and implementation of compensators. Discussions of topics not found in other texts—such as pole placement, model matching and robust tracking—add to the text's cutting-edge presentation. Students will appreciate the applications and discussions of practical aspects, including the leading problem in developing block diagrams, noise, disturbances, and plant perturbations. State feedback and state estimators are designed using state variable equations and transfer functions, offering a comparison of the two approaches. The incorporation of MATLAB throughout the text helps students to avoid time-consuming computation and concentrate on control system design and analysis.

*Applied Digital Control* John Wiley & Sons

Introduction; Review of continuous control; Introductory digital control; Discrete systems analysis; Sampled-data systems; Discrete equivalents; Design using transform techniques; Design using state-space methods; Multivariable and optimal control; Quantization effects; Sample rate selection; System identification; Nonlinear control; Design of a disk drive servo: a case study; Appendix A: Examples; Appendix B: Tables; Appendix C: A few results from matrix analysis; Appendix D: Summary of facts from the theory of probability and stochastic processes; Appendix E: Matlab functions; Appendix F; Differences between Matlab v5 and v4; References; Index.

**Digital Control Systems** Prentice Hall

Designed for graduate and upper-level undergraduate engineering students, this is an introduction to control systems, their functions, and their current role in engineering design. Organized from a design rather than an analysis viewpoint, it shows students how to carry out practical engineering design on all types of control systems. Covers basic analysis, operating and design techniques as well as hardware/software implementation. Includes case studies.

*Digital Control System Design* CRC Press

For both undergraduate and graduate courses in Control System Design. Using a "how to do it" approach with a strong emphasis on real-world design, this text provides comprehensive, single-source coverage of the full spectrum of control system design. Each of the text's 8 parts covers an area in control—ranging from signals and systems (Bode Diagrams, Root Locus, etc.), to SISO control (including PID and Fundamental Design Trade-Offs) and MIMO systems (including Constraints, MPC, Decoupling, etc.).

*Digital Control Systems* Academic Press

Digital Control Applications Illustrated with MATLAB covers the modeling, analysis, and design of linear discrete control systems. Illustrating all topics using the micro-computer implementation of digital controllers aided by MATLAB, Simulink, and FEEDBACK

Modern Control System Theory and Design Pearson

The great advances made in large-scale integration of semiconductors, the resulting cost-effective digital processors and data storage devices, and the development of suitable programming techniques are all having increasing influence on the techniques of measurement and control and on automation in general. The application of digital techniques to process automation started in about 1960 when the first process computer was installed. From about 1970 computers have become standard equipment for the automation of industrial processes, connected on-line in open or closed loop. The annual increase of installed process computers in the last decade was about 20-30%. The cost of hardware has shown a tendency to decrease, whereas the relative cost of user software has tended to increase. Because of the relatively high total cost, the first

phase of digital computer application to process control is characterized by the centralization of many functions in a single (though sometimes in several) process computer. Such centralization does not permit full utilization of the many advantages of digital signal processing and rapid economic pay-off as analog back-up systems or parallel standby computers must often be provided to cover possible breakdowns in the central computer. In 1971 the first microprocessors were marketed which, together with large-scale integrated semiconductor memory units and input/output modules, can be assembled into more cost-effective process microcomputers.

**An Optimal Digital Control System Design** OUP USA

The definitive guide to control system design Modern Control System Theory and Design, Second Edition offers the most comprehensive treatment of control systems available today. Its unique text/software combination integrates classical and modern control system theories, while promoting an interactive, computer-based approach to design solutions. The sheer volume of practical examples, as well as the hundreds of illustrations of control systems from all engineering fields, make this volume accessible to students and indispensable for professional engineers. This fully updated Second Edition features a new chapter on modern control system design, including state-space design techniques, Ackermann's formula for pole placement, estimation, robust control, and the H method for control system design. Other notable additions to this edition are: \* Free MATLAB software containing problem solutions, which can be retrieved from The Mathworks, Inc., anonymous FTP server at <ftp://ftp.mathworks.com/pub/books/shinners> \* Programs and tutorials on the use of MATLAB incorporated directly into the text \* A complete set of working digital computer programs \* Reviews of commercial software packages for control system analysis \* An extensive set of new, worked-out, illustrative solutions added in dedicated sections at the end of chapters \* Expanded end-of-chapter problems—one-third with answers to facilitate self-study \* An updated solutions manual containing solutions to the remaining two-thirds of the problems Superbly organized and easy-to-use, Modern Control System Theory and Design, Second Edition is an ideal textbook for introductory courses in control systems and an excellent professional reference. Its interdisciplinary approach makes it invaluable for practicing engineers in electrical, mechanical, aeronautical, chemical, and nuclear engineering and related areas.

*Discrete-Time Control System Design with Applications* Prentice Hall

Introduction to Control System Design equips students with the basic concepts, tools, and knowledge they need to effectively design automatic control systems. The text not only teaches readers how to design a control system, it inspires them to innovate and expand current methods to address new automation technology challenges and opportunities. The text is designed to support a two-quarter/semester course and is organized into two main parts. Part I covers basic linear system analysis and model-assembly concepts. It presents readers with a short history of control system design and introduces basic control concepts using first-order and second-order systems. Additional chapters address the modeling of mechanical and electrical systems, as well as assembling complex models using subsystem interconnection tools. Part II focuses on linear control system design. Students learn the fundamentals of feedback control systems; stability, regulation, and root locus design; time delay, plant uncertainty, and robust stability; and state feedback and linear quadratic optimization. The final chapter covers observer theory and output feedback control and reformulates the linear quadratic optimization problem as the more general H<sub>2</sub>

problem.

*Digital Control of Dynamic Systems* CRC Press

An essential core text, this volume develops theoretical foundations and explains how control systems work in real industrial situations. Several case histories assist students in visualizing applications. 1992 edition.

**Digital Control Applications Illustrated with MATLAB**

Springer

Appropriate for a one semester/two-quarter senior-level course in digital or discrete-time controls. This revision of the best-selling text in digital controls is a significant update with the integration of MATLAB software and new coverage in several areas. This program presents a better teaching and learning experience-for you and your students. \*Provide MATLAB programs to students: Short MATLAB programs have been included in many of the examples, which allow students to experiment and learn more skills. \*Motivate students with running applications that are featured throughout the book: Simple physical systems are introduced in one chapter and then used again later to illuminate more advanced material. \*Reinforce core concepts with examples and problems: Over 400 problems and 130 worked examples help students grasp the text's concepts.

**Applied Digital Control** CRC Press/ LLC

This work presents traditional methods and current techniques of incorporating the computer into closed-loop dynamic systems control, combining conventional transfer function design and state variable concepts. Digital Control Designer - an award-winning software program which permits the solution of highly complex problems - is available on the CR

[Digital Control Engineering](#) IET

This is a practical approach to control techniques. The author covers background material on analog controllers, digital controllers, and filters. Commonly used controllers are presented. Extended use of PSpice (a popular circuit simulation program) is used in problem solving. The book is also documented with 50 computer programs that circuit designers can use. Explains integration of control systems with a personal computer Compares numerous control algorithms in digital and analog form Details the use of SPICE in problem solving Presents modeling concepts for linear and nonlinear systems Examines commonly used controllers

*Digital Control Systems* Ernest Otto Doebelin

This textbook presents an integrated approach to digital (discrete-time) control systems covering analysis, design, simulation, and real-time implementation through relevant hardware and software platforms. Topics related to discrete-time control systems include z-transform, inverse z-transform, sampling and reconstruction, open- and closed-loop system characteristics, steady-state accuracy for different system types and input functions, stability analysis in z-domain-Jury's test, bilinear transformation from z- to w-domain, stability analysis in w-domain- Routh-Hurwitz criterion, root locus techniques in z-domain, frequency domain analysis in w-domain, control system specifications in time- and frequency- domains, design of controllers - PI, PD, PID, phase-lag, phase-lead, phase-lag-lead using time- and frequency-domain specifications, state-space methods- controllability and observability, pole placement controllers, design of observers (estimators) - full-order prediction, reduced-order, and current observers, system identification, optimal control- linear quadratic regulator (LQR), linear quadratic Gaussian (LQG) estimator (Kalman filter), implementation of controllers, and laboratory experiments for validation of analysis and design techniques on real laboratory scale hardware modules. Both single-input single-output (SISO) and multi-input multi-output (MIMO) systems are covered.

Software platform of Matlab/Simulink is used for analysis, design, and simulation and hardware/software platforms of National Instruments (NI)/LabVIEW are used for implementation and validation of analysis and design of digital control systems. Demonstrating the use of an integrated approach to cover interdisciplinary topics of digital control, emphasizing theoretical background, validation through analysis, simulation, and implementation in physical laboratory experiments, the book is ideal for students of engineering and applied science across in a range of concentrations.

**Control System Design Guide** Mercury Learning and Information

Digital controllers are part of nearly all modern personal, industrial, and transportation systems. Every senior or graduate student of electrical, chemical or mechanical engineering should therefore be familiar with the basic theory of digital controllers. This new text covers the fundamental principles and applications of digital control engineering, with emphasis on engineering design. Fadali and Visioli cover analysis and design of digitally controlled systems and describe applications of digital controls in a wide range of fields. With worked examples and Matlab applications in every chapter and many end-of-chapter assignments, this text provides both theory and practice for those coming to digital control engineering for the first time, whether as a student or practicing engineer. Extensive Use of computational tools: Matlab sections at end of each chapter show how to implement concepts from the chapter Frees the student from the drudgery of mundane calculations and allows him to consider more subtle aspects of control system analysis and design An engineering approach to digital controls: emphasis throughout the book is on design of control systems.

Mathematics is used to help explain concepts, but throughout the text discussion is tied to design and implementation. For example coverage of analog controls in chapter 5 is not simply a review, but is used to show how analog control systems map to digital control systems Review of Background Material: contains review material to aid understanding of digital control analysis and design. Examples include discussion of discrete-time systems in time domain and frequency domain (reviewed from linear systems course) and root locus design in s-domain and z-domain (reviewed from feedback control course) Inclusion of Advanced Topics In addition to the basic topics required for a one semester senior/graduate class, the text includes some advanced material to make it suitable for an introductory graduate level class or for two quarters at the senior/graduate level. Examples of optional topics are state-space methods, which may receive brief coverage in a one semester course, and nonlinear discrete-time systems Minimal Mathematics Prerequisites The mathematics background required for understanding most of the book is based on what can be reasonably expected from the average electrical, chemical or mechanical engineering senior. This background includes three semesters of calculus, differential equations and basic linear algebra. Some texts on digital control require more

**Industrial Digital Control Systems** Routledge

Control systems are pervasive in our lives. Our homes have environmental controls. The appliances we use at home, such as the washing machine, microwave, etc. have embedded controllers. We fly in airplanes and drive automobiles, which make extensive use of control systems. The increasing automation in the past few decades has increased our reliance on control systems. A First Course in Control System Design discusses control systems design from a model-based perspective as applicable to single-input single-output systems. The emphasis in this book is on understanding and applying the techniques that enable the design of effective control systems.

The book covers the time-domain and the frequency-domain design methods, as well as the design of continuous-time and discrete-time systems. Technical topics discussed in the book include: □ Modeling of physical systems □ Analysis of transfer function and state variable models □ Control system design via root locus □ Control system design in the state-space □ Control design of sampled-data systems □ Compensator design via frequency response modification

*Digital Control* Cognella Academic Publishing

Includes: Digital signals and systems. Digital controllers for process control applications. Design of digital controllers. Control of time delay systems. State-space concepts. System identification. Introduction to discrete optimal control. Multivariable control. Adaptive control. Computer aided design for industrial control systems. Reliability and redundancy in microprocessor controllers. Software and hardware aspects of industrial controller implementations. Application of distributed digital control algorithms to power stations. An expert system for process control.

*Design of Modern Control Systems* Springer Science & Business Media

EMBEDDED DIGITAL CONTROL WITH MICROCONTROLLERS

Explore a concise and practical introduction to implementation methods and the theory of digital control systems on microcontrollers Embedded Digital Control with Microcontrollers delivers expert instruction in digital control system implementation techniques on the widely used ARM Cortex-M microcontroller. The accomplished authors present the included information in three phases. First, they describe how to implement prototype digital control systems via the Python programming language in order to help the reader better understand theoretical digital control concepts. Second, the book offers readers direction on using the C programming language to implement digital control systems on actual microcontrollers. This will allow readers to solve real-life problems involving digital control, robotics, and mechatronics. Finally, readers will learn how to merge the theoretical and practical issues discussed in the book by implementing digital control systems in real-life

applications. Throughout the book, the application of digital control systems using the Python programming language ensures the reader can apply the theory contained within. Readers will also benefit from the inclusion of: A thorough introduction to the hardware used in the book, including STM32 Nucleo Development Boards and motor drive expansion boards An exploration of the software used in the book, including Python, MicroPython, and Mbed Practical discussions of digital control basics, including discrete-time signals, discrete-time systems, linear and time-invariant systems, and constant coefficient difference equations An examination of how to represent a continuous-time system in digital form, including analog-to-digital conversion and digital-to-analog conversion Perfect for undergraduate students in electrical engineering, Embedded Digital Control with Microcontrollers will also earn a place in the libraries of professional engineers and hobbyists working on digital control and robotics systems seeking a one-stop reference for digital control systems on microcontrollers.

**Analog and Digital Control System Design** Oxford University Press, USA

This book covers the theory and mathematics needed to understand the concepts in control system design. Chapter 1 deals with compensation network design. Nonlinear control systems, including phase-plane analysis and the Delta method are presented in chapter 2. The analysis and design aspects based on the state variable approach are presented in Chapter 3. The discrete time control systems form the basis for the study of digital control systems in Chapter 4, covering the frequency response, root locus analysis, and stability considerations for discrete-time control systems. The stability analysis based on the Lyapunov method is given in chapter 5. The appendices include two US government articles on industrial control systems (NIST) and the control system design for a solar energy storage system (U.S. Dept. of Energy). Concepts in the text are supported by numerical examples. Features: • Covers the theory and mathematics needed to understand the concepts in control system design • Includes two U.S. government articles on industrial control systems (NIST) and the control system design for a solar energy storage system (U.S. Department of Energy)

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