

# **Control Systems**

# Control Systems

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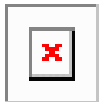
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# Control Systems



**Control Systems** is an inter-disciplinary engineering text that analyzes the effects and interactions of mathematical systems. This book is for third and fourth year undergraduates in an engineering program.

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## Preface



This book requires that you first read **Signals and Systems**.



This book is intended for **professional** readers.

This book will discuss the topic of Control Systems, which is an interdisciplinary engineering topic. Methods considered here will consist of both "Classical" control methods, and "Modern" control methods. Also, discretely sampled systems (digital/computer systems) will be considered in parallel with the more common analog methods. This book will not focus on any single engineering

discipline (electrical, mechanical, chemical, etc.), although readers should have a solid foundation in the fundamentals of at least one discipline.

This book will require prior knowledge of linear algebra, integral and differential calculus, and at least some exposure to ordinary differential equations. In addition, a prior knowledge of integral transforms, specifically the Laplace and Z transforms will be very beneficial. Also, prior knowledge of the Fourier Transform will shed more light on certain subjects. Wikibooks with information on calculus topics or transformation topics required for this book will be listed below:

- [Calculus](#)
- [Linear Algebra](#)
- [Signals and Systems](#)
- [Digital Signal Processing](#)

## Table of Contents

## Special Pages



This book contains mathematical formulae that look better **rendered as PNG**.



Readers may wish to reference the **Engineering Tables**.

<b>Print Version:</b>	<a href="#">Full Print version (it)</a>	<b>Warning:</b> Print version is over <i>230 pages long</i> old version as of 13 Oct, 2008.
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- Preface

## Controls Introduction

- Introduction
- System Identification
- Digital and Analog
- System Metrics
- System Modeling

## Classical Control Methods

- Transforms
- Transfer Functions
- Poles and Zeros

## Modern Control Methods

- State-Space Equations
- Linear System Solutions
- Time-Variant System Solutions
- Digital State-Space
- Eigenvalues and Eigenvectors
- Standard Forms
- MIMO Systems
- Realizations

## System Representation

- Gain

- Block Diagrams
- Feedback Loops
- Signal Flow Diagrams
- Bode Plots
- Nichols Charts

## Stability

- Stability
- State-Space Stability
- Discrete-Time Stability
- Routh-Hurwitz Criterion
- Jury's Test
- Root Locus
- Nyquist Stability Criterion

## Controllers and Compensators

- Controllability and Observability
- System Specifications
- State Feedback
- Estimators and Observers
- Controllers and Compensators
- Polynomial Design

## Adaptive Control

- Adaptive Control

### Nonlinear Systems

- State Machines
- Nonlinear Systems
- Common Nonlinearities

### Noisy Systems

- Noise Driven Systems

### Introduction to Digital Controls

- Digital Control Systems
- Discrete-Time Stability
- System Delays
- Sampled Data Systems
- Z Transform Mappings

### Examples

- Examples

### Appendices

- Physical Models
- Transforms
- System Representations
- Matrix Operations
- Using MATLAB ®



## Resources, Glossary, and License

- [Glossary](#)
- [List of Equations](#)
- [Resources](#)
- [Licensing](#)

