Luenberger Chapter 4

Finally, there is now a new edition of Professor Gandolfo`s acclaimed text on Economic Dynamics. Long out of print, but still in demand, this completely rewritten and updated edition treats all of the mathematical methods used in economic dynamics, from elementary linear difference and differential equations and simultaneous systems to the qualitative analysis of non-linear dynamical systems.
David G. Luenberger's Investment Science has become the dominant seller in Master of Finance programs, Senior or Masters level engineering, economics and statistics programs, as well as the programs in Financial Engineering. The author gives thorough yet highly accessible mathematical coverage of the fundamental topics of introductory investments: fixed-income securities, modern portfolio theory a capital asset pricing theory, derivatives (futures, options, and swaps), and innovations in optimal portfolio growth andvaluation of multi period risky investments. Throughout the text, Luenberger uses mathematics to present essential ideas about investments and their applications in business practice. The new edition is updated to include the significant advances in financial theory and practice. The text now includes two new chapters on Risk Measurement and Credit Risk and the expanded use of so-called real options, the characterization of volatility changes, and methods for incorporating suchbehavior in valuation. New exercise material and modifications to reflect the most recent financial changes have been made to nearly all chapters in this second edition.
The first book of its kind, Power Converters and AC Electrical Drives with Linear Neural Networks systematically explores the application of neural networks in the field of power electronics, with particular emphasis on the sensorless control of AC drives. It presents the classical theory based on space-vectors in identification, discusses control of electrical drives and power converters, and examines improvements that can be attained when using linear neural networks. The book integrates power electronics and electrical drives with artificial neural networks (ANN). Organized into four parts, it first deals with voltage source inverters and their control. It then covers AC electrical drive control, focusing on induction and permanent magnet synchronous motor drives. The third part examines theoretical aspects of linear neural networks, particularly the neural EXIN family. The fourth part highlights original applications in electrical drives and power quality, ranging from neural-based parameter estimation and sensorless control to distributed generation systems from renewable sources and active power filters. Simulation and experimental results are provided to validate the theories. Written by experts in the field, this state-of-the-art book requires basic knowledge of electrical machines and power electronics, as well as some familiarity with control systems, signal processing, linear algebra, and numerical analysis. Offering multiple paths through the material, the text is suitable for undergraduate and postgraduate students, theoreticians, practicing engineers, and researchers involved in applications of ANNs.
In a systems theoretic context, the terms 'consensus' and 'synchronization' both describe the property that all individual systems in a group behave asymptotically identical, i.e., output or state trajectories asymptotically converge to a common trajectory. The objective of the present thesis is an improved understanding of some of the diverse coupling mechanisms leading to consensus and synchronization. A starting point is the observation that classical consensus and synchronization results commonly deal with two distinct facets of the problem: Consensus has regularly a strong focus on the interconnections and related constraints while synchronization typically addresses questions about complex individual dynamical systems. Very few results exist that address both facets simultaneously. A thorough analysis static couplings in consensus algorithms provides explanations for this observation by unveiling limitations inherent to this type of couplings. Novel dynamic coupling mechanisms are proposed to overcome these limitations. These methods essentially rely on an internal model principle for consensus and synchronization derived in the thesis. This principle provides necessary conditions for consensus and synchronization in groups of non-identical systems, and it establishes a link to the output regulation problem. The fresh point of view revealed by this link eventually leads to a new hierarchical mechanism for consensus and synchronization among complex non-identical systems with weak assumptions on the interconnections. Applications include synchronization of linear systems and phase synchronization nonlinear oscillators.
Advances in Efficiency and Productivity II
Parimutuel Applications In Finance
Convex Optimization
Optimal Control Methods for Linear Discrete-Time Economic Systems
Practical Optimization

Financial intermediaries typically offer derivatives to their customers only when they can hedge the exposures from these transactions. Baron and Lange show that parimutuel auctions can be used by financial intermediaries to offer derivatives without exposing themselves to risk.
The composition of portfolios is one of the most fundamental and important methods in financial engineering, used to control the risk of investments. This book provides a comprehensive overview of statistical inference for portfolios and their various applications. A variety of asset processes are introduced, including non-Gaussian stationary processes, nonlinear processes, non-stationary processes, and the book provides a framework for statistical inference using local asymptotic normality (LAN). The approach is generalized for portfolio estimation, so that many important problems can be covered. This book can primarily be used as a reference by researchers from statistics, mathematics, finance, econometrics, and genomics. It can also be used as a textbook by senior undergraduate and graduate students in these fields.
Closes the gap between bioscience and mathematics-based process engineering This book presents the most commonly employed approaches in the control of bioprocesses. It discusses the role that control theory plays in understanding the mechanisms of cellular and metabolic processes, and presents key results in various fields such as dynamic modeling, dynamic properties of bioprocess models, software sensors designed for the online estimation of parameters and state variables, and control and supervision of bioprocesses Control in Bioengineering and Bioprocessing: Modeling, Estimation and the Use of Sensors is divided into three sections. Part I, Mathematical preliminaries and overview of the control and monitoring of bioprocess, provides a general overview of the control and monitoring of bioprocesses, and introduces the mathematical framework necessary for the analysis and characterization of bioprocess dynamics. Part II, Observability and control concepts, presents the observability concepts which form the basis of design online estimation algorithms (software sensor) for bioprocesses, and reviews controllability of these concepts, including automatic feedback control systems. Part III, Software sensors and observer-based control schemes for bioprocesses, features six application cases including dynamic behavior of 3-dimensional continuous bioreactors; observability analysis applied to 2D and 3D bioreactors with inhibitory and non-inhibitory models; and regulation of a continuously stirred bioreactor via modeling error compensation. Applicable across all areas of bioprocess engineering, including food and beverages, biofuels and renewable energy, pharmaceuticals and nutraceuticals, fermentation systems, product separation technologies, wastewater and solid-waste treatment technology, and bioremediation Provides a clear explanation of the mass-balance–based mathematical modelling of bioprocesses and the main tools for its dynamic analysis Offers industry-based applications on: myco-diesel for implementing "quality" of observability; developing a virtual sensor based on the Just-In-Time Model to monitor biological control systems; and virtual sensor design for state estimation in a photocatalytic bioreactor for hydrogen production Control in Bioengineering and Bioprocessing is intended as a foundational text for graduate level students in bioengineering, as well as a reference text for researchers, engineers, and other practitioners interested in the field of estimation and control of bioprocesses.
This decade has seen an explosive growth in computational speed and memory and a rapid enrichment in our understanding of artificial neural networks. These two factors provide systems engineers and statisticians with the ability to build models of physical, economic, and information-based time series and signals. This book provides a thorough and coherent introduction to the mathematical properties of feedforward neural networks and to the intensive methodology which has enabled their highly successful application to complex problems.
A Unified Framework
State-space and Multivariable Theory
Power Converters and AC Electrical Drives with Linear Neural Networks
Economic Dynamics
Information Science

Multiplicative noise appears in systems where the process or measurement noise levels depend on the system state vector. Such systems are relevant, for example, in radar measurements where larger ranges involve higher noise level. This monograph embodies a comprehensive survey of the relevant literature with basic problems being formulated and solved by applying various techniques including game theory, linear matrix inequalities and Lyapunov parameter-dependent functions. Topics covered include: convex H2 and H-infinity norms analysis of systems with multiplicative noise; state feedback control and state estimation of systems with multiplicative noise; dynamic and static output feedback of stochastic bilinear systems; tracking controllers for stochastic bilinear systems utilizing preview information. Various examples which demonstrate the applicability of the theory to practical control engineering problems are considered; two such examples are taken from the aerospace and guidance control areas.
This book offers a compact introduction to modern linear control design. The simplified overview presented of linear time-domain methodology paves the road for the study of more advanced non-linear techniques. Only rudimentary knowledge of linear systems theory is assumed - no use of Laplace transforms or frequency design tools is required. Emphasis is placed on assumptions and logical implications, rather than abstract completeness; on interpretation and physical meaning, rather than theoretical formalism; on results and solutions, rather than derivation or solvability. The topics covered include transient performance and stabilization via state or output feedback; disturbance attenuation and robust control; regional eigenvalue assignment and constraints on input or output variables; asymptotic regulation and disturbance rejection. Lyapunov theory and Linear Matrix Inequalities (LMI) are discussed as key design methods. All methods are demonstrated with MATLAB to promote practical use and comprehension.
As our title reveals, we focus on optimal control methods and applications relevant to linear dynamic economic systems in discrete-time variables. We deal only with discrete cases simply because economic data are available in discrete forms, hence realistic economic policies should be established in discrete-time structures. Though many books have been written on optimal control in engineering, we see few on discrete-type optimal control. More over, since economic models take slightly different forms than do engineer ing ones, we need a comprehensive, self-contained treatment of linear optimal control applicable to discrete-time economic systems. The present work is intended to fill this need from the standpoint of contemporary macroeconomic stabilization. The work is organized as follows. In Chapter 1 we demonstrate instru ment instability in an economic stabilization problem and thereby establish the motivation for our departure into the optimal control world. Chapter 2 provides fundamental concepts and propositions for controlling linear deterministic discrete-time systems, together with some economic applica tions and numerical methods. Our optimal control rules are in the form of feedback from known state variables of the preceding period. When state variables are not observable or are accessible only with observation errors, we must obtain appropriate proxies for these variables, which are called "observers" in deterministic cases or "filters" in stochastic circumstances. In Chapters 3 and 4, respectively, Luenberger observers and Kalman filters are discussed, developed, and applied in various directions. Noticing that a separation principle lies between observer (or filter) and controller (cf.
Stabilizing and Optimizing Control for Time-Delay Systems introduces three important classes of stabilizing controls for time-delay systems: non-optimal (without performance criteria); suboptimal (including guaranteed costs); and optimal controls. Each class is treated in detail and compared in terms of prior control structures. State- and input-delayed systems are considered. The book provides a unified mathematical framework with common notation being used throughout. Receding-horizon, or model predictive, linear quadratic (LQ), linear-quadratic-Gaussian and H? controls for time-delay systems are chosen as optimal stabilizing controls. Cost monotonicity is investigated in order to guarantee the asymptotic stability of closed-loop systems operating with such controls. The authors use guaranteed LQ and H? controls as representative sub-optimal methods; these are obtained with pre-determined control structures and certain upper bounds of performance criteria. Non-optimal stabilizing controls are obtained with predetermined control structures but with no performance criteria. Recently developed inequalities are exploited to obtain less conservative results. To facilitate computation, the authors use linear matrix inequalities to represent gain matrices for non-optimal and sub-optimal stabilizing controls, and all the initial conditions of coupled differential Riccati equations of optimal stabilizing controls. Numerical examples are provided with MATLAB® codes (downloadable from http://extras.springer.com/) to give readers guidance in working with more difficult optimal and suboptimal controls. Academic researchers studying control of a variety of real processes in chemistry, biology, transportation, digital communication networks and mechanical systems that are subject to time delays will find the results presented in Stabilizing and Optimizing Control for Time-Delay Systems to be helpful in their work. Practitioners working in related sectors of industry will also find this book to be of use in developing real-world control systems for the many time-delayed processes they encounter.
Handbook of Operations Analytics Using Data Envelopment Analysis
State Observers for Linear Systems with Uncertainty
Observers in Control Systems
Study Edition
New Markets for New Risks

This third edition of the classic textbook in Optimization has been fully revised and updated. It comprehensively covers modern theoretical insights in this crucial computing area, and will be required reading for analysts and operations researchers in a variety of fields. The book connects the purely analytical character of an optimization problem, and the behavior of algorithms used to solve it. Now, the third edition has been completely updated with recent Optimization Methods. The book also has a new co-author, Yinyu Ye of California's Stanford University, who has written lots of extra material including some on Interior Point Methods.
This book presents the basic concepts and recent developments of linear control problems with perturbations. The presentation concerns both continuous and discrete dynamical systems. It is self-contained and illustrated by numerous examples. From the contents: Notion of state observers Observability Observers of full-phase vectors for fully determined linear systems Functional observers for fully determined linear systems Asymptotic observers for linear systems with uncertainty Observers for bilinear and discrete systems
This handbook focuses on Data Envelopment Analysis (DEA) applications in operations analytics which are fundamental tools and techniques for improving operation functions and attaining long-term competitiveness. In fact, the handbook demonstrates that DEA can be viewed as Data Envelopment Analytics. Chapters include a review of cross-efficiency evaluation; a case study on measuring the environmental performance of OECS countries; how to select a set of performance metrics in DEA with an application to American banks; a relational network model to take the operations of individual periods into account in measuring efficiencies; how the efficient frontier methods DEA and stochastic frontier analysis (SFA) can be used synergistically; and how to integrate DEA and multidimensional scaling. In other chapters, authors construct a dynamic three-stage network DEA model; a bootstrapping based methodology to evaluate returns to scale and convexity assumptions in DEA; hybridizing DEA and cooperative games; using DEA to represent the production technology and directional distance functions to measure band performance; an input-specific Luenberger energy and environmental productivity indicator; and the issue of reference set by differentiating between the uniquely found reference set and the unary and maximal types of the reference set. Finally, additional chapters evaluate and compare the technological advancement observed in different hybrid electric vehicles (HEV) market segments over the past 15 years; radial measurement of efficiency for the production process possessing multi-components under different production technologies; issues around the use of accounting information in DEA; how to use DEA environmental assessment to establish corporate sustainability; a summary of research efforts on DEA environmental assessment applied to energy in the last 30 years; and an overview of DEA and how it can be utilized alone and with other techniques to investigate corporate environmental sustainability questions.
This 2001 book presents a general theory as well as a constructive methodology to solve 'observation problems', that is, reconstructing the full information about a dynamical process on the basis of partial observed data. A general methodology to control processes on the basis of the observations is also developed. Illustrative but also practical applications in the chemical and petroleum industries are shown. This book is intended for use by scientists in the areas of automatic control, mathematics, chemical engineering and physics.
Control Theory for Partial Differential Equations: Volume 1, Abstract Parabolic Systems
A Time-Domain Approach
Deterministic Observation Theory and Applications
Investment Science
An Invitation to Statistics in Wasserstein Space

A comprehensive introduction to the tools, techniques and applications of convex optimization.
Originally published in 1985. Mathematical methods and models to facilitate the understanding of the processes of economic dynamics and prediction were refined considerably over the period before this book was written. The field had grown; and many of the techniques involved became extremely complicated. Areas of particular interest include optimal control, non-linear models, game-theoretic approaches, demand analysis and time-series forecasting. This book presents a critical appraisal of developments and identifies potentially productive new directions for research. It synthesises work from mathematics, statistics and economics and includes a thorough analysis of the relationship between system understanding and predictability.
The recent rapid growth in the variety and complexity of new machine learning architectures requires the development of improved methods for designing, analyzing, evaluating, and communicating machine learning technologies. Statistical Machine Learning: A Unified Framework provides students, engineers, and scientists with tools from mathematical statistics and nonlinear optimization theory to become experts in the field of machine learning. In particular, the material in this text directly supports the mathematical analysis and design of old, new, and not-yet-invented nonlinear high-dimensional machine learning algorithms. Features: Unified empirical risk minimization framework supports rigorous mathematical analyses of widely used supervised, unsupervised, and reinforcement machine learning algorithms Matrix calculus methods for supporting machine learning analysis and design applications Explicit conditions for ensuring convergence of adaptive, batch, minibatch, MCEM, and MCMC learning algorithms that minimize both unimodal and multimodal objective functions Explicit conditions for characterizing asymptotic properties of M-estimators and model selection criteria such as AIC and BIC in the presence of possible model misspecification This advanced text is suitable for graduate students or highly motivated undergraduate students in statistics, computer science, electrical engineering, and applied mathematics. The text is self-contained and only assumes knowledge of lower-division linear algebra and upper-division probability theory. Students, professional engineers, and multidisciplinary scientists possessing these minimal prerequisites will find this text challenging yet accessible. About the Author: Richard M. Golden (Ph.D., M.S.E.E., B.S.E.E.) is Professor of Cognitive Science and Participating Faculty Member in Electrical Engineering at the University of Texas at Dallas. Dr. Golden has published articles and given talks at scientific conferences on a wide range of topics in the fields of both statistics and machine learning over the past three decades. His long-term research interests include identifying conditions for the convergence of deterministic and stochastic machine learning algorithms and investigating estimation and inference in the presence of possibly misspecified probability models.
Presented in a tutorial style, this comprehensive treatment unifies, simplifies, and explains most of the techniques for designing and analyzing adaptive control systems. Numerous examples clarify procedures and methods. 1995 edition.

Observer Design for Control and Fault Diagnosis of Boolean Networks
Dynamic Efficiency and Productivity Measurement
Modern Linear Control Design
Microeconomic Theory: Basic Principles and Extensions
Observer Design for Nonlinear Systems

This book surveys the state-of-the-art in efficiency and productivity analysis, examining advances in the analytical foundations and empirical applications. The analytical techniques developed in this book for efficiency provide alternative ways of defining optimum outcome sets, typically as a (technical) production frontier or as an (economic) cost, revenue or profit frontier, and alternative ways of measuring efficiency relative to an appropriate frontier. Simultaneously, the analytical techniques developed for efficiency analysis extend directly to productivity analysis, thereby providing alternative methods for estimating productivity levels, and productivity change through time or productivity variation across producers. This book includes chapters using data envelopment analysis (DEA) or stochastic frontier analysis (SFA) as quantitative techniques capable of measuring efficiency and productivity. Across the book's 15 chapters, it broadly extends into popular application areas including agriculture, banking and finance, and municipal performance, and relatively new application areas including corporate social responsibility, the value of intangible assets, land consolidation, and the measurement of economic well-being. The chapters also cover topics such as permutation tests for production frontier shifts, new indices of total factor productivity, and also randomized controlled trials and production frontiers.

A systematic treatment of dynamic decision making and performance measurement Modern business environments are dynamic. Yet, the models used to make decisions and quantify success within them are stuck in the past. In a world where demands, resources, and technology are interconnected and evolving, measures of efficiency need to reflect that environment. In Dynamic Efficiency and Productivity Measurement, Elvira Silva, Spiro E. Stefanou, and Alfons Oude Lansink look at the business process from a dynamic perspective. Their systematic study covers dynamic production environments where current production decisions impact future production possibilities. By considering practical factors like adjustments over time, this book offers an important lens for contemporary microeconomic analysis. Silva, Stefanou, and Lansink develop the analytical foundations of dynamic production technology in both primal and dual representations, with an emphasis on directional distance functions. They cover concepts measuring the production structure (economies of scale, economies of scope, capacity utilization) and performance (allocative, scale and technical inefficiency, productivity) in a methodological and comprehensive way. Through a unified approach, Dynamic Efficiency and Productivity Measurement offers a guide to how firms maximize potential in changing environments and an invaluable contribution to applied microeconomics.

This new edition of Mathematics for Dynamic Modeling updates a widely used and highly-respected textbook. The text is appropriate for upper-level undergraduate and graduate level courses in modeling, dynamical systems, differential equations, and linear multivariable systems offered in a variety of departments including mathematics, engineering, computer science, and economics. The text features many different realistic applications from a wide variety of disciplines. The book covers important tools such as linearization, feedback concepts, the use of Liapunov functions, and optimal control. This new edition is a valuable tool for understanding and teaching a rapidly growing field. Practitioners and researchers may also find this book of interest. Contains a new chapter on stability of dynamic models Covers many realistic applications from a wide variety of fields in an accessible manner Provides a broad introduction to the full scope of dynamical systems Incorporates new developments such as new models for chemical reactions and autocatalysis Integrates MATLAB throughout the text in both examples and illustrations Includes a new introduction to nonlinear differential equations

This open access book presents the key aspects of statistics in Wasserstein spaces, i.e. statistics in the space of probability measures when endowed with the geometry of optimal transportation. Further to reviewing state-of-the-art aspects, it also provides an accessible introduction to the fundamentals of this current topic, as well as an overview that will serve as an invitation and catalyst for further research. Statistics in Wasserstein spaces represents an emerging topic in mathematical statistics, situated at the interface between functional data analysis (where the data are functions, thus lying in infinite dimensional Hilbert space) and non-Euclidean statistics (where the data satisfy nonlinear constraints, thus lying on non-Euclidean manifolds). The Wasserstein space provides the natural mathematical formalism to describe data collections that are best modeled as random measures on Euclidean space (e.g. images and point processes). Such random measures carry the infinite dimensional traits of functional data, but are intrinsically nonlinear due to positivity and integrability restrictions. Indeed, their dominating statistical variation arises through random deformations of an underlying template, a theme that is pursued in depth in this monograph.

Linear and Nonlinear Programming
From Static to Dynamic Couplings in Consensus and Synchronization Among Identical and Non-Identical Systems
Mathematics for Dynamic Modeling
Routledge Library Editions: Econometrics
A Practical Guide

Control Theory for Linear Systems deals with the mathematical theory of feedback control of linear systems. It treats a wide range of control synthesis problems for linear state space systems with inputs and outputs. The book provides a treatment of these problems using state space methods, often with a geometric flavour. Its subject matter ranges from controllability and observability, stabilization, disturbance decoupling, and tracking and regulation, to linear quadratic regulation, H2 and H-infinity control, and robust stabilization. Each chapter of the book contains a series of exercises, intended to increase the reader's understanding of the material. Often, these exercises generalize and extend the material treated in the regular text.

First of a two-volume treatise on deterministic control systems modeled by multi-dimensional partial differential equations, originally published in 2000.

Estimation and Control of Large Scale Networked Systems is the first book that systematically summarizes results on large-scale networked systems. In addition, the book also summarizes the most recent results on structure identification of a networked system, attack identification and prevention. Readers will find the necessary mathematical knowledge for studying large-scale networked systems, as well as a systematic description of the current status of this field, the features of these systems, difficulties in dealing with state estimation and controller design, and major achievements. Numerical examples in chapters provide strong application backgrounds and/or are abstracted from actual engineering problems, such as gene regulation networks and electricity power systems. This book is an ideal resource for researchers in the field of systems and control engineering. Provides necessary mathematical knowledge for studying large scale networked systems Introduces new features for filter and control design of networked control systems Summarizes the most recent results on structural identification of a networked system, attack identification and prevention

Reissuing works originally published between 1929 and 1991, this collection of 17 volumes presents a variety of considerations on Econometrics, from introductions to specific research works on particular industries. With some volumes on models for macroeconomics and international economies, this is a widely interesting set of economic texts. Input/Output methods and databases are looked at in some volumes while others look at Bayesian techniques, linear and non-linear models. This set will be of use to those in industry and business studies, geography and sociology as well as politics and economics.

Feedforward Neural Network Methodology
Continuous and Approximation Theories
Estimation and Control of Large-Scale Networked Systems
Linear State-Space Control Systems
Mathematical Methods for Neural Network Analysis and Design

Observer Design for Nonlinear Systems deals with the design of observers for the large class of nonlinear continuous-time models. It contains a unified overview of a broad range of general designs, including the most recent results and their proofs, such as the homogeneous and nonlinear Luenberger design techniques. The book starts from the observation that most observer designs consist in looking for a reversible change of coordinates transforming the expression of the system dynamics into some specific structures, called normal forms, for which an observer is known. Therefore, the problem of observer design is broken down into three sub-problems: • What are the available normal forms and their associated observers?• Under which conditions can a system be transformed into one of these forms and through which transformation? • How can an inverse transformation that recovers an estimate in the given initial coordinates be achieved? This organisation allows the book to structure results within a united framework, highlighting the importance of the choice of the observer coordinates for nonlinear systems. In particular, the first part covers state-affine forms with their Luenberger or Kalman designs, and triangular forms with their homogeneous high-gain designs. The second part addresses the transformation into linear forms through linearization by output injection or in the context of a nonlinear Luenberger design, and into triangular forms under the well-known uniform and differential observability assumptions. Finally, the third part presents some recently developed methods for avoiding the numerically challenging inversion of the transformation. Observer Design for Nonlinear Systems addresses students and researchers looking for an introduction to or an overview of the state of the art in observer design for nonlinear continuous-time dynamical systems. The book gathers the most important results focusing on a large and diffuse literature on general observer designs with global convergence, and is a valuable source of information for academics and practitioners.

When Harold Fried, et al. published The Measurement of Productive Efficiency: Techniques and Applications with OUP in 1993, the book received a great deal of professional interest for its accessible treatment of the rapidly growing field of efficiency and productivity analysis. The first several chapters, providing the background, motivation, and theoretical foundations for this topic, were the most widely recognized. In this tight, direct update, these same editors have compiled over ten years of the most recent research in this changing field, and expanded on those seminal chapters. The book will guide readers from the basic models to the latest, cutting-edge extensions, and will be reinforced by references to classic and current theoretical and applied research. It is intended for professors and graduate students in a variety of fields, ranging from economics to agricultural economics, business administration, management science, and public administration. It should also appeal to public servants and policy makers engaged in business performance analysis or regulation.

Now readers can truly understand and apply the latest economic models while working directly with theoretical tools, real-world applications, and the popular new behavioral economics. This reader-friendly, market-leading book -- MICROECONOMIC THEORY: BASIC PRINCIPLES AND EXTENSIONS, 12E -- takes a calculus-based approach to provide the ideal level of mathematical rigor for the upper-level student of economics. Insightful graphic presentations help readers visually grasp the connections between the calculus and the algebraic and geometric approach to the same material. End-of-chapter problems present simple numerical/mathematical exercises, which strengthens the reader's intuition before they tackle the book's analytical, theoretical, behavioral, and complex problems. Unlike other more theoretical books, MICROECONOMIC THEORY, 12E closely connects all theory that is presented to real applications in the world today. Important Notice: Media content referenced within the product description or the product text may not be available in the ebook version.

From cell phones to Web portals, advances in information and communications technology have thrust society into an information age that is far-reaching, fast-moving, increasingly complex, and yet essential to modern life. Now, renowned scholar and author David Luenberger has produced Information Science, a text that distills and explains the most important concepts and insights at the core of this ongoing revolution. The book represents the material used in a widely acclaimed course offered at Stanford University. Drawing concepts from each of the constituent subfields that collectively comprise information science, Luenberger builds his book around the five "E's" of information: Entropy, Economics, Encryption, Extraction, and Emission. Each area directly impacts modern information products, services, and technology--everything from word processors to digital cash, database systems to decision making, marketing strategy to spread spectrum communication. To study these principles is to learn how English text, music, and pictures can be compressed, how it is possible to construct a digital signature that cannot simply be copied, how beautiful photographs can be sent from distant planets with a tiny battery, how communication networks expand, and how producers of information products can make a profit under difficult market conditions. The book contains vivid examples, illustrations, exercises, and points of historic interest, all of which bring to life the analytic methods presented: Presents a unified approach to the field of information science Emphasizes basic principles Includes a wide range of examples and applications Helps students develop important new skills Suggests exercises with solutions in an instructor's manual

The Measurement of Productive Efficiency and Productivity Growth
Control Theory for Linear Systems
Modeling, Estimation and the Use of Soft Sensors
New Mathematical Advances in Economic Dynamics
Algorithms and Engineering Applications

The book blends readability and accessibility common to undergraduate control systems texts with the mathematical rigor necessary to form a solid theoretical foundation. Appendices cover linear algebra and provide a Matlab overivew and files. The reviewers pointed out that this is an ambitious project but one that will pay off because of the lack of good up-to-date textbooks in the area.

In many industries the tariffs are not strictly proportional to the quantity purchased, i. e, they are nonlinear. Examples of nonlinear tariffs include railroad and electricity schedules and rental rates for durable goods and space. The major justification for the nonlinear pricing is the existence of private information on the side of consumers. In the early papers on the subject, private information was captured either by assuming a finite number of types (e. g. Adams and Yellen, 1976) or by a unidimensional continuum of types (Mussa and Rosen, 1978). Economics of the unidimen sional problems is by now well understood. The unidimensional models, however, do not cover all the situations of practical interest. Indeed, often the nonlinear tariffs specify the payment as a function of a variety of characteristics. For example, railroad tariffs spec ify charges based on weight, volume, and distance of each shipment. Dif ferent customers may value each of these characteristics differently, hence the customer's type will not in general be captured by a unidimensional characteristic and a problem of multidimensional screening arises. In such models the consumer's private information (her type) is captured by an m—dimensional vector, while the good produced by the monopolist has n quality dimensions.

Financial Economics, Risk and Information presents the fundamentals of finance in static and dynamic frameworks with focus on risk and information. The objective of this book is to introduce undergraduate and first-year graduate students to the methods and solutions of the main problems in finance theory relating to the economics of uncertainty and information. The main goal of the second edition is to make the materials more accessible to a wider audience of students and finance professionals. The focus is on developing a core body of theory that will provide the student with a solid intellectual foundation for more advanced topics and methods. The new edition has streamlined chapters and topics, with new sections on portfolio choice under alternative information structures. The starting point is the traditional mean-variance approach, followed by portfolio choice from first principles. The topics are extended to alternative market structures, alternative contractual arrangements and agency, dynamic stochastic general equilibrium in discrete and continuous time, attitudes towards risk and towards inter-temporal substitution in discrete and continuous time; and option pricing. In general, the book presents a balanced introduction to the use of stochastic methods in discrete and continuous time in the field of financial economics.

For convenience, many of the proofs of the key theorems have been rewritten so that the entire book uses a relatively uniform notion.

Including Model Predictive Controls
Control in Bioprocessing
Stabilizing and Optimizing Control for Time-Delay Systems
Statistical Portfolio Estimation
Robust Adaptive Control

Practical Optimization: Algorithms and Engineering Applications is a hands-on treatment of the subject of optimization. A comprehensive set of problems and exercises makes the book suitable for use in one or two semesters of a first-year graduate course or an advanced undergraduate course. Each half of the book contains a full semester's worth of complementary yet stand-alone material. The practical orientation of the topics chosen and a wealth of useful examples also make the book suitable for practitioners in the field.

Observers are digital algorithms that combine sensor outputs with knowledge of the system to provide results superior to traditional structures, which rely wholly on sensors. Observers have been used in selected industries for years, but most books explain them with complex mathematics. Observers in Control Systems uses intuitive discussion, software experiments, and supporting analysis to explain the advantages and disadvantages of observers. If you are working in controls and want to improve your control systems, observers could be the technology you need and this book will give you a clear, thorough explanation of how they work and how to use them. Control systems and devices have become the most essential part of nearly all mechanical systems, machines, devices and manufacturing systems throughout the world. Increasingly the efficiency of production, the reliability of output and increased energy savings are a direct result of the quality and deployment of the control system. A modern and essential tool within the engineer's kit is the Observer which helps improve the performance and reduce the cost of these systems. George Ellis is the author of the highly successful Control System Design Guide (Second Edition). Unlike most controls books, which are written by control theorists and academics, Ellis is a leading engineer, designer, author and lecturer working in industry directly with the users of industrial motion control systems. Observers in Control Systems is written for all professional engineers and is designed to be utilized without an in-depth background in control theory. This is a "real-world" book which will demonstrate how observers work and how they can improve your control system. It also shows how observers operate when conditions are not ideal and teaches the reader how to quickly tune an observer in a working system. Software Available online: A free updated and enhanced version of the author's popular Visual ModelQ allows the reader to practice the concepts with Visual ModelQ models on a PC. Based on a virtual laboratory, all key topics are demonstrated with more than twenty control system models. The models are written in Visual ModelQ ,and are available on the Internet to every reader with a PC. Teaches observers and Kalman filters from an intuitive perspective Explains how to reduce control system susceptibility to noise Shows how to design an adaptive controller based on estimating parameter variation using observers Shows how to improve a control system's ability to reject disturbances Key topics are demonstrated with PC-based models of control systems. The models are written in both MatLab ® and ModelQ; models are available free of charge

H-infinity Control and Estimation of State-multiplicative Linear Systems
Statistical Machine Learning
Financial Economics, Risk And Information (2nd Edition)
Multidimensional Screening