Advanced Digital Communications Systems And Signal Processing Techniques

Offers the most complete, up-to-date coverage available on the principles of digital communications. Focuses on basic issues, relating theory to practice wherever possible. Numerous examples, worked out in detail, have been included to help the reader develop an intuitive grasp of the theory. Topics covered include the sampling process, digital modulation techniques, error-control coding, robust quantization for pulse-code modulation, coding speech at low bit radio, information theoretic concepts, coding and computer communication. Because the book covers a broad range of topics in digital communications, it should satisfy a variety of backgrounds and interests, and offers a great deal of flexibility for teaching the course. The author has included suggested course outlines for courses at the undergraduate or graduate levels. Digital Communication using MATLAB and Simulink is intended for a broad audience. For the student taking a traditional course, the text provides simulations of the MATLAB and Simulink systems, and the opportunity to go beyond the lecture or laboratory and develop investigations and projects. For the professional, the text facilitates an expansive

review of and experience with the tenets of digital communication systems.

This book is for designers and would-be designers of digital communication systems. The general approach of this book is to extract the common principles underlying a range of media and applications and present them in a unified framework. Digital Communication is relevant to the design of a variety of systems, including voice and video digital cellular telephone, digital CATV distribution, wireless LANs, digital subscriber loop, metallic Ethernet, voiceband data modems, and satellite communication systems. New in this Third Edition: New material on recent advances in wireless communications, error-control coding, and multi-user communications has been added. As a result, two new chapters have been added, one on the theory of MIMO channels, and the other on diversity techniques for mitigating fading. Error-control coding has been rewritten to reflect the current state of the art. Chapters 6 through 9 from the Second Edition have been reorganized and streamlined to highlight pulse-amplitude modulation, becoming the new Chapters 5 through 7. Readability is increased by relegating many of the more detailed derivations to appendices and exercise solutions, both of which are included in the book. Exercises, problems, and solutions have been revised and expanded. Three chapters from the previous edition have been moved

to the book's Web site to make room for new material. This book is ideal as a first-year graduate textbook, and is essential to many industry professionals. The book is attractive to both audiences through the inclusion of many practical examples and a practical flavor in the choice of topics. Digital Communication has a Web site at : http://www.ece.gatech.edu/~barry/digital/, where the reader may find additional information from the Second Edition, other supplementary materials, useful links, a problem solutions manual, and errata. Written by two distinguished experts in the field of digital communications, this classic text remains a vital resource three decades after its initial publication. Its treatment is geared toward advanced students of communications theory and to designers of channels, links, terminals, modems, or networks used to transmit and receive digital messages. The three-part approach begins with the fundamentals of digital communication and block coding, including an analysis of block code ensemble performance. The second part introduces convolutional coding, exploring ensemble performance and sequential decoding. The final section addresses source coding and rate distortion theory, examining fundamental concepts for memoryless sources as well as precepts related to memory, Gaussian sources, and universal coding. Appendixes of useful information appear throughout the text, and each chapter

concludes with a set of problems, the solutions to which are available online.

This book concerns digital communication. Specifically, we treat the transport of bit streams from one geographical location to another over various physical media, such as wire pairs, coaxial cable, optical fiber, and radio waves. Further, we cover the mul tiple access and synchronization issues relevant to constructing communication net works that simultaneously transport bit streams from many users. The material in this book is thus directly relevant to the design of a,multitude of digital communication systems, including for example local and metropolitan area data networks, voice and video telephony systems, digital CATV distribution, digital cellular and radio systems, the narrowband and broadband integrated services digital network (ISDN), computer communication systems, voiceband data modems, and satellite communication sys tems. We extract the common principles underlying these and other applications and present them in a unified framework. This book is intended for designers and would-be designers of digital communication systems. To limit the scope to manageable proportions we have had to be selective in the topics covered and in the depth of coverage. In the case of advanced information, coding, and detection theory, for example, we have not tried to duplicate the in-depth coverage of many advanced

textbooks, but rather have tried to cover those aspects directly relevant to the design of digital communication systems.

Featuring a variety of applications that motivate students, this book serves as a companion or supplement to any of the comprehensive textbooks in communication systems. The book provides a variety of exercises that may be solved on the computer using MATLAB„? (The authors assume that the student is familiar with the fundamentals of MATLAB). By design, the treatment of the various topics is brief. The authors provide the motivation and a short introduction to each topic, establish the necessary notation, and then illustrate the basic concepts by means of an example.

A young man begins a journey from Saudi Arabia, believing it will end with his death in England. If his mission succeeds, he will go to his god a martyr - and many innocents will die with him. For David Banks, an armed protection officer, charged with neutralizing the threat to London's safety, his role is no longer clear-cut: one man's terrorist is another man's freedom fighter: dangerous distinctions to a police officer with his finger on the trigger. Soon the two men's paths will cross. Before then, their commitment will be shaken by the journeys that take them there. The suicide bomber and the policeman will have cause to question the roads they've chosen. Win or lose, neither will be the same again...

Revised to reflect all the current trends in the digital communications field, this all-inclusive guide delivers an outstanding introduction to the analysis and design of digital communication systems. Includes expert coverage of new topics: Turbocodes, Turboequalization, Antenna Arrays, Digital Cellular Systems, and Iterative Detection. Convenient, sequential organization begins with a look at the historyo and classification of channel models and builds from there.

An engineer's introduction to concepts, algorithms, and advancements in Digital Signal Processing. This lucidly written resource makes extensive use of real-world examples as it covers all the important design and engineering references.

Combining theoretical knowledge and practical applications, this advanced-level textbook covers the most important aspects of contemporary digital communication systems. Introduction to Digital Communication Systems focuses on the rules of functioning digital communication system blocks, starting with the performance limits set by the information theory. Drawing on information relating to turbo codes and LDPC codes, the text presents the basic methods of error correction and detection, followed by baseband transmission methods, and single- and multi-carrier digital modulations. The basic properties of several physical communication channels used in digital communication systems are

explained, showing the transmission and reception
methods on channels suffering from intersymbol
interference. The text also describes the most recent
developments in the transmission techniques
specific to wireless communications used both in
wireline and wireless systems. The case studies are
a unique feature of this book, illustrating elements of
the theory developed in each chapter. Introduction to
Digital Communication Systems provides a concise
approach to digital communications, with practical
examples and problems to supplement the text.
There is also a companion website featuring an
instructors' solutions manual and presentation slides
to aid understanding. Offers theoretical and practical
knowledge in a self-contained textbook on digital
communications Explains basic rules of recent
achievements in digital communication systems such
as MIMO, turbo codes, LDPC codes, OFDMA, SC-
FDMA Provides problems at the end of each chapter
with an instructors' solutions manual on the
companion website Includes case studies and
representative communication system examples
such as DVB-S, GSM, UMTS, 3GPP-LTE
This second edition of Digital Optical
Communications provides a comprehensive
treatment of the modern aspects of coherent
homodyne and self-coherent reception techniques
using algorithms incorporated in digital signal
processing (DSP) systems and DSP-based

transmitters to overcome several linear and nonlinear transmission impairments and frequency mismatching between the local oscillator and the carrier, as well as clock recovery and cycle slips. These modern transmission systems have emerged as the core technology for Tera-bits per second (bps) and Peta-bps optical Internet for the near future. Featuring extensive updates to all existing chapters, Advanced Digital Optical Communications, Second Edition: Contains new chapters on optical fiber structures and propagation, optical coherent receivers, DSP equalizer algorithms, and high-order spectral DSP receivers Examines theoretical foundations, practical case studies, and MATLAB® and Simulink® models for simulation transmissions Includes new end-of-chapter practice problems and useful appendices to supplement technical information Downloadable content available with qualifying course adoption Advanced Digital Optical Communications, Second Edition supplies a fundamental understanding of digital communication applications in optical communication technologies, emphasizing operation principles versus heavy mathematical analysis. It is an ideal text for aspiring engineers and a valuable professional reference for those involved in optics, telecommunications, electronics, photonics, and digital signal processing. This is a concise presentation of the concepts underlying the design of digital communication

systems, without the detail that can overwhelm students. Many examples, from the basic to the cutting-edge, show how the theory is used in the design of modern systems and the relevance of this theory will motivate students. The theory is supported by practical algorithms so that the student can perform computations and simulations. Leading edge topics in coding and wireless communication make this an ideal text for students taking just one course on the subject. Fundamentals of Digital Communications has coverage of turbo and LDPC codes in sufficient detail and clarity to enable hands-on implementation and performance evaluation, as well as 'just enough' information theory to enable computation of performance benchmarks to compare them against. Other unique features include space-time communication and geometric insights into noncoherent communication and equalization. A rare text dedicated to high-performance measurement techniques in modern communications. It describes high performance measurement techniques for digital communications and digital signal processing in radio and microwave systems, wire line channels, as well as measurements for analog communications channels. AUTHOR'S COMMENTS The purpose of this book is to present the engineering considerations necessary for the comprehension of modern telecommunication measurement and related instrumentation and

analysis techniques. I wish to emphasize that this is not an academic book in the sense of analytical communications or measurement theory. Rather, it stresses the measurements, experimental analysis and instrumentation problems related to communications systems. PUBLISHER'S COMMENTS This book provides a strong foundation for understanding the special problems associated with testing modern communications systems. Its original publication anticipated the needs of communications engineers, setting a foundation for current work. The book's continued availability assures that new engineers will have access to a key reference text in this important area of technology.

The definitive guide to problem-solving in the design of communications systems In Algorithms for Communications Systems and their Applications, 2nd Edition, authors Benvenuto, Cherubini, and Tomasin have delivered the ultimate and practical guide to applying algorithms in communications systems. Written for researchers and professionals in the areas of digital communications, signal processing, and computer engineering, Algorithms for Communications Systems presents algorithmic and computational procedures within communications systems that overcome a wide range of problems facing system designers. New material in this fully updated edition includes: MIMO

systems (Space-time block coding/Spatial multiplexing /Beamforming and interference management/Channel Estimation) OFDM and SC-FDMA (Synchronization/Resource allocation (bit and power loading)/Filtered OFDM) Improved radio channel model (Doppler and shadowing/mmWave) Polar codes (including practical decoding methods) 5G systems (New Radio architecture/initial access for mmWave/physical channels) The book retains the essential coding and signal processing theoretical and operative elements expected from a classic text, further adopting the new radio of 5G systems as a case study to create the definitive guide to modern communications systems.

Because fine-tuning the parameters of a system is critical to a developer's success, Performance Optimization of Digital Communications Systems examines particular optimization problems in digital communications, presenting analytical techniques in combination with SystemView and MATLAB simulations. Consisting of ten chapters, this monograph presen

Digital Underwater Acoustic Communications focuses on describing the differences between underwater acoustic communication channels and radio channels, discusses loss of transmitted sound in underwater acoustic channels, describes digital underwater acoustic communication signal processing, and provides a comprehensive reference to digital underwater acoustic communication equipment. This book is designed to serve as a reference for postgraduate students and practicing engineers involved in the design and analysis of underwater acoustic communications systems as

well as for engineers involved in underwater acoustic engineering. Introduces the basics of underwater acoustics, along with the advanced functionalities needed to achieve reliable communications in underwater environment Identifies challenges in underwater acoustic channels relative to radio channels, underwater acoustic propagation, and solutions Shows how multi-path structures can be thought of as time diversity signals Presents a new, robust signal processing system, and an advanced FH-SS system for multimedia underwater acoustic communications with moderate communication ranges (above 20km) and rates (above 600bps) Describes the APNFM system for underwater acoustic communication equipment (including both civil and military applications), to be employed in active sonar to improve its performance

A comprehensive and detailed treatment of the program SIMULINK® that focuses on SIMULINK® for simulations in Digital and Wireless Communications Modeling of Digital Communication Systems Using SIMULINK® introduces the reader to SIMULINK®, an extension of the widely-used MATLAB modeling tool, and the use of SIMULINK® in modeling and simulating digital communication systems, including wireless communication systems. Readers will learn to model a wide selection of digital communications techniques and evaluate their performance for many important channel conditions. Modeling of Digital Communication Systems Using SIMULINK® is organized in two parts. The first addresses Simulink® models of digital communications systems using various modulation, coding, channel conditions and receiver processing techniques. The second part provides a collection of examples, including speech coding, interference cancellation, spread spectrum, adaptive signal processing, Kalman filtering and modulation and coding techniques currently implemented in mobile

wireless systems. Covers case examples, progressing from basic to complex Provides applications for mobile communications, satellite communications, and fixed wireless systems that reveal the power of SIMULINK modeling Includes access to useable SIMULINK® simulations online All models in the text have been updated to R2018a; only problem sets require updating to the latest release by the user Covering both the use of SIMULINK® in digital communications and the complex aspects of wireless communication systems, Modeling of Digital Communication Systems UsingSIMULINK® is a great resource for both practicing engineers and students with MATLAB experience. This book offers an easily accessible treatment of the theory and practice of digital data communications, explaining how to design, implement, and test software-defined radio modems. System analysts and designers will benefit from detailed system performance simulations that ensure compliance with end-user specified requirements under the expected channel conditions. The book features case studies and examples for end-to-end performance evaluations, simulation codes for waveform acquisition and data demodulation, design and analysis techniques, applications for microwave and millimeter wave bands, and much more. A concise introduction to the core concepts in digital communication, providing clarity and depth through examples, problems and MATLAB exercises. Its simple structure maps a logical route to understand the most basic principles in digital communication, and also leads students through more in-depth treatment with examples and step-by step instructions. The renowned communications theorist Robert Gallager brings his lucid writing style to the study of the fundamental system aspects of digital communication for a one-semester course for graduate students. With the clarity and insight that

have characterized his teaching and earlier textbooks, he develops a simple framework and then combines this with careful proofs to help the reader understand modern systems and simplified models in an intuitive yet precise way. A strong narrative and links between theory and practice reinforce this concise, practical presentation. The book begins with data compression for arbitrary sources. Gallager then describes how to modulate the resulting binary data for transmission over wires, cables, optical fibers, and wireless channels. Analysis and intuitive interpretations are developed for channel noise models, followed by coverage of the principles of detection, coding, and decoding. The various concepts covered are brought together in a description of wireless communication, using CDMA as a case study. ???????????????????????????

This book uses a practical approach in the application of theoretical concepts to digital communications in the design of software defined radio modems. This book discusses the design, implementation and performance verification of waveforms and algorithms appropriate for digital data modulation and demodulation in modern communication systems. Using a building-block approach, the author provides an introductory to the advanced understanding of acquisition and data detection using source and executable simulation code to validate the communication system performance with respect to theory and design specifications. The author focuses on theoretical analysis, algorithm design, firmware and software designs and subsystem and system testing. This book treats system designs with a variety of channel characteristics from very low to optical frequencies. This book offers system analysis and

subsystem implementation options for acquisition and data detection appropriate to the channel conditions and system specifications, and provides test methods for demonstrating system performance. This book also: Outlines fundamental system requirements and related analysis that must be established prior to a detailed subsystem design Includes many examples that highlight various analytical solutions and case studies that characterize various system performance measures Discusses various aspects of atmospheric propagation using the spherical 4/3 effective earth radius model Examines Ionospheric propagation and uses the Rayleigh fading channel to evaluate link performance using several robust waveform modulations Contains end-of-chapter problems, allowing the reader to further engage with the text Digital Communications with Emphasis on Data Modems is a great resource for communication-system and digital signal processing engineers and students looking for in-depth theory as well as practical implementations.
Introduction to Digital Communications explores the basic principles in the analysis and design of digital communication systems, including design objectives, constraints and trade-offs. After portraying the big picture and laying the background material, this book lucidly progresses to a comprehensive and detailed discussion of all critical elements and key functions in digital communications. The first undergraduate-level textbook exclusively on digital communications, with a complete coverage of source and channel coding, modulation, and synchronization. Discusses major aspects of

communication networks and multiuser communications
Provides insightful descriptions and intuitive explanations
of all complex concepts Focuses on practical
applications and illustrative examples. A companion Web
site includes solutions to end-of-chapter problems and
computer exercises, lecture slides, and figures and
tables from the text

PSpice for Digital Communications Engineering shows
how to simulate digital communication systems and
modulation methods using the very powerful Cadence
Orcad PSpice version 10.5 suite of software programs.
Fourier series and Fourier transform are applied to
signals to set the ground work for the modulation
techniques introduced in later chapters. Various
baseband signals, including duo-binary baseband
signaling, are generated and the spectra are examined
to detail the unsuitability of these signals for accessing
the public switched network. Pulse code modulation and
time-division multiplexing circuits are examined and
simulated where sampling and quantization noise topics
are discussed. We construct a single-channel PCM
system from transmission to receiver i.e. end-to-end, and
import real speech signals to examine the problems
associated with aliasing, sample and hold.Companding
is addressed here and we look at the A and mu law
characteristics for achieving better signal to quantization
noise ratios. Several types of delta modulators are
examined and also the concept of time
divisionmultiplexing is considered. Multi-level signaling
techniques such as QPSK andQAMare analyzed and
simulated and â€˜home-made metersâ€™, such as

scatter and eye meters, are used to assess the performance of these modulation systems in the presence of noise. The raised-cosine family of filters for shaping data before transmission is examined in depth where bandwidth efficiency and channel capacity is discussed. We plot several graphs in Probe to compare the efficiency of these systems. Direct spread spectrum is the last topic to be examined and simulated to show the advantages of spreading the signal over a wide bandwidth and giving good signal security at the same time.

The book covers fundamentals and basics of engineering communication theory. It presents right mix of explanation of mathematics (theory) and explanation. The book discusses both analogue communication and digital communication in details. It covers the subject of 'classical' engineering communication starting from the very basics of the subject to the beginning of more advanced areas. It also covers all the basic mathematics which is required to read the text. It covers a two semester course as an undergraduate text and some topics in master's course as well.

This book primarily focuses on the design of analog and digital communication systems; and has been structured to cater to the second year engineering undergraduate students of Computer Science, Information Technology, Electrical Engineering and Electronics and Communication departments. For better understanding, the basics of analog communication systems are outlined before the digital communication systems section. The content of this book is also suitable for the

students with little knowledge in communication systems. The book is divided into five modules for efficient presentation, and it provides numerous examples and illustrations for the detailed understanding of the subject, in a thorough manner. Technical topics discussed in the book include: Analog modulation techniques-AM, FM and PMDigital modulation techniques-ASK, PSK, FSK, QPSK, MSK and M-ary modulationPulse modulation techniques and Data communicationSource coding techniques-Shannon Fano and Huffman coding; channel coding techniques-Linear block codes and convolutional codesAdvanced communication techniques topics includes-Cellular communication, Satellite communication and multiple access schemes. Offers concise, practical knowledge on modern communication systems to help students transition smoothly into the workplace and beyond This book presents the most relevant concepts and technologies of today's communication systems and presents them in a concise and intuitive manner. It covers advanced topics such as Orthogonal Frequency-Division Multiplexing (OFDM) and Multiple-Input Multiple-Output (MIMO) Technology, which are enabling technologies for modern communication systems such as WiFi (including the latest enhancements) and LTE-Advanced. Following a brief introduction to the field, Digital Communication for Practicing Engineers immerses readers in the theories and technologies that engineers deal with. It starts off with Shannon Theorem and Information Theory, before moving on to basic modules of a communication system, including modulation, statistical detection, channel

coding, synchronization, and equalization. The next part of the book discusses advanced topics such as OFDM and MIMO, and introduces several emerging technologies in the context of 5G cellular system radio interface. The book closes by outlining several current research areas in digital communications. In addition, this text: Breaks down the subject into self-contained lectures, which can be read individually or as a whole Focuses on the pros and cons of widely used techniques, while providing references for detailed mathematical analysis Follows the current technology trends, including advanced topics such as OFDM and MIMO Touches on content this is not usually contained in textbooks such as cyclo-stationary symbol timing recovery, adaptive self-interference canceler, and Tomlinson-Harashima precoder Includes many illustrations, homework problems, and examples Digital Communication for Practicing Engineers is an ideal guide for graduate students and professionals in digital communication looking to understand, work with, and adapt to the current and future technology.

This supplement to any standard communication systems text is one of the first books to successfully integrate the use of MATLAB in the study of communication systems concepts and problems. It has been developed for instructors and students who wish to make use of MATLAB as an integral part of their study. The former will find the means by which to use MATLAB as a powerful tool to motivate students and illustrate essential theory without having to customize the applications themselves; the latter will find relevant

problems quickly and easily. The book includes numerous MATLAB-based simulations and examples of communication systems, while providing a good balance of theory and hands-on computer experience. This Updated Printing revises the book and MATLAB files (available for downloading from the Brooks/Cole Bookware Companion Resource Center Web Site) to MATLAB V5.

Featuring a variety of applications that motivate students, this book serves as a companion or supplement to any of the comprehensive textbooks in communication systems. The book provides a variety of exercises that may be solved on the computer using MATLAB. By design, the treatment of the various topics is brief. The authors provide the motivation and a short introduction to each topic, establish the necessary notation, and then illustrate the basic concepts by means of an example. Comprehensive in scope and contemporary in coverage, this text explores modern digital and data communications systems, microwave radio communications systems, satellite communications systems, and optical fiber communications systems. Digital Signal Processing in Modern Communication Systems takes you on a journey that starts with basic DSP principles and ends with a treatment of modern wireless modems like OFDM and single-tone transceivers. Throughout this journey, we will cover signal processing topics that are applicable not just to the field of communications but to many engineering disciplines. This text steps outside the often dry mathematical presentation of more traditional DSP books

and provides a more intuitive approach to this fascinating topic. Some of this book's uniqueness can be summarized as follows: - An intuitive approach to the topic of digital signal processing. - Working in-book MatLab examples supporting all important concepts. - A large scope covering basic concepts (correlation, convolution, DFT, FIR filters ...) as well as advanced topics (optimization, adaptive signal processing, equalization, OFDM, MIMO ...). - MatLab modeling of analog/RF effects (multipath channel, thermal noise, phase noise, IQ imbalances, DC and frequency offsets) that must be addressed and solved in modern modem design. - Real world topics that go beyond the ordinary communication textbooks such as signal synchronization, modem rate management, and fixed-point effects. All in all, this book is a must-have for students and practicing engineers who want to build upon the principles of Digital Signal Processing, enrich their understanding with advanced topics, and then apply that knowledge to the design of modern wireless modems.

Featuring a variety of applications that motivate students, this book serves as a companion or supplement to any of the comprehensive textbooks in communication systems. The book provides a variety of exercises that may be solved on the computer using MATLAB. By design, the treatment of the various topics is brief. The authors provide the motivation and a short introduction to each topic, establish the necessary notation, and then illustrate the basic concepts by means of an example. Important Notice: Media content referenced within the

product description or the product text may not be available in the ebook version.

Get a Solid Account of Physical Layer Communications Theory, Illustrated with Numerous Interactive MATLAB Mini-Projects You can rely on Fundamentals of Communications Systems for a solid introduction to physical layer communications theory, filled with modern implementations and MATLAB examples. This state-of-the-art guide covers essential theory and current engineering practice, carefully explaining the real-world tradeoffs necessary among performance, spectral efficiency, and complexity. Written by an award-winning communications expert, the book first takes readers through analog communications basics, amplitude modulations, analog angle modulation, and random processes. This essential resource then explains noise in bandpass communications systems...bandpass Gaussian random processes...digital communications basics...complexity of optimum demodulation...spectrally efficient data transmission...and more. Fundamentals of Communications Systems features: A modern approach to communications theory, reflecting current engineering applications Numerous MATLAB problems integrated throughout, with software available for download Detailed coverage of tradeoffs among performance, spectral efficiency, and complexity in engineering design Text written in four parts for easy modular presentation Inside This On-Target Communications Engineering Tool • Mathematical Foundations • Analog Communications Basics • Amplitude Modulations • Analog Angle Modulation • More Topics in Analog Communications •

Random Processes • Noise in Bandpass Communications Systems • Bandpass Gaussian Random Processes • Digital Communications Basics • Optimal Single Bit Demodulation Structures • Transmitting More than One Bit • Complexity of Optimum Demodulation • Spectrally Efficient Data Transmission

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