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**MIMO Wireless Networks** - Bruno Clerckx - 2013-01-23
This book is unique in presenting channels, techniques and standards for the next generation of MIMO wireless networks. Through a unified framework, it emphasizes how propagation mechanisms impact the system performance under realistic power constraints. Combining a solid mathematical analysis with a physical and intuitive approach to space-time signal processing, the book progressively derives innovative designs for space-time coding and precoding as well as multi-user and multi-cell techniques, taking into consideration that MIMO channels are often far from ideal. Reflecting developments since the first edition was published, this book has been thoroughly revised, and now includes new sections and five new chapters, respectively dealing with receiver design, multi-user MIMO, multi-cell MIMO, MIMO implementation in standards, and MIMO system-level evaluation. Extended introduction to multi-dimensional propagation, including polarization aspects Detailed and comparative description of physical models and analytical representations of single- and multi-link MIMO channels, covering the latest standardized models Thorough overview of space-time coding techniques, covering both classical and more recent schemes under information theory and error probability perspectives Intuitive illustration of how real-world propagation affects the capacity and the error performance of MIMO transmission schemes Detailed information theoretic analysis of multiple access, broadcast and interference channels In-depth presentation of multi-user diversity, resource allocation and (non-)linear MU-MIMO precoding techniques with perfect and imperfect channel knowledge Extensive coverage of cooperative multi-cell MIMO-OFDMA networks, including network resource allocation optimization, coordinated scheduling, beamforming and power control, interference alignment, joint processing, massive and network MIMO Applications of MIMO and Coordinated Multi-Point (CoMP) in LTE, LTE-A and WiMAX Theoretical derivations and results contrasted with practical system level evaluations highlighting the performance of single- and multi-cell MIMO techniques in realistic deployments.
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**Fundamentals of Wireless Communication** - David Tse - 2005-05-26
This textbook takes a unified view of the fundamentals of wireless communication and explains cutting-edge concepts in a simple and intuitive way. An abundant supply of exercises make it ideal for graduate courses in electrical and computer engineering and it will also be of great interest to practising engineers.

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**Adaptive Wireless Communications** - Daniel W. Bliss - 2013-05-09
A comprehensive and self-contained exploration of cutting-edge applications in adaptive wireless communications, perfect for self-study.

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**MIMO Communication for Cellular Networks** - Howard Huang - 2011-11-19
As the theoretical foundations of multiple-antenna techniques evolve and as these multiple-input multiple-output (MIMO) techniques become essential for providing high data rates in wireless systems, there is a growing need to understand the performance limits of MIMO in practical networks. To address this need, MIMO Communication for Cellular Networks presents a systematic description of MIMO technology classes and a framework for MIMO system design that takes into account the essential physical-layer features of practical cellular networks. In contrast to works that focus on the theoretical performance of abstract MIMO channels, MIMO Communication for Cellular Networks emphasizes the practical performance of realistic MIMO systems. A unified set of system simulation results highlights relative performance gains of different MIMO techniques and provides insights into how best to use multiple antennas in cellular networks under various conditions. MIMO Communication for Cellular Networks describes single-user, multiuser, network MIMO technologies and
Technologies and Applications presents comprehensive coverage of wireless resource scheduling, interference mitigation, and simulation methodologies. The key concepts are presented with sufficient generality to be applied to a wide range of wireless systems, including those based on cellular standards such as LTE, LTE-Advanced, WiMAX, and WiMAX2. The book is intended for use by graduate students, researchers, and practicing engineers interested in the physical-layer design of state-of-the-art wireless systems.

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This updated second edition of the Artech House book Wireless Positioning Technologies and Applications presents comprehensive coverage of wireless positioning principles and technologies for engineers involved in using or developing wireless location applications. This book explains the basics of GPS and demonstrates the applications of fundamental distance measuring principles. This edition includes updated and expanded chapters on satellite navigation, OFDM (Orthogonal Frequency Division Multiplex), TDOA location facilities in 3GPP LTE specifications, carrier phase measurements and DGPS, wireless sensor networks, MIMO positions, inertial navigation, and data fusion. Moreover, complete coverage of cellular network infrastructure for location, including 4G LTE, and up-to-date Bluetooth location in short-range wireless networks is presented as well as modernization programs used for GPS accuracy and reliability. This book helps readers assess available positioning methods for new applications, locate applicable sources for a given technology, and simply difficult engineering and mathematical concepts.

**Foundations of MIMO Communication** - Robert W. Heath Jr - 2018-12-06

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Foundations of MIMO Communication - Robert W. Heath Jr - 2018-12-06
An accessible, comprehensive and coherent treatment of MIMO communication, drawing on ideas from information theory and signal processing.

MIMO Wireless Communications - Claude Oestges - 2010-07-27
Uniquely, this book proposes robust space-time code designs for real-world wireless channels. Through a unified framework, it emphasizes how propagation mechanisms such as space-time frequency correlations and coherent components impact the MIMO system performance under realistic power constraints. Combining a solid mathematical analysis with a physical and intuitive approach to space-time coding, the book progressively derives innovative designs, taking into consideration that MIMO channels are often far from ideal. The various chapters of this book provide an essential, complete and refreshing insight into the performance behaviour of space-time codes in realistic scenarios and constitute an ideal source of the latest developments in MIMO propagation and space-time coding for researchers, R&D engineers and graduate students. Features include • Physical models and analytical representations of MIMO propagation channels, highlighting the strengths and weaknesses of various models • Overview of space-time coding techniques, covering both classical and more recent schemes under information theory and error probability perspectives • In-depth presentation of how real-world propagation affects the capacity and the error performance of MIMO transmission schemes • Innovative and practical designs of robust space-time coding, precoding and antenna selection techniques for realistic propagation (including single-carrier and MIMO-OFDM transmissions) "This book offers important insights into how space-time coding can be tailored for real-world MIMO channels. The discussion of MIMO propagation models is also intuitive and well-developed." Arogyaswami J. Paulraj, Professor, Stanford University, CA
"Finally a book devoted to MIMO from a new perspective that bridges the boundaries between propagation, channel modeling, signal processing and conceptual explanations with detailed, stringent derivations of basic facts of MIMO." Ernst Bonek, Emeritus Professor, Technische Universität Wien, Austria

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the skill set needed to design and analyze complex wireless communication conceptual explanations with detailed, stringent derivations of basic facts of MIMO." Ernst Bonek, Emeritus Professor, Technische Universität Wien, Austria * Presents space-time coding techniques for real-world MIMO channels * Contains new design methodologies and criteria that guarantee the robustness of space-time coding in real life wireless communications applications * Evaluates the performance of space-time coding in real world conditions

Fundamentals of Massive MIMO - Thomas L. Marzetta - 2016-11-17
Written by pioneers of the concept, this is the first complete guide to the physical and engineering principles of Massive MIMO. Assuming only a basic background in communications and statistical signal processing, it will guide readers through key topics in multi-cell systems such as propagation modeling, multiplexing and de-multiplexing, channel estimation, power control, and performance evaluation. The authors' unique capacity-bounding approach will enable readers to carry out effective system performance analyses and develop advanced Massive MIMO techniques and algorithms. Numerous case studies, as well as problem sets and solutions accompanying the book online, will help readers put knowledge into practice and acquire the skill set needed to design and analyze complex wireless communication systems. Whether you are a graduate student, researcher, or industry professional working in the field of wireless communications, this will be an indispensable guide for years to come.

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As we all know by now, wireless networks offer many advantages over fixed (or wired) networks. Foremost on that list is mobility, since going wireless frees you from the tether of an Ethernet cable at a desk. But that's just the tip of the cable-free iceberg. Wireless networks are also more flexible, faster and easier for you to use, and more affordable to deploy and maintain. The de facto standard for wireless networking is the 802.11 protocol, which includes Wi-Fi (the wireless standard known as 802.11b) and its faster cousin, 802.11g. With easy-to-install 802.11 network hardware available everywhere you turn, the choice seems simple, and many people dive into wireless computing with less thought and planning than they'd give to a wired network. But it's wise to be familiar with both the capabilities and risks associated with the 802.11 protocols. And 802.11 Wireless Networks: The Definitive Guide, 2nd Edition is the perfect place to start. This updated edition covers everything you'll ever need to know about wireless technology. Designed with the system administrator or serious home user in mind, it's a no-nonsense guide for setting up 802.11 on Windows and Linux. Among the wide range of topics covered are discussions on: deployment considerations network monitoring and performance tuning wireless security issues how to use and select access points network monitoring essentials wireless card configuration security issues unique to wireless networks With wireless technology, the advantages to its users are indeed plentiful. Companies no longer have to deal with the hassle and expense of wiring buildings, and households with several computers can avoid fights over who's online. And now, with 802.11 Wireless Networks: The Definitive Guide, 2nd Edition, you can integrate wireless technology into your current infrastructure with the utmost confidence.

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mmWave Massive MIMO - Shahid Mumtaz - 2016-12-02
mmWave Massive MIMO: A Paradigm for 5G is the first book of its kind to hinge together related discussions on mmWave and Massive MIMO under the umbrella of 5G networks. New networking scenarios are identified, along with fundamental design requirements for mmWave Massive MIMO networks from an architectural and practical perspective. Working towards final deployment, this book updates the research community on the current mmWave Massive MIMO roadmap, taking into account the future emerging technologies emanating from 3GPP/IEEE. The book's editors draw on their vast experience in international research on the forefront of the mmWave Massive MIMO research arena and standardization. This book aims to talk openly about the topic, and will serve as a useful reference not only for postgraduates students to learn more on this evolving field, but also as inspiration for mobile communication researchers who want to make further innovative strides in the field to mark their legacy in the 5G arena. Contains tutorials on the basics of mmWave and Massive MIMO Identifies new 5G networking scenarios, along with design requirements from an architectural and practical perspective Details the latest updates on the evolution of the mmWave Massive MIMO roadmap, considering future emerging technologies emanating from 3GPP/IEEE Includes contributions from leading experts in the field in modeling and prototype design for mmWave Massive MIMO design Presents an ideal reference that not only helps postgraduate students learn more in this evolving field, but also inspires mobile communication researchers towards further innovation.
Wireless Communications - Andrea Goldsmith - 2005-08-08
Wireless technology is a truly revolutionary paradigm shift, enabling multimedia communications between people and devices from any location. It also underpins exciting applications such as sensor networks, smart homes, telemedicine, and automated highways. This book provides a comprehensive introduction to the underlying theory, design techniques and analytical tools of wireless communications, focusing primarily on the core principles of wireless system design. The book begins with an overview of wireless systems and standards. The characteristics of the wireless channel are then described, including their fundamental capacity limits. Various modulation, coding, and signal processing schemes are then discussed in detail, including state-of-the-art adaptive modulation, multicarrier, spread spectrum, and multiple antenna techniques. The concluding chapters deal with multiuser communications, cellular system design, and ad-hoc network design. Design insights and tradeoffs are emphasized throughout the book. It contains many worked examples, over 200 figures, almost 300 homework exercises, over 700 references, and is an ideal textbook for students.

Introduction to MIMO Communications - Jerry R. Hampton - 2013-11-28
This accessible guide contains everything you need to get up to speed on the theory and implementation of MIMO techniques.

Signal Processing for 5G: Algorithms and Implementations - Fa-Long Luo - 2016-10-17
A comprehensive and invaluable guide to 5G technology, implementation and practice in one single volume. For all things 5G, this book is a must-read. Signal processing techniques have played the most important role in wireless communications since the second generation of cellular systems. It is anticipated that new techniques employed in 5G wireless networks will not only improve peak service rates significantly, but also enhance capacity, coverage, reliability, low-latency, efficiency, flexibility, compatibility and convergence to meet the increasing demands imposed by applications such as big data, cloud service, machine-to-machine (M2M) and mission-critical communications. This book is a comprehensive and detailed guide to all signal processing techniques employed in 5G wireless networks. Uniquely organized into four categories, New Modulation and Coding, New Spatial Processing, New Spectrum Opportunities and New System-level Enabling Technologies, it covers everything from network architecture, physical-layer (down-link and up-link), protocols and air interface, to cell acquisition, scheduling and rate adaption, access procedures and relaying to spectrum allocations. All technology aspects and major roadmaps of global 5G standard development and deployments are included in the book. Key Features: Offers step-by-step guidance on bringing 5G technology into practice, by applying algorithms and design methodology to real-time circuit implementation, taking into account rapidly growing applications that have
Features: Offers step-by-step guidance on bringing 5G technology into 5G, in particular massive multiple-input multiple-output (massive-MIMO), FD-MIMO and 3D-MIMO along with orbital angular momentum multiplexing, 3D beamforming and diversity. Provides detailed algorithms and implementations, and compares all multicarrier modulation and multiple access schemes that offer superior data transmission performance including FBMC, GFDM, F-OFDM, UFMC, SEFDM, FTN, MUSA, SCMA and NOMA. Demonstrates the translation of signal processing theories into practical solutions for new spectrum opportunities in terms of millimeter wave, full-duplex transmission and license assisted access. Presents well-designed implementation examples, from individual function block to system level for effective and accurate learning. Covers signal processing aspects of emerging system and network architectures, including ultra-dense networks (UDN), software-defined networks (SDN), device-to-device (D2D) communications and cloud radio access network (C-RAN).

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**Wireless Information Networks** - Kaveh Pahlavan - 2005-11-07
Towards location aware mobile ad hoc sensors A Systems Engineering Approach to Wireless Information Networks The Second Edition of this internationally respected textbook brings readers fully up to date with the myriad of developments in wireless communications. When first published in 1995, wireless communications was synonymous with cellular telephones. Now wireless information networks are the most important technology in all branches of telecommunications. Readers can learn about the latest applications in such areas as ad hoc sensor networks, home networking, and wireless positioning. Wireless Information Networks takes a systems engineering approach: technical topics are presented in the context of how they fit into the ongoing development of new systems and services, as well as the recent developments in national and international spectrum allocations and standards. The authors have organized the myriad of current and emerging wireless technologies into logical categories: * Introduction to Wireless Networks presents an up-to-the-moment discussion of the evolution of the cellular industry from analog cellular technology to 2G, 3G,
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Massive MIMO Networks - Emil Björnson - 2018-01-31
Massive MIMO Networks is the first book on the subject to cover the spatial channel correlation and consider rigorous signal processing design essential for the complete understanding by the students, practicing engineers and researchers working on modern day communication systems.

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LTE-Advanced and Next Generation Wireless Networks - Guillaume de la Roche - 2012-11-05
LTE- A and Next Generation Wireless Networks: Channel Modeling and Performance describes recent advances in propagation and channel modeling necessary for simulating next generation wireless systems. Due to

Wireless Information Networks - Kaveh Pahlavan - 2005-11-07
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Multiple-input multiple-output (MIMO) technology constitutes a breakthrough in the design of wireless communications systems, and is already at the core of several wireless standards. Exploiting multipath scattering, MIMO techniques deliver significant performance enhancements in terms of data transmission rate and interference reduction. This 2007 book is a detailed introduction to the analysis and design of MIMO wireless systems. Beginning with an overview of MIMO technology, the authors then examine the fundamental capacity limits of MIMO systems. Transmitter design, including precoding and space-time coding, is then treated in depth, and the book closes with two chapters devoted to receiver design. Written by a team of leading experts, the book blends theoretical analysis with physical insights, and highlights a range of key design challenges. It can be used as a textbook for advanced courses on wireless communications, and will also appeal to researchers and practitioners working on MIMO wireless systems.

**LTE-Advanced and Next Generation Wireless Networks** - Guillaume de la Roche - 2012-11-05

LTE-A and Next Generation Wireless Networks: Channel Modeling and Performance describes recent advances in propagation and channel modeling necessary for simulating next generation wireless systems. Due to the radio spectrum scarcity, two fundamental changes are anticipated compared to the current status. Firstly, the strict reservation of a specific band for a unique standard could evolve toward a priority policy allowing the coexistence of secondary users in a band allocated to a primary system. Secondly, a huge increase of the number of cells is expected by combining outdoor base stations with smaller cells such as pico/femto cells and relays. This evolution is accompanied with the emergence of cognitive radio that becomes a reality internormals together with the development of self-organization capabilities and distributed cooperative behaviors. The book is divided into three parts: Part I addresses the fundamentals (e.g., technologies, channel modeling principles etc.) Part II addresses propagation and modeling discussing topics such as indoor propagation, outdoor propagation, etc. Part III explores system performance and applications (e.g., MIMO Over-the-air testing, electromagnetic safety, etc).

**MIMO Wireless Communications** - Ezio Biglieri - 2007-01-08

Multiple-input multiple-output (MIMO) technology constitutes a breakthrough in the design of wireless communications systems, and is already at the core of several wireless standards. Exploiting multipath scattering, MIMO techniques deliver significant performance enhancements in terms of data transmission rate and interference reduction. This 2007 book is a detailed introduction to the analysis and design of MIMO wireless systems. Beginning with an overview of MIMO technology, the authors then examine the fundamental capacity limits of MIMO systems. Transmitter design, including precoding and space-time coding, is then treated in depth, and the book closes with two chapters devoted to receiver design. Written by a team of leading experts, the book blends theoretical analysis with physical insights, and highlights a range of key design challenges. It can be used as a textbook for advanced courses on wireless communications, and will also appeal to researchers and practitioners working on MIMO wireless systems.

**MIMO-OFDM Wireless Communications with MATLAB** - Yong Soo Cho - 2010-08-20

MIMO-OFDM is a key technology for next-generation cellular
MIMO-OFDM Wireless Communications with MATLAB - Yong Soo Cho - 2010-08-20

MIMO-OFDM is a key technology for next-generation cellular communications (3GPP-LTE, Mobile WiMAX, IMT-Advanced) as well as wireless LAN (IEEE 802.11a, IEEE 802.11n), wireless PAN (MB-OFDM), and broadcasting (DAB, DVB, DMB). In MIMO-OFDM Wireless Communications with MATLAB®, the authors provide a comprehensive introduction to the theory and practice of wireless channel modeling, OFDM, and MIMO, using MATLAB® programs to simulate the various techniques on MIMO-OFDM systems. One of the only books in the area dedicated to explaining simulation aspects Covers implementation to help cement the key concepts Uses materials that have been classroom-tested in numerous universities Provides the analytic solutions and practical examples with downloadable MATLAB® codes Simulation examples based on actual industry and research projects Presentation slides with key equations and figures for instructor use MIMO-OFDM Wireless Communications with MATLAB® is a key text for graduate students in wireless communications. Professionals and technicians in wireless communication fields, graduate students in signal processing, as well as senior undergraduates majoring in wireless communications will find this book a practical introduction to the MIMO-OFDM techniques. Instructor materials and MATLAB® code examples available for download at www.wiley.com/go/chomimo

5G System Design - Wan Lei - 2019-09-09

This book presents a detailed pedagogical description of the 5G commercial wireless communication system design, from an end to end perspective. It compares and contrasts NR with LTE, and gives a concise and highly accessible description of the key technologies in the 5G physical layer, radio access network layer protocols and procedures. This book also illustrates how the 5G core and EPC is integrated into the radio access network, how virtualization and edge computer fundamentally change the way users interact with the network, as well as 5G spectrum issues. This book is structured into six chapters. The first chapter reviews the use cases, requirements, and standardization organization and activities for 5G. These are 5G requirements and not NR specifically, as technology that meets the requirements, may be submitted to the ITU as 5G technology. This includes a set of Radio Access Technologies (RATs), consisting of NR and LTE; with each RAT meeting different aspects of the requirements. The second chapter describes the air interface of NR and LTE side by side. The basic aspects of LTE that NR builds upon are first described, followed by sections on the NR specific technologies, such as carrier/channel, spectrum/duplexing (including SUL), LTE/NR co-existence and new physical layer technologies (including waveform, Polar/LDPC codes, MIMO, and URLLC/mMTC). In all cases the enhancements made relative to LTE are made apparent. The third chapter contains descriptions of NR procedures (IAM/Beam Management/Power control/HARQ), protocols (CP/UP/mobility, including grant-free), and RAN architecture. The fourth chapter includes a detailed discussion related to end-to-end system architecture, and the 5G Core (5GC), network slicing, service continuity, relation to EPC, network virtualization, and edge computing. The fifth and major chapter describes the ITU submission and how NR and LTE meet the 5G requirements in significant detail, from the rapporteur responsible for leading the
the ITU submission and how NR and LTE meet the 5G requirements in computer scientists and professionals with a passing knowledge of 4G LTE and a comprehensive understanding of the end to end 5G commercial wireless system will find this book to be a valuable asset. Advanced-level students and researchers studying and working in communication engineering, who want to gain an understanding of the 5G system (as well as methodologies to evaluate features and technologies intended to supplement 5G) will also find this book to be a valuable resource.

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**Wireless Communications** - Andreas F. Molisch - 2012-02-06
"Professor Andreas F. Molisch, renowned researcher and educator, has put together the comprehensive book, Wireless Communications. The second edition, which includes a wealth of new material on important topics, ensures the role of the text as the key resource for every student, researcher, and practitioner in the field." —Professor Moe Win, MIT, USA Wireless communications has grown rapidly over the past decade from a niche market into one of the most important, fast moving industries. Fully updated to incorporate the latest research and developments, Wireless Communications, Second Edition provides an authoritative overview of the principles and applications of mobile communication technology. The author provides an in-depth analysis of current treatment of the area, addressing both the traditional elements, such as Rayleigh fading, BER in flat fading channels, and equalisation, and more recently emerging topics such as multi-user detection in CDMA systems, MIMO systems, and cognitive radio. The dominant wireless standards; including cellular, cordless and wireless LANs; are discussed. Topics featured include: wireless propagation channels, transceivers and signal processing, multiple access and advanced transceiver schemes, and standardised wireless systems. Combines mathematical descriptions with intuitive explanations of the physical facts, enabling readers to acquire a deep understanding of the subject. Includes new chapters on cognitive radio, cooperative communications and relaying, video coding, 3GPP Long Term Evolution, and WiMax; plus significant new sections on multi-user MIMO, 802.11n, and information theory. Companion website featuring: supplementary material on 'DECT', solutions manual and
Wireless communications has grown rapidly over the past decade from a niche market into one of the most important, fast moving industries. Fully updated to incorporate the latest research and developments, Wireless Communications, Second Edition provides an authoritative overview of the principles and applications of mobile communication technology. The author provides an in-depth analysis of current treatment of the area, addressing both the traditional elements, such as Rayleigh fading, BER in flat fading channels, and equalisation, and more recently emerging topics such as multi-user detection in CDMA systems, MIMO systems, and cognitive radio. The dominant wireless standards; including cellular, cordless and wireless LANs; are discussed. Topics featured include: wireless propagation channels, transceivers and signal processing, multiple access and advanced transceiver schemes, and standardised wireless systems. Combines mathematical descriptions with intuitive explanations of the physical facts, enabling readers to acquire a deep understanding of the subject. Includes new chapters on cognitive radio, cooperative communications and relaying, video coding, 3GPP Long Term Evolution, and WiMax; plus significant new sections on multi-user MIMO, 802.11n, and information theory. Companion website featuring: supplementary material on 'DECT', solutions manual and presentation slides for instructors, appendices, list of abbreviations and other useful resources.

Wireless Communications Fundamental & Advanced Concepts - Sanjay Kumar - 2015-03-31
Wireless communication is one of the fastest growing fields in the engineering world today. Rapid growth in the domain of wireless communication systems, services and application has drastically changed the way we live, work and communicate. Wireless communication offers a broad and dynamic technological field, which has stimulated incredible excitement and technological advancements over last few decades. The expectations from wireless communication technology are increasing every day. This is placing enormous challenges to wireless system designers. Moreover, this has created an ever increasing demand for conceptually strong and well versed communication engineers who understand the wireless technology and its future possibilities. In recent years, significant progress in wireless communication system design has taken place, which will continue in future. Especially for last two decades, the research contributions in wireless communication system design have resulted in several new concepts and inventions at remarkable speed. A text book is indeed required to offer familiarity with such developments and underlying concepts, to be taught in the classroom to future engineers. This is one of the motivations for writing this book. Practically no book can be up to date in this field, due to the fast ongoing research and developments. The new developments are announced almost every day. Teaching directly from the research papers in the classroom cannot build the necessary foundation. Therefore need for a textbook is unavoidable, which is integral to learning, and is an essential source to build the concept. The prime goal of this book is to cooperate in the learning process. This book is based on current research as well as classical text books in the field, and aims to provide in depth understanding on fundamental concepts, which form the basis of wireless communication and build the platform, on which current developments can be understood and future contributions can be made. This book is written in self-explanatory manner to facilitate critical thinking and to support self study. Special emphasis has been given in this book to systematically organize and present the wide domain of wireless communication technology. Extra care has been taken to present the contents and the concepts in user friendly way to enable an easy understanding. Therefore the language of this book is made to make one feel, listening to a classroom lecture. This makes learning straight forward. Sometimes, the explanation could seem to be oversimplified, this is in order to support wide spectrum of readers as well as to clarify the hazy picture. A book of this kind, which addresses a fast developing technology, the frequent use of acronyms and abbreviations is almost inevitable. A care has
systematically organize and present the wide domain of wireless practically suitable in the text. Besides, a list of acronyms and abbreviations has also been provided.

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**MIMO Antennas for Wireless Communication** - Leeladhar Malviya - 2020-12-15

The desired objective of this book is to investigate diversity and mutual coupling effects on MIMO antenna designs for WLAN/WiMAX/LTE applications, controlled with diversity and ground modification techniques including equivalent circuit diagrams. Diversity techniques in MIMO antennas leading to the performance improvement ratings are demonstrated and deliberated. The book contributes towards the development of 2:1 VSWR MIMO antennas with diversity techniques for indoor/outdoor applications for high data rate, QOS, and SNR. The improved MIMO antenna structures are investigated and presented in this book including part of massive MIMO to provide the important aspects of emerging technology. Aimed at researchers, professionals and graduate students in electrical engineering, electromagnetics, communications and signal processing including antenna theory and design, smart antennas, communication systems, this book: Investigates real time MIMO antenna designs for WLAN/WiMAX/LTE applications. Covers effects of ECC, MEG, TARC, and equivalent circuit. Addresses the coupling and diversity aspects of antenna design problem for MIMO systems. Focus on the MIMO antenna designs for the real time applications. Exclusive chapter on 5G Massive MIMO along with case studies throughout the book.

**MIMO Antennas for Wireless Communication** - Leeladhar Malviya -
implementation of massive MIMO precoding in 5G Cloud RAN. Graduate students in electrical engineering and computer science interested in the application of mathematical optimization to model and solve precoding problems in massive MIMO cellular systems will also be interested in this book.


This book covers the design and optimization of hybrid RF-baseband precoding for massive multiple-input multiple-output (MIMO)-enabled cloud radio access networks (RANs), where use cases such as millimeter-wave wireless backhauling, fully-loaded cellular networks are of interest. The suitability and practical implementation of the proposed precoding solutions for the Cloud RAN architecture are also discussed. Novel techniques are examined for RF precoding optimization in combination with nonlinear precoding at baseband, and the superiority of joint RF-baseband design is verified. Moreover, the efficacy of hybrid RF-baseband precoding to combat intercell interference in a multi-cell environment with universal frequency reuse is investigated, which is concluded to be a promising enabler for the dense deployment of base stations. This book mainly targets researchers and engineers interested in the challenges, optimization, and implementation of massive MIMO precoding in 5G Cloud RAN. Graduate students in electrical engineering and computer science interested in the application of mathematical optimization to model and solve precoding problems in massive MIMO cellular systems will also be interested in this book.

**Foundations of User-Centric Cell-Free Massive MIMO** - Özlem Tugfe Demir - 2021-01-25

Modern day cellular mobile networks use Massive MIMO technology to extend range and service multiple devices within a cell. This has brought tremendous improvements in the high peak data rates that can be handled. Nevertheless, one of the characteristics of this technology is large variations in the quality of service dependent on where the end user is located in any given cell. This becomes increasingly problematic when we are creating a society where wireless access is supposed to be ubiquitous.
When payments, navigation, entertainment, and control of autonomous vehicles are all relying on wireless connectivity the primary goal for future mobile networks should not be to increase the peak rates, but the rates that can be guaranteed to the vast majority of the locations in the geographical coverage area. The cellular network architecture was not designed for high-rate data services but for low-rate voice services, thus it is time to look beyond the cellular paradigm and make a clean-slate network design that can reach the performance requirements of the future. This monograph considers the cell-free network architecture that is designed to reach the aforementioned goal of uniformly high data rates everywhere. The authors introduce the concept of a cell-free network before laying out the foundations of what is required to design and build such a network. They cover the foundations of channel estimation, signal processing, pilot assignment, dynamic cooperation cluster formation, power optimization, fronthaul signaling, and spectral efficiency evaluation in uplink and downlink under different degrees of cooperation among the access points and arbitrary linear combining and precoding. This monograph provides the reader with all the fundamental information required to design and build the next generation mobile networks without being hindered by the inherent restrictions of modern cellular-based technology.

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MIMO - Alain Sibille - 2010-12-03
Foreword from Arogyaswami Paulraj, Professor (Emeritus), Stanford University (USA) The first book to show how MIMO principles can be implemented in today’s mobile broadband networks and components Explains and solves some of the practical difficulties that arise in designing and implementing MIMO systems Both theory and implementation sections are written in the context of the most recent standards: IEEE 802.11n (WiFi); IEEE 802.16 (WIMAX); 4G networks (3GPP/3GPP2, LTE)

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CWNA Certified Wireless Network Administrator Study Guide - David D. Coleman - 2018-08-29
The bestselling CWNA study guide, updated for the latest exam The CWNA:
Certified Wireless Network Administrator Study Guide is the ultimate preparation resource for the CWNA exam. Fully updated to align with the latest version of the exam, this book features expert coverage of all exam objectives to help you internalize essential information. A pre-assessment test reveals what you already know, allowing you to focus your study time on areas in need of review, while hands-on exercises allow you to practice applying CWNA concepts to real-world scenarios. Expert-led discussion breaks complex topics down into easily-digestible chunks to facilitate clearer understanding, and chapter review questions help you gauge your progress along the way. You also get a year of free access to the Sybex online interactive learning environment, which features additional resources and study aids including bonus practice exam questions. The CWNA exam tests your knowledge of regulations and standards, protocols and devices, network implementation, security, and RF site surveying. Thorough preparation gives you your best chance of passing, and this book covers it all with a practical focus that translates to real-on-the-job skills.

Study 100% of the objectives for Exam CWNA-107: Assess your practical skills with hands-on exercises, Test your understanding with challenging chapter tests, Access digital flashcards, white papers, bonus practice exams, and more. The CWNA certification is a de facto standard for anyone working with wireless technology. It shows employers that you have demonstrated competence in critical areas, and have the knowledge and skills to perform essential duties that keep their wireless technology functioning and safe.

The CWNA: Certified Wireless Network Administrator Study Guide gives you everything you need to pass the exam with flying colors.
Baseband Receiver Design for Wireless MIMO-OFDM Communications - Tzi-Dar Chiueh - 2012-04-24
The Second Edition of OFDM Baseband Receiver Design for Wireless Communications, this book expands on the earlier edition with enhanced coverage of MIMO techniques, additional baseband algorithms, and more IC design examples. The authors cover the full range of OFDM technology, from theories and algorithms to architectures and circuits. The book gives a concise yet comprehensive look at digital communication fundamentals before explaining signal processing algorithms in receivers. The authors give detailed treatment of hardware issues - from architecture to IC implementation. Links OFDM and MIMO theory with hardware implementation Enables the reader to transfer communication received concepts into hardware; design wireless receivers with acceptable implementation loss; achieve low-power designs Covers the latest standards, such as DVB-T2, WiMax, LTE and LTE-A Includes more baseband algorithms, like soft-decoding algorithms such as BCJR and SOVA Expanded treatment of channel models, detection algorithms and MIMO techniques Features concrete design examples of WiMAX systems and cognitive radio applications Companion website with lecture slides for instructors Based on materials developed for a course in digital communication IC design, this book is ideal for graduate students and researchers in VLSI design, wireless communications, and communications signal processing. Practicing engineers working on algorithms or hardware for wireless communications devices will also find this to be a key reference.

Network Information Theory - Abbas El Gamal - 2011-12-08
This comprehensive treatment of network information theory and its applications provides the first unified coverage of both classical and recent results. With an approach that balances the introduction of new models and new coding techniques, readers are guided through Shannon's point-to-point information theory, single-hop networks, multihop networks, and extensions to distributed computing, secrecy, wireless communication, and networking. Elementary mathematical tools and techniques are used throughout, requiring only basic knowledge of probability, whilst unified proofs of coding theorems are based on a few simple lemmas, making the text accessible to newcomers. Key topics covered include successive cancellation and superposition coding, MIMO wireless communication, network coding, and cooperative relaying. Also covered are feedback and interactive communication, capacity approximations and scaling laws, and asynchronous and random access channels. This book is ideal for use in the classroom, for self-study, and as a reference for researchers and engineers in industry and academia.

Advances in Wireless Networks - Geyong Ming - 2007
Recent years have witnessed tremendous growth in the population of mobile users demanding high performance, reliability and quality-of-service (QoS).
overview of the rapidly evolving world of telecommunications. Providing an
changes in the underlying technologies, in order to cope with the difficulties
posed by the scarce wireless resource as well as keep up with the
increasing day-to-day demand for cost-effective service of multimedia
applications. Predicting and optimising the performance and QoS of
wireless networks using analytical modelling, simulation experiments,
monitoring and testbed-based measurements are crucial to the proper
design, tuning, resource management and capacity planning of such
networks. This book is dedicated to review important developments and
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The objective is to make analytical modelling, simulation and measurement
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Telecommunications Essentials, Second Edition - Lillian Goleniewski -
2006-10-10
Telecommunications Essentials, Second Edition, provides a comprehensive
overview of the rapidly evolving world of telecommunications. Providing an
in-depth, one-stop reference for anyone wanting to get up to speed on the
$1.2 trillion telecommunications industry, this book not only covers the
basic building blocks but also introduces the most current information on
new technologies. This edition features new sections on IP telephony, VPNs,
NGN architectures, broadband access alternatives, and broadband wireless
applications, and it describes the technological and political forces at play in
the world of telecommunications around the globe. Topics include
Communications fundamentals, from traditional transmission media, to
establishing communications channels, to the PSTN Data networking and
the Internet, including the basics of data communications, local area
networking, wide area networking, and the Internet and IP infrastructures
Next-generation networks, including the applications, characteristics, and
requirements of the new generation of networks that are being built to
quickly and reliably carry the ever-increasing network traffic, focusing on IP
services, network infrastructure, optical networking, and broadband access
alternatives Wireless networking, including the basics of wireless
networking and the technologies involved in WWANs, WMANs, WLANs, and
WPANs
Antennas: Models, Protocols, and Systems - John D. Matyjas - quickly and reliably carry the ever-increasing network traffic, focusing on IP services, network infrastructure, optical networking, and broadband access alternatives. Wireless networking, including the basics of wireless networking and the technologies involved in WWANs, WMANs, WLANs, and WPANs.

Cognitive Wireless Networks - Frank H. P. Fitzek - 2007-09-07
This book advocates the idea of breaking up the cellular communication architecture by introducing cooperative strategies among wireless devices through cognitive wireless networking. It is divided into different parts dealing with cooperative and cognitive aspects for future wireless communication networks. Chapters written by world leading researchers in the field cover, among others, social and biological inspired behavior applied to wireless networks, peer-to-peer networking, cognitive radio or more generally cognitive networks, cooperative networks, game theory, spectrum sensing and management. In addition, tools and methodologies for modeling and analyzing cooperative and cognitive interactions in wireless networks are explained in detail to facilitate access to this advanced research topic.

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Wireless Network Performance Enhancement via Directional Antennas: Models, Protocols, and Systems - John D. Matyjas -
Directional antenna technologies have made significant advancements in the last decade. These advances have opened the door to many exciting new design opportunities for wireless networks to enhance quality of service (QoS), performance, and network capacity. In this book, experts from around the world present the latest research and development in wireless networks with directional antennas. Their contributed chapters provide detailed coverage of the models, algorithms, protocols, and applications of wireless networks with various types of directional antennas operating at different frequency bands. Wireless Network Performance Enhancement via Directional Antennas: Models, Protocols, and Systems identifies several interesting research problems in this important field, providing an opportunity to learn about solid solutions to these issues. It also looks at a number of practical hardware designs for the deployment of next-generation antennas, as well as efficient network protocols for exploitation of directional communications. The book is organized into six sections: Directional Antennas - covers the hardware design of different types of antennas; Directional MAC - focuses on the principles of designing medium access control (MAC) protocols for directional networks; Millimeter Wave - explores different design aspects of millimeter wave (mm-Wave) systems, which operate in higher-frequency bands (such as 60 GHz); MIMO - explains how to establish a multiple-input, multiple-output (MIMO) antenna system and describes how it operates in a cognitive radio network; Advanced Topics - looks at additional topics such as beamforming in cognitive radio networks, multicast algorithm development, network topology management for connectivity, and sensor network lifetime issues; Applications - illustrates some important applications, such as military networks and airborne networking, that benefit from directional networking designs. With this book, researchers and engineers will be well-equipped to advance the research and development in this important field. If you're new to this field, you will find this book to be a valuable reference on basic directional networking principles, engineering design, and challenges.
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Spectrum Sharing - Constantinos B. Papadias - 2020-04-20
Combines the latest trends in spectrum sharing, both from a research and a standards/regulation/experimental standpoint Written by noted professionals from academia, industry, and research labs, this unique book provides a comprehensive treatment of the principles and architectures for spectrum sharing in order to help with the existing and future spectrum crunch issues. It presents readers with the most current standardization trends, including CEPT / CEE, eLSA, CBRS, MulteFire, LTE-Unlicensed (LTE-U), LTE WLAN integration with Internet Protocol security tunnel (LWIP), and LTE/Wi-Fi aggregation (LWA), and offers substantial trials and experimental results, as well as system-level performance evaluation results. The book also includes a chapter focusing on spectrum policy reinforcement and another on the economics of spectrum sharing. Beginning with the historic form of cognitive radio, Spectrum Sharing: The Next Frontier in Wireless Networks continues with current standardized forms of spectrum sharing, and reviews all of the technical ingredients that may arise in spectrum sharing approaches. It also looks at policy and implementation aspects and ponders the future of the field. White spaces and data base-assisted spectrum sharing are discussed, as well as the licensed shared access approach and cooperative communication techniques. The book also covers reciprocity-based beam forming techniques for spectrum sharing in MIMO networks; resource allocation for shared spectrum networks; large scale wireless spectrum monitoring; and much more. Contains all the latest standardization trends, such as CEPT / ECC, eLSA, CBRS, MulteFire, LTE-Unlicensed (LTE-U), LTE WLAN integration with Internet Protocol security tunnel (LWIP) and LTE/Wi-Fi aggregation (LWA) Presents a number of emerging technologies for future spectrum sharing (collaborative sensing, cooperative communication, reciprocity-based beamforming, etc.), as well as novel spectrum sharing paradigms (e.g. in full duplex and radar systems) Includes substantial trials and experimental results, as well as system-level performance evaluation results Contains a dedicated chapter on spectrum policy reinforcement and one on the economics of spectrum sharing Edited by experts in the field, and featuring contributions by respected professionals in the field world wide Spectrum Sharing: The Next Frontier in Wireless Networks is highly recommended for graduate students and researchers working in the areas of wireless communications and signal processing engineering. It would also benefit radio communications engineers and practitioners.
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MIMO Wireless Communications over Generalized Fading Channels - Brijesh Kumbhani - 2017-07-12
MIMO systems have been known to better the quality of service for wireless communication systems. This book discusses emerging techniques in MIMO systems to reduce complexities and keep benefits unaffected at the same time. It discusses about benefits and shortcomings of various MIMO technologies like spatial multiplexing, space time coding, spatial modulation, transmit antenna selection and various power allocation schemes to optimize the performance. Crux of the book is focus on MIMO communication over generalized fading channels as they can model the propagation of signals in a non-homogeneous environment. Relevant MATLAB codes are also included in the appendices. Book is aimed at graduate students and researchers in electronics and wireless engineering specifically interested in electromagnetic theory, antennas and propagation, future wireless systems, signal processing.

Spectrum Sharing - Constantinos B. Papadias - 2020-03-13
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Radio Propagation and Adaptive Antennas for Wireless Communication Networks

Radio Propagation and Adaptive Antennas for Wireless Communication Networks, 2nd Edition, presents a comprehensive overview of wireless communication system design, including the latest updates to considerations of over-the-terrain, atmospheric, and ionospheric communication channels. New features include the latest experimentally-verified stochastic approach, based on several multi-parametric models; all-new chapters on wireless network fundamentals, advanced technologies, and current and modern multiple access networks; and helpful problem sets at the conclusion of each chapter to enhance clarity. The volume’s emphasis remains on a thorough examination of the role of obstructions on the corresponding propagation phenomena that influence the transmission of radio signals through line-of-sight (LOS) and non-line-of-sight (NLOS) propagation conditions along the radio path between the transmitter and the receiver antennas—and how adaptive antennas, used at the link terminals, can be used to minimize the deleterious effects of such obstructions. With its focus on 3G, 4G, MIMO, and the latest wireless technologies, Radio Propagation and Adaptive Antennas for Wireless Communication Networks represents an invaluable resource to topics critical to the design of contemporary wireless communication systems. Explores novel wireless networks beyond 3G, and advanced 4G technologies, such as MIMO, via propagation phenomena and the fundamentals of adapted antenna usage. Explains how adaptive antennas can improve GoS and QoS for any wireless channel, with specific examples and applications in land, aircraft and satellite communications. Introduces new stochastic approach based on several multi-parametric models describing various terrestrial scenarios, which have been experimentally verified in different environmental conditions. New chapters on fundamentals of wireless networks, cellular and non-cellular, multiple access networks, new applications of adaptive antennas for positioning, and localization of subscribers. Includes the addition of problem sets at the end of chapters describing fundamental aspects of wireless communication and antennas.
(6) Multi-user and multiple input-multiple output (MIMO) communications; antennas.

**New Directions in Wireless Communications Research** - Vahid Tarokh - 2009-08-19
New Directions in Wireless Communications Research addresses critical issues in the design and performance analysis of current and future wireless system design. Intended for use by system designers and academic researchers, the contributions are by acknowledged international leaders in their field. Topics covered include: (1) Characterization of wireless channels; (2) The principles and challenges of OFDM; (3) Low-correlation sequences for communications; (4) Resource allocation in wireless systems; (5) Signal processing for wireless systems, including iterative systems collaborative beamforming and interference rejection and network coding; (6) Multi-user and multiple input-multiple output (MIMO) communications; (7) Cooperative wireless networks, cognitive radio systems and coded bidirectional relaying in wireless networks; (8) Fourth generation standards such as LTE and WiMax and standard proposals such as UMB. With chapters from some of the leading researchers in the field, this book is an invaluable reference for those studying and practicing in the field of wireless communications. The book provides the most recent information on topics of current interest to the research community including topics such as sensor networks, coding for networks, cognitive networks and many more.

**Wireless-Powered Communication Networks** -

Featuring contributions from major technology vendors, industry consortia, and government and private research establishments, the Industrial Communication Technology Handbook, Second Edition provides comprehensive and authoritative coverage of wire- and wireless-based specialized communication networks used in plant and factory automation, automotive applications, avionics, building automation, energy and power systems, train applications, and more. New to the Second Edition: 46 brand-new chapters and 21 substantially revised chapters Inclusion of the latest, most significant developments in specialized communication technologies and systems Addition of new application domains for specialized networks The Industrial Communication Technology Handbook, Second Edition supplies readers with a thorough understanding of the application-specific requirements for communication services and their supporting technologies. It is useful to a broad spectrum of professionals involved in the conception, design, development, standardization, and use of specialized communication networks as well as academic institutions engaged in engineering education and vocational training.

**Industrial Communication Technology Handbook, Second Edition** -
Towards Gigabit and Green 802.11 Wireless Networks - Ioannis Pefkianakis - 2012

Wireless is an increasingly dominant communication medium. The continued quest for wireless connectivity in a multitude of mobile devices, along with the emerging bandwidth hungry applications, has resulted in a huge growth of the wireless traffic. Multiple-Input Multiple-Output (MIMO) is considered the dominant technology to provide gigabit wireless links, and to accommodate the increasing demand of speed over wireless. By using multiple transmit and receive antennas, MIMO can support more reliable and faster communication. But how efficient are the current MIMO systems? Our experiments with commodity MIMO 802.11n devices reveal that, the MIMO wireless is low speed and energy hungry. The fundamental reason for MIMO devices' poor performance the use of legacy 802.11a/b/g, single antenna designs over the multiple antenna, MIMO 802.11n setting. Specifically, the existing designs used over the new MIMO 802.11n devices, are oblivious to MIMO unique communication characteristics. They do not also consider that, MIMO speed comes at the cost of increased power consumption, proportional to the number of antennas. In order to investigate solutions to these problems, this dissertation first experimentally studies the unique features of MIMO wireless and their impact on existing designs' performance. Then, it revises the key mechanisms that control speed and energy over MIMO wireless, named Rate Adaptation, and MIMO Energy Save, and develops three systems. History-Aware Robust Rate Adaptation (HA-RRAA) is our first step towards gigabit wireless. It opportunistically selects the best goodput PHY transmission rate for legacy 802.11a/b/g networks by introducing novel mechanisms to capture short-term channel dynamics. Different from HA-RRAA, our MIMO Rate Adaptation (MiRA) proposal, seeks to identify the best goodput PHY transmission rate in MIMO 802.11n networks by considering the unique features of MIMO. Finally, MIMO Energy Save seeks to select the optimal antenna setting at runtime to minimize energy consumption. Our proposals depart from existing designs in three fundamental ways. They manage the unique MIMO communication modes in a distinct manner. They consider new metrics, to capture the tradeoffs between speed and power consumption. Our proposals also apply novel learning mechanisms to capture the wireless channel dynamics. There are three main contributions in this dissertation. First, it builds a strong connection between wireless communication theory and wireless system design. Specifically, this dissertation provides the first experimental study of fundamental MIMO wireless communication tradeoffs (i.e. diversity vs. spatial multiplexing MIMO modes, speed vs. number of antennas) using 802.11n standard-compliant commodity testbeds. Then, it uncovers their impact on existing designs' performance. Second, it proposes novel and practical rate adaptation and energy save designs that consider MIMO unique characteristics, and are able deliver high performance gains. Third, this dissertation provides the first implementation and evaluation of MIMO rate adaptation and energy save using 802.11n standard-compliant commodity devices. The high performance in real world settings make our proposals a significant step towards gigabit and green wireless networks.

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