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YUAWYN - KORBIN ANGEL

In recent years, intelligent cities, also known as smart cities or cognitive cities, have become a perceived solution for improving the quality of life of citizens while boosting the efficiency of city services and processes. This new vision involves the integration of various sectors of society through the use of the internet of things. By continuing to enhance research for the better development of the smart environments needed to sustain intelligent cities, citizens will be empowered to provision the e-services provided by the city, city officials will have the ability to interact directly with the community as well as monitor digital environments, and smart communities will be developed where citizens can enjoy improved quality of life. Developing and Monitoring Smart Environments for Intelligent Cities compiles the latest research on the development, management, and monitoring of digital cities and intelligent environments into one complete reference source. The book contains chapters that examine current technologies and the future use of internet of things frameworks as well as device connectivity approaches, communication protocols, security challenges, and their inherent issues and limitations. Including unique coverage on topics such as connected vehicles for smart transportation, security issues for smart homes, and building smart cities for the blind, this reference is ideal for practitioners, urban developers, urban planners, academicians, researchers, and students.

From mobile, cable-free re-charging of electric vehicles, smart phones and laptops to collecting solar electricity from orbiting solar farms, wireless power transfer (WPT) technologies offer consumers and society enormous benefits. Written by innovators in the field, this comprehensive resource explains the fundamental principles and latest advances in WPT and illustrates key applications of this emergent technology. Key features and coverage include: The fundamental principles of WPT to practical applications on dynamic charging and static charging of EVs and smartphones. Theories for inductive power transfer (IPT) such as the coupled inductor model, gyrator circuit model, and magnetic mirror model. IPTs for road powered EVs, including controller, compensation circuit, electro-magnetic field cancel, large tolerance, power rail segmentation, and foreign object detection. IPTs for static charging for EVs and large tolerance and capacitive charging issues, as well as IPT mobile applications such as free space omnidirectional IPT by dipole coils and 2D IPT for robots. Principle and applications of capacitive power transfer. Synthesized magnetic field focusing, wireless nuclear instrumentation, and future WPT. A technical asset for engineers in the power electronics, internet of things and automotive sectors, Wireless Power Transfer for Electric Vehicles and Mobile Devices is an essential design and analysis guide and an important reference for graduate and higher undergraduate students preparing for careers in these industries.

This book brings together papers presented at the 4th International Conference on Communications, Signal Processing, and Systems, which provides a venue to disseminate the latest developments and to discuss the interactions and links between these multidisciplinary fields. Spanning topics ranging from Communications, Signal Processing and Systems, this book is aimed at undergraduate and graduate students in Electrical Engineering, Computer Science and Mathematics, researchers and engineers from academia and industry as well as government employees (such as NSF, DOD, DOE, etc).

Provides a collection of works produced by COST Action IC1301 with the goal of achieving significant advances in the field of wireless power transmission This book constitutes together information from COST Action IC1301, a group of academic and industry experts seeking to align research efforts in the field of wireless power transmission (WPT). It begins with a discussion of backscatter as a solution for Internet of Things (IoT) devices and goes on to describe ambient backscattering sensors that use FM broadcasting for low cost and low power wireless applications. The book also explores localization of passive RFID tags and augmented tags using nonlinearities of RFID chips. It

concludes with a review of methods of electromagnetic characterization of textile materials for the development of wearable antennas. Wireless Power Transmission for Sustainable Electronics: COST WiPE - IC1301 covers textile-supported wireless energy transfer, and reviews methods for the electromagnetic characterization of textile materials for the development of wearable antennas. It also looks at: backscatter RFID sensor systems for remote health monitoring; simultaneous localization (of robots and objects) and mapping (SLAM); autonomous system of wireless power distribution for static and moving nodes of wireless sensor networks; and more. Presents techniques for smart beam-forming for "on demand" wireless power transmission (WPT) Discusses RF and microwave energy harvesting for space applications Describes miniaturized RFID transponders for object identification and sensing Wireless Power Transmission for Sustainable Electronics: COST WiPE - IC1301 is an excellent book for both graduate students and industry engineers involved in wireless communications and power transfer, and sustainable materials for those fields.

This book addresses the design challenges in near-field wireless power transfer (WPT) systems, such as high efficiency, compact size, and long transmission range. It presents new low-profile designs for the TX/RX structures using different shapes of defected ground structures (DGS) like (H, semi-H, and spiral-strips DGS). Most near-field WPT systems depend on magnetic resonant coupling (MRC) using 3-D wire loops or helical antennas, which are often bulky. This, in turn, poses technical difficulties in their application in small electronic devices and biomedical implants. To obtain compact structures, printed spiral coils (PSCs) have recently emerged as a candidate for low-profile WPT systems. However, most of the MRC WPT systems that use PSCs have limitations in the maximum achievable efficiency due to the feeding method. Inductive feeding constrains the geometric dimensions of the main transmitting (TX)/receiving (RX) resonators, which do not achieve the maximum achievable unloaded quality factor. This book will be of interest to researchers and professionals working on WPT-related problems.

The immense genius of Tesla resulted from a mind that could see an invention in 3-D, from every angle, within his mind before it was easily built. Tesla's inventions were complete down to dimensions and part sizes in his visionary process. Tesla would envision his electromagnetic devices as he stared into the sky, or into a corner of his laboratory. His inventions on rotating magnetic fields creating AC current as we know it today, have changed the world—yet most people have never heard of this great inventor Is he a suppressed inventor, as many historians contend? Many of Tesla's concepts and inventions are still thought of as science fiction today—over 60 years later! Includes: Tesla's fantastic vision of the future, his wireless transmission of power, Tesla's Magnifying Transmitter, the testing and building of his towers for wireless power, tons more. The genius of Nikola Tesla is being realized by millions all over the world!

In this work, a general theory of coupled resonators is proposed. On one hand, it provides a design-oriented analysis while also preserving rigorously throughout the derivation; on the other hand, it uses graphical methods to offer an intuitive understanding. Using an impedance loci analysis, it then ties the above to aspects together to render an integrated body of theory. Guided by the developed theory, a robust wireless power transfer system using an oscillator driver is designed, capable of providing more than 90mW of power to a brain implant. Its maximum operating range spans 4.2cm and handles up to 40x load variations. It achieves a peak efficiency of more than 80%. Building upon this wireless power system, a novel data modulation, Load-Induced Resonance-Shift Keying (L-RSK) is implemented to transmit reverse data simultaneously with the forward regulated power, at high rate and low power, through the same pair of coils. It can support up to 5Mb/s data rate and burns negligible power (at most 0.395mW) compared with the total delivered amount. The milli-Watt level wireless power for biomedical implants can be extended to Watt level so that it can be used for charging portable consumer electronics. The scaled system can provide up to 11W power with 85% peak efficiency. Lastly, second harmonics in LC oscillators are ana-

lyzed. Analysis on the second harmonics at the output and at the tail current source of current-mode LC oscillators provides useful insights on how to improve power-conversion efficiency. Analysis on the second harmonics in oscillators with mismatch in threshold voltages of FETs shows that flicker noise at switching FETs of an LC oscillator can be up-converted to become phase noise at the output of the oscillation.

This book covers the next generation of power transfer in which power is transmitted via energy harvesting applications. It describes far-field Wireless Power Transfers (WPT) and why it is considered a special type of power transfer where power is transmitted through wireless power sources like radio waves, Wi-Fi, and TV broadcasting signals rather than utilizing near field wireless power sources. The book is the first of its kind to explain far-field WPT and energy harvesting technology from the same viewpoint. It provides you with an application-oriented review of how the latest WPT and energy harvesting tech can solve practical real-world problems. You will also get insight to R & D activities and regulations for commercial products in the future market. The book helps you understand the theory of far field WPT, and you will learn about the rising market for power transfer, factory automation (FA) and Internet-of-Things (IoT) sensors. With its comprehensive and unique coverage combining WPT and energy harvesting technology, this is an excellent resource for researchers, graduate students and engineers looking to further their knowledge on the theory of far field wireless power transfer.

Astrology, ancient temples, modern banking: here are the alchemical physics behind it all.

What Is Wireless Power Transfer The transmission of electrical energy in the absence of cables as a physical connection is referred to variously as wireless power transfer (WPT), wireless power transmission (WPT), wireless energy transmission (WET), or electromagnetic power transfer (EPT). In a system for wirelessly transmitting power, a transmitter device is propelled by electric power derived from a power source. This drives the device to generate a time-varying electromagnetic field, which in turn transmits power across space to a receiver device. The receiver device then extracts power from the field and supplies it to an electrical load. By removing the need for cables and batteries, the technology of wireless power transfer may increase the portability, convenience, and safety of an electronic gadget for all of its users. It is helpful to employ wireless power transmission in order to power electrical equipment in situations where physically connecting cables would be difficult, harmful, or otherwise impossible. How You Will Benefit (I) Insights, and validations about the following topics: Chapter 1: Wireless power transfer Chapter 2: Microwave Chapter 3: Electromagnetic compatibility Chapter 4: Antenna (radio) Chapter 5: Klystron Chapter 6: Near and far field Chapter 7: Index of electronics articles Chapter 8: Resonator Chapter 9: Spark-gap transmitter Chapter 10: Loop antenna Chapter 11: Index of electrical engineering articles Chapter 12: Grid dip oscillator Chapter 13: Coupling (electronics) Chapter 14: Inductive charging Chapter 15: Dielectric resonator antenna Chapter 16: WREL (technology) Chapter 17: Resonant inductive coupling Chapter 18: Qi (standard) Chapter 19: Magnetoquasistatic field Chapter 20: Glossary of electrical and electronics engineering Chapter 21: History of the Tesla coil (II) Answering the public top questions about wireless power transfer. (III) Real world examples for the usage of wireless power transfer in many fields. (IV) 17 appendices to explain, briefly, 266 emerging technologies in each industry to have 360-degree full understanding of wireless power transfer' technologies. Who This Book Is For Professionals, undergraduate and graduate students, enthusiasts, hobbyists, and those who want to go beyond basic knowledge or information for any kind of wireless power transfer.

Wireless power transfer allows the transfer of energy from a transmitter to a receiver across an air gap, without any electrical connections. Technically, any device that needs power can become an application for wireless power transmission. The current list of applications is therefore very diverse, from low-power portable electronics and household devices to high-power industrial automation and electric vehicles. With the rise of IoT sensor networks and Industry 4.0, the presence of

wireless energy transfer will only increase. In order to improve the current state of the art, models are being developed and tested experimentally. Such models allow simulating, quantifying, predicting, or visualizing certain aspects of the power transfer from transmitter(s) to receiver(s). Moreover, they often result in a better understanding of the fundamentals of the wireless link. This book presents a wonderful collection of peer-reviewed papers that focus on the modelling of wireless power transmission. It covers both inductive and capacitive wireless coupling and includes work on multiple transmitters and/or receivers.

The objective of this book is to publish the most recent technological advancements, and theoretical and practical research outcomes, alongside high-quality literature reviews on wireless power transfer to charge electric vehicles. More substantial research is proposed due to the fast-growing market for electric vehicles, and recent advances in wireless power transfer techniques have the potential to make this technology available for all consumers by overcoming its drawbacks. For instance, one of the major downsides to EVs is the requirement for an automobile to be idle during charging times. This problem can be solved by implementing dynamic wireless power transfer (WPT) with a higher power transfer efficiency (PTE). So, this book endeavors to create a major forum for investigating recent advances and the envisioned future in wireless power transfer for electric vehicles in terms of modeling, design, performance, operation, control, implementation, storage, electric machines, power electronics converters, optimization, cost, charging techniques, and applications. This book provides valuable contributions to the field of electric vehicles: inductive power transfer concepts; airport inductive charging infrastructures; the design of a wireless charging system for an e-bike with grid connection; control of renewables; social, economic, political, and technical factors for dynamic wireless charging; the influence of posture and coil position on the safety of a WPT; double-coil dynamic shielding technology for WPT; reduction in cogging torque in a PM brushless DC motor; and optimal dynamic scheduling of EVs in a parking lot.

Wireless power transfer (WPT) is a promising technology used to transfer electric energy from a transmitter to a receiver wirelessly without wires through various methods and technologies using time-varying electric, magnetic, or electromagnetic fields. It is an attractive solution for many industrial applications due to its many benefits over wired connections. This book discusses the theory and practical aspects of WPT technology.

This book presents a system-level analysis of inductive wireless power transfer (WPT) links. The basic requirements, design parameters, and utility of key building blocks used in inductive WPT links are presented, followed by detailed theoretical analysis, design, and optimization procedure, while considering practical aspects for various application domains. Readers are provided with fundamental, yet easy to follow guidelines to help them design high-efficiency inductive links, based on a set of application-specific target specifications. The authors discuss a wide variety of recently proposed approaches to achieve the maximum efficiency point, such as the use of additional resonant coils, matching networks, modulation of the load quality factor (Q-modulation), and adjustable DC-DC converters. Additionally, the attainability of the maximum efficiency point together with output voltage regulation is addressed in a closed-loop power control mechanism. Numerous examples, including MATLAB/Octave calculation scripts and LTspice simulation files, are presented throughout the book. This enables readers to check their own results and test variations, facilitating a thorough understanding of the concepts discussed. The book concludes with real examples demonstrating the practical application of topics discussed. Covers both introductory and advanced levels of theory and practice, providing readers with required knowledge and tools to carry on from simple to advanced wireless power transfer concepts and system designs; Provides theoretical foundation throughout the book to address different design aspects; Presents numerous examples throughout the book to complement the analysis and designs; Includes supplementary material (numerical and circuit simulation files) that provide a "hands-on" experience for the reader; Uses real examples to demonstrate the practical application of topics discussed.

This book is the first systematic exposition on the emerging domain of wireless power transfer in ad hoc communication networks. It selectively spans a coherent, large spectrum of fundamental aspects of wireless power transfer, such as mobility management in the network, combined wireless power and information transfer, energy flow among network devices, joint activities with wireless power transfer (routing, data gathering and solar energy harvesting), and safety provisioning through electromagnetic radiation control, as well as fundamental and novel circuits and technologies enabling the wide application of wireless powering. Comprising a total of 27 chapters, contributed by leading experts, the content is organized into six thematic sections: technologies, communication, mobility, energy flow, joint operations, and electromagnetic radiation awareness. It will

be valuable for researchers, engineers, educators, and students, and it may also be used as a supplement to academic courses on algorithmic applications, wireless protocols, distributed computing, and networking.

This book presents new circuits and systems for implantable biomedical applications targeting neural recording. The authors describe a system design adapted to conform to the requirements of an epilepsy monitoring system. Throughout the book, these requirements are reflected in terms of implant size, power consumption, and data rate. In addition to theoretical background which explains the relevant technical challenges, the authors provide practical, step-by-step solutions to these problems. Readers will gain understanding of the numerical values in such a system, enabling projections for feasibility of new projects.

This project of WPT is to construct and develop a prototype of wireless power transfer in application of wireless mobile battery charger. To achieve the aim of this project, the analysis are divided into two major parts which are through simulation using software and hardware implementation. In order to make it success, simulation using MULTISIM Version 13.0 are used. The method using MULTISIM is aimed to construct the circuits (transmitter and receiver) because MULTISIM easy to use, simple and many part of component needed. As the result, this software show the oscillating frequency appear at output of transmitter and waveform of input and output of transmitter and receiver circuits. So MULTISIM Version 13.0 to construct circuit foot-print into PCB layout from final circuit. In this research, technical skill is needed to create the suitable size of circuit on PCB. All working procedures are discussed in next chapter.

This book introduces the most state-of-the-art wireless power transfer technologies for electric vehicles from the fundamental theories to practical designs and applications, especially on the circuit analysis methods, resonant compensation networks, magnetic couplers, and related power electronics converters. Moreover, some other necessary design considerations, such as communication systems, detection of foreign and living objects, EMI issues, and battery charging strategies, are also introduced to provide sufficient insights into the industrial applications. Finally, some future points are mentioned in brief. Different from other works, all the WPT technologies in this book are applied in real EV applications, whose effectiveness and reliability have been already tested and verified. From this book, readers who are interested in the area of wireless power transfer can have a broad view of modern WPT technologies. Readers who have no experience in the WPT area can learn the basic concept, analysis methods, and design principles of the WPT system for EV charging. Even for the readers who are occupied in this area, this book also provides rich knowledge on engineering applications and future trends of EV wireless charging.

"This comprehensive book addresses applications for hobbyist broadcasting of AM, SSB, TV, FM Stereo and NBFM VHF-UHF signals with equipment readers can build themselves for thousands of dollars less than similar equipment sold on the retail market. The authors fully explore the legal limits and ramifications of using the equipment as well as how to get the best performance for optimum range. The key advantage is referencing a low-cost source for all needed parts, including the printed circuit board, as well as the kit. Complete source information has been included to help each reader find the kits and parts they need to build these fascinating projects."--BOOK JACKET.

Nikola Tesla dream in the early 20th century of a "World Wireless System" led him to build the Wardenclyffe Tower, a prototype base station serving as an emitter for his "World Wireless System". The base station was to supply wireless supply of electrical energy to a distant receiver. This book builds upon that dream and is a result of intensive research interest in powerline, machine to machine communications and wireless power transfer globally. Wireless energy transfer or Witricity (Wireless electricity) transfers electricity instead of data. The technology is useful in cases where instantaneous or continuous energy is needed but interconnecting wires are inconvenient, hazardous, or impossible. The transfer is made through inductive coupling and electromagnetic radiation. Inductive coupling provides optimum power delivery to a receiver load if both the emitter and the receiver achieve magnetic resonance concurrently. Energy transfer systems mostly use antennas operating in their near field regions. As fossil energy sources are being depleted rapidly worldwide and oil prices soar, solar energy enhanced with wireless power transfer (WPT) have become reasonable alternatives for renewable energy and power harvesting. They are finding use in transportation, electric and hybrid vehicles, very fast trains and the emerging field of Internet of Things. This book is written by the leading experts on wireless energy transfer technology and its applications. It introduces and explains the technology in great details and provides the theory and practice of WPT through the two approaches of coupled mode theory and circuit theory. Both approaches are dependent on resonance techniques. The level of presentation is suitable for design and

training. In depth coverage is provided on near field concepts; coupled-mode theory and models; circuit models of inductive antennas; radiative and inductive wireless power transfer, wireless power relay concepts, optimization techniques for wireless power transfer systems, control of wireless power transfer systems, wireless charging concepts; wireless energy transfer applications in electric vehicles, embedded medical systems and propagation in human tissues. Each chapter is written by experts on a selected aspect of wireless energy transfer. The authors have gone to great lengths to provide worked examples to assist the reader in working through some of the difficult concepts and to allow more understanding. The book is an excellent foundation for applying wireless energy transfer technologies in most fields including transportation, communication, home automation, biomedical systems and home appliances. The book is recommended to practitioners and engineers in the power industry, students in universities and research institutes. Honours and post graduate students in Physics, electrical/electronic engineering and computer science will find the book easy to read and apply because of the mode of presentation.

Wireless Power Transfer is the second edition of a well received first book, which published in 2012. It represents the state-of-the-art at the time of writing, and addresses a unique subject of great international interest in terms of research. Most of the chapters are contributed by the main author, though as in the first edition several chapters are contributed by other authors. The authors of the various chapters are experts in their own right on the specific topics within wireless energy transfer. Compared to the first edition, this new edition is more comprehensive in terms of the concepts discussed, and the range of current industrial applications which are presented, such as those of magnetic induction. From the eleven chapters of the first edition, this second edition has expanded to twenty chapters. More chapters on the theoretical foundations and applications have been included. This new edition also contains chapters which deal with techniques for reducing power losses in wireless power transfer systems. In this regard, specific chapters discuss impedance matching methods, frequency splitting and how to deploy systems based on frequency splitting. A new chapter on multi-dimensional wireless power transfer has also been added. The design of wireless power transfer systems based on bandpass filtering approach has been included, in addition to the two techniques using couple mode theory and electronic circuits. The book has retained chapters on how to increase efficiency of power conversion and induction, and also how to control the power systems. Furthermore, detailed techniques for power relay, including applications, which were also discussed in the first edition, have been updated and kept. The book is written in a progressive manner, with a knowledge of the first chapters making it easier to understand the later chapters. Most of the underlying theories covered in the book are clearly relevant to inductive near field communications, robotic control, robotic propulsion techniques, induction heating and cooking and a range of mechatronic systems.

Permanent monitoring of blood pressure helps in diagnosis and tracking progress of medical interventions. This dissertation details the design, fabrication and implementation of tiny wirelessly powered implant devices for detection of endoleaks and occlusion occurring in stent grafts used for treatment of Abdominal Aortic Aneurysm (AAA) and portal hypertension (due to liver cirrhosis). Custom fabricated low-power application-specific integrated circuit (ASIC) together with pressure sensors and telemetry units for wireless power reception and data transmission form an implant device. Using wireless inductive telemetry links, these devices achieved a wireless range of 20 cm.

em style="font-family: mso-bidi-font-style: normal;"Wireless Information and Power Transfer offers an authoritative and comprehensive guide to the theory, models, techniques, implementation and application of wireless information and power transfer (WIPT) in energy-constrained wireless communication networks. With contributions from an international panel of experts, this important resource covers the various aspects of WIPT systems such as, system modeling, physical layer techniques, resource allocation and performance analysis. The contributors also explore targeted research problems typically encountered when designing WIPT systems.

This book provides an in-depth introduction to the newest technologies for designing wireless power transfer systems for medical applications. The authors present a systematic classification of the various types of wireless power transfer, with a focus on inductive power coupling. Readers will learn to overcome many challenges faced in the design a wirelessly powered implant, such as power transfer efficiency, power stability, and the size of power antennas and circuits. This book focuses exclusively on medical applications of the technology and a batteryless capsule endoscopy system and other, real wirelessly powered systems are used as examples of the techniques described.

This book covers the very latest in theory and technology for Wireless Power Transfer (WPT), for

both coupling as well as radiative WPT. It describes the theory as well as the technology and applications.

Around the world, the major automakers are developing their strategies for conductive and wireless charging technologies, with concerted efforts to establish technical standards on wireless electric vehicle charging, mainly focused on the safety considerations and inter-operability. *Wireless Charging Technology and the Future of Electric Transportation* covers the current status of wireless power transfer (WPT) technology and its potential applications to the future road and rail transportation systems. Focusing on the applications of WPT technology to electric vehicle charging and the future green transportation field, *Wireless Charging Technology and the Future of Electric Transportation* was written collaboratively by nine experts in the field, led by Dr. In-Soo Suh, a professor and researcher from the Korean Advanced Institute of Technology (KAIST). This book brings an in-depth analysis of the most important areas of interest in this new area, such as:

- Working principles of wireless power transfer technology
- Current technology and its projected future impact on electric vehicles
- Comparison between conductive and wireless charging of electric vehicles
- Introduction to dynamic wireless charging systems
- Technological challenges and international technical standards activities
- Applications in consumer electronics, rail, aviation, marine, and off-road transportation
- Long-distance electrical energy transfer

Recent advances in Wireless Power Transmission (WPT) technologies have enabled various engineering applications with potential product implementation. WPT can be utilized to charge batteries in various pieces of equipment without the need for a wired connection. Energy can be harvested from ambient RF and microwave radiation and 1 million kW microwaves can be transmitted from space to the ground. This book covers all the theory and technologies of WPT, such as microwave generators with semi-conductors and microwave tubes, antennas, phased arrays, beam efficiency, and rectifiers (rectenna). The authors also discuss coupling WPT. Applications, such as energy harvesting, sensor networks, point-to-point WPT, WPT to moving targets (airplane, vehicle, etc.) and Solar Power Satellite are also presented.

This book comprises the proceedings of the select peer-reviewed papers presented during the 18th Control Instrumentation System Conference (CISCON 2021). This book highlights the latest trends in instrumentation, sensors and systems, industrial automation and control, image and signal processing, robotics, renewable energy, power systems, and power drives. The research works covered in the book are of high quality and contributed by experts in academia and industry to provide meaningful direction for prolific growth. The book also features a few chapters contributed by the leading policymakers, technologists, farmers, and doctors who help outline the roadmap from the need for technology to policy-making to effect and implement technological advancements for the nation-building process. The book will serve as a valuable reference resource for academics and researchers across the globe.

This book describes new circuits and systems for implantable wireless neural monitoring systems and explains the design of a batteryless, remotely-powered implantable micro-system, designed for continuous neural monitoring. Following new trends in implantable biomedical applications, the authors demonstrate a system which is capable of efficient remote powering and reliable data communication. Novel architecture and design methodologies are used for low power and small area wireless communication link. Additionally, hermetically sealed packaging and in-vivo validation of the implantable device is presented.

Implantable microdevices, providing accurate measurement of target analytes in animals and humans, have always been important in biological science, medical diagnostics, clinical therapy, and personal healthcare. Recently, there have been increasing unmet needs for developing high-performance implants that are small, minimally-invasive, biocompatible, long-term stable, and cost-effective. Therefore, the aim of this Special Issue is to bring together state-of-the-art research and development contributions that address key challenges and topics related to implantable microdevices. Applications of primary interest include, but are not limited to, miniaturized optical sensing and imaging tools, implantable sensors for detecting biochemical species and/or metabolites, transducers for measuring biophysical quantities (e.g., pressure and/or strain), and neural prosthetic devices.

Wireless Power Transfer (WPT) is considered to be an innovative game changing technology. The same radio wave and electromagnetic field theory and technology for wireless communication and remote sensing is applied for WPT. In conventional wireless communication systems, information is “carried” on a radio wave and is then transmitted over a distance. In WPT however, the energy of the radio wave itself is transmitted over a distance. Wireless communication technology has

proven to be extremely useful, however in future it should be even more useful to apply both wireless communication and wireless power technologies together. There are various WPT technologies, e.g. inductive near field WPT, resonance coupling WPT, WPT via radio waves, and laser power transfer. Recent *Wireless Power Transfer Technologies via Radio Waves* focusses on recent technologies and applications of the WPT via radio waves in far field. The book also covers the history, and future, of WPT via radio waves, as well as safety, EMC and coexistence of radio waves for WPT. Technical topics discussed in the book include:

- Radio Wave Generation
- Radio Wave Amplification
- Solid States Circuit and Microwave Tubes
- Antenna and Beam Forming Technologies
- Radio Wave Conversion/Rectification to Electricity
- Battery-less Sensor Applications toward Internet of Things (IoT)
- Solar Power Satellite Application
- Safety, EMC, Coexistence of Radio Waves for the WPT

WPT is an old technology based on the basic theory of radio waves, however WPT is also a state-of-the-art technology for the latest applications in IoT, sensor networks, wireless chargers for mobile phones, and solar power satellite. The theory behind these technologies, as well as applications, are explained in this book.

A thorough treatment of the principles, applications and system integration of energy harvesting technology.

Technologies that enable powering a device without the need for being connected with a cable to the grid are gaining attention in recent years due to the advantages that they provide. They are a commodity to users and provide additional functionalities that promote autonomy among the devices. *Emerging Capabilities and Applications of Wireless Power Transfer* is an essential reference source that analyzes the different applications of wireless power transfer technologies and how the technologies are adapted to fulfill the electrical, magnetic, and design-based requirements of different applications. Featuring research on topics such as transfer technologies, circuital analysis, and inductive power transfer, this book is a vital resource for academicians, electrical engineers, scientists, researchers, and industry professionals seeking coverage on device power and creating autonomy through alternative power options for devices.

Do you need to get up to speed quickly on the technologies and services that could transform the wireless world over the coming decade? Whether you work directly with wireless or in a sector where wireless solutions could be beneficial (e.g. healthcare, transport, sensor networks, location and smart metering), this concise guide provides a critical insight into future developments. For the first time, you will have a clear view of all the key technologies, including mesh networks, white space/cognitive devices, 4G/LTE and femtocells, and all the sectors or applications in which they could be used, with a comparison of the positives and negatives of each technology and sector area. You'll also see where the technologies required overlap and so could bring benefits across multiple areas, as well as how the key drivers of change in the past may impact on the future.

Wireless power transfer techniques have been gaining researchers' and industry attention due to the increasing number of battery-powered devices, such as mobile computers, mobile phones, smart devices, intelligent sensors, mainly as a way to replace the standard cable charging, but also for powering battery-less equipment. The storage capacity of batteries is an extremely important element of how a device can be used. If we talk about battery-powered electronic equipment, the autonomy is one factor that may be essential in choosing a device or another, making the solution of remote powering very attractive. A distinction has to be made between the two forms of wireless power transmission, as seen in terms of how the transmitted energy is used at the receiving point:

- Transmission of information or data, when it is essential for an amount of energy to reach the receiver to restore the transmitted information;
- Transmission of electric energy in the form of electromagnetic field, when the energy transfer efficiency is essential, the power being used to energize the receiving equipment.

The second form of energy transfer is the subject of this book.

Emerging Communication Technologies Based on Wireless Sensor Networks: Current Research and Future Applications fills a gap in the existing literature by combining a plethora of WSN-based emerging technologies into a single source so that researchers can form opinions regarding these technologies. It presents different types of emerging communication technologies based on WSNs and describes how wireless sensor networks can be integrated with other communication technologies. It covers many of the new techniques and demonstrates the application of WSNs. The book's 14 chapters are divided into four parts. The first part covers the basics of wireless sensor networks and their principal working methods. The authors then move on to discuss different types of WSNs, characteristics of different types of emerging technologies based on WSNs, renewable energy sources, battery replenishment strategies, and application-specific energy challenges of WSNs. The second part is dedicated to issues related to wireless body area networks (WBANs). It discusses

wearable WSNs and their applications, standards, and research trends. The authors also discuss routing schemes devised for WBANs and thermal-aware routing protocols for WBANs. The third part focuses on different emerging communication technologies based on WSNs, including electromagnetic wireless nanosensor networks, WSNs in the IoT, management of WSNs through satellite networks, WSNs in smart homes, and cognitive radio technology in conjunction with WSNs. The last part of the book covers topics generally related to typical WSNs, including energy-efficient data collection in WSNs, key distribution mechanisms in WSNs, distributed data gathering algorithms for mobile WSNs, and finally, a novel mobility scheme for WSNs that supports IPv6.

Wireless Power Transfer is the second edition of a well received first book, which published in 2012. It represents the state-of-the-art at the time of writing, and addresses a unique subject of great international interest in terms of research. Most of the chapters are contributed by the main author, though as in the first edition several chapters are contributed by other authors. The authors of the various chapters are experts in their own right on the specific topics within wireless energy transfer. Compared to the first edition, this new edition is more comprehensive in terms of the concepts discussed, and the range of current industrial applications which are presented, such as those of magnetic induction. From the eleven chapters of the first edition, this second edition has expanded to twenty chapters. More chapters on the theoretical foundations and applications have been included. This new edition also contains chapters which deal with techniques for reducing power losses in wireless power transfer systems. In this regard, specific chapters discuss impedance matching methods, frequency splitting and how to deploy systems based on frequency splitting. A new chapter on multi-dimensional wireless power transfer has also been added. The design of wireless power transfer systems based on bandpass filtering approach has been included, in addition to the two techniques using couple mode theory and electronic circuits. The book has retained chapters on how to increase efficiency of power conversion and induction, and also how to control the power systems. Furthermore, detailed techniques for power relay, including applications, which were also discussed in the first edition, have been updated and kept. The book is written in a progressive manner, with a knowledge of the first chapters making it easier to understand the later chapters. Most of the underlying theories covered in the book are clearly relevant to inductive near field communications, robotic control, robotic propulsion techniques, induction heating and cooking and a range of mechatronic systems.

Modern oil industry requires detailed monitoring and management to reduce the risks of unwanted fluid release. Sensors need to be planted along oil wells to gather the downhole environment data. However, there are production packers along oil pipes that are used to provide a seal between pipe casing and tubing to control pipe pressure. Such structures make it difficult for power cables to extend along oil pipes. In order to provide power supply on both sides of production packers, we consider wireless power transfer technique via inductive magnetic coupling between two coils wound along oil pipes. But eddy current induced in metallic pipe and sea water in oil well will counteract the flux link between the transmitting and receiving coils. Also, the distance of power transfer is limited due to the fast decay of the inductive magnetic field. In this research, we propose a long distance wireless power transfer system along the oil pipes with acceptable efficiency. We cover the oil pipe with a thin layer of soft ferrite, and we add a soft ferrite core to the transmitting and receiving coils. We use FEM simulation software to analyze the magnetic flux link improved by the ferrite structures. A CAD model is used to extract FEM field solutions to estimate the power transfer efficiency, and the estimated efficiency is compared and validated with measurement. We will show through FEM simulation and experiments that the ferrite layer on oil pipe forms a magnetic flux pathway and greatly enhances the flux link between transmitter and receiver, and by building a flux pathway extending through pipe, we are able to make the long distance wireless power transfer in oil well possible.

A guide to a multi-disciplinary approach that includes perspectives from noted experts in the energy and utilities fields *Advances in Energy Systems* offers a stellar collection of articles selected from the acclaimed journal *Wiley Interdisciplinary Review: Energy and Environment*. The journal covers all aspects of energy policy, science and technology, environmental and climate change. The book covers a wide range of relevant issues related to the systemic changes for large-scale integration of renewable energy as part of the on-going energy transition. The book addresses smart energy systems technologies, flexibility measures, recent changes in the marketplace and current policies. With contributions from a list of internationally renowned experts, the book deals with the hot topic of systems integration for future energy systems and energy transition. This important resource: Contains contributions from noted experts in the field Covers a broad range of topics on

the topic of renewable energy Explores the technical impacts of high shares of wind and solar power Offers a review of international smart-grid policies Includes information on wireless power transmission Presents an authoritative view of micro-grids Contains a wealth of other relevant topics Written for energy planners, energy market professionals and technology developers, Advances in

Energy Systems is an essential guide with contributions from an international panel of experts that addresses the most recent smart energy technologies.

This book presents state-of-the-art analog and power management IC design techniques for various wireless power transfer (WPT) systems. To create elaborate power management solutions, cir-

cuit designers require an in-depth understanding of the characteristics of each converter and regulator in the power chain. This book addresses WPT design issues at both system- and circuit-level, and serves as a handbook offering design insights for research students and engineers in the integrated power electronics area.