

## Green Building Nptel

An Introduction to Optimization Techniques introduces the basic ideas and techniques of optimization. Optimization is a precise procedure using design constraints and criteria to enable the planner to find the optimal solution. Optimization techniques have been applied in numerous fields to deal with different practical problems. This book is designed to give the reader a sense of the challenge of analyzing a given situation and formulating a model for it while explaining the assumptions and inner structure of the methods discussed as fully as possible. It includes real-world examples and applications making the book accessible to a broader readership. Features Each chapter begins with the Learning Outcomes (LO) section, which highlights the critical points of that chapter. All learning outcomes, solved examples and questions are mapped to six Bloom Taxonomy levels (BT Level). Book offers fundamental concepts of optimization without becoming too complicated. A wide range of solved examples are presented in each section after the theoretical discussion to clarify the concept of that section. A separate chapter on the application of spreadsheets to solve different optimization techniques. At the end of each chapter, a summary reinforces key ideas and helps readers recall the concepts discussed. The wide and emerging uses of optimization techniques make it essential for students and professionals. Optimization techniques have been applied in numerous fields to deal with different practical problems. This book serves as a textbook for UG and PG students of science, engineering, and management programs. It will be equally useful for Professionals, Consultants, and Managers.

This book introduces a modern approach to embedded system design, presenting software design and hardware design in a unified manner. It covers trends and challenges, introduces the design and use of single-purpose processors ("hardware") and general-purpose processors ("software"), describes memories and buses, illustrates hardware/software tradeoffs using a digital camera example, and discusses advanced computation models, controls systems, chip technologies, and modern design tools. For courses found in EE, CS and other engineering departments.

This book is primarily intended to serve as a textbook and reference work for graduate and professional training coursework on solar desalination of water. The book begins with an introduction to the increasing demand for potable water, various types of water pollution and its impacts on human health, and goes on to cover basics of desalination technologies. It covers all aspects of solar-energy based distillation and desalination for producing potable water resources, including radiation and heat transfer concepts, a history of solar distillation systems, and background on solar collectors. The contents include thermal modeling and parametric study of solar distillation. Energy and exergy aspects are analyzed in detail, including energy matrices of solar distillation. A special chapter on exeroeconomics introduces fundamental equations which include the general balance equation, thermodynamic balance equations, and economic balance equations. A chapter on Economic Analysis of Solar Distillation completes the coverage. The book includes solved examples and end-of-chapter exercises in the form of both problems and objective-type questions. The contents of this book are useful to students, researchers, professionals, and policymakers looking for a comprehensive resource on solar desalination.

This book presents a large number of organic reactions performed under green conditions, which were earlier performed using anhydrous conditions and various volatile organic solvents. The conditions used involve green solvents like water, super critical carbon dioxide, ionic liquids, polymer-supported reagents, polyethylene glycol and perfluorous liquids. A number of reactions have been conducted in solid state without using any solvent. Most of the reactions have been conducted under microwave irradiations and sonication. In large number of reactions, catalysts like phase transfer catalysts, crown ethers and biocatalysts have been used. Providing the protocols that every laboratory should adopt, this book elaborates the principles of green chemistry and discusses the planning and preparations required to convert to green laboratory techniques. It includes applications relevant to practicing researchers, students and environmental chemists. This book is useful for students (graduate and postgraduate), researchers and industry professionals in the area of chemical engineering, chemistry and allied fields.

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LEED v4 Practices, Certification, and Accreditation Handbook, Second Edition, provides users with a practical user-friendly roadmap that presents the guidelines for selecting the LEED v4 rating system to better fit a particular project (e.g. LEED for Building Design and Construction, LEED for Operations and Maintenance, LEED for Interior Design and Construction, LEED for Building Design and Construction, or LEED for Neighborhood Development). In addition, this comprehensive handbook carefully explains the modifications in the credentialing process, including the new 3-Tier system requiring applicants to first take the LEED™ Green Associate exam, followed by the LEED™ Professional Accreditation exam. Practical strategies and guidelines for applying LEED v4 project certification Annotated tables, checklists, charts, and references to "quantum leap," LEED v4 Includes case studies with special focus is put on key areas where most errors occur Demystifies LEED v4 requirements for project as well as personal/professional LEED Certification Appendixes including sample exam questions, acronyms and abbreviations and a glossary

This book comprises the proceedings of the International Conference on Green Buildings and Sustainable Engineering (GBSE 2018), which focused on the theme "Transforming our Built Environment through Innovation and Integration towards a Smart and Sustainable Future". The papers included address all aspects of green buildings and sustainability practices in civil engineering, and offer a valuable reference resource for researchers, practitioners, and policy makers.

To properly select and specify green building materials, architects need advice on how to select and use nontoxic, recycled, and recyclable products, and how to integrate these

products into the design process in order to capitalize on their many practical and economic advantages. This fully updated new edition is a reliable, up-to-date resource for professionals and students alike. Written by two nationally known experts on green building methods and materials, Green Building Materials, Third Edition offers in-depth, practical information on the product selection, product specification, and construction process. This new Third Edition is an excellent hands-on guide to today's newest range of green building materials- what they are, where to find them, how to use them effectively, and how to address LEED requirements. Organized by CSI MasterFormat® categories for fast access to specific information.

Primarily intended for senior undergraduate and postgraduate students of civil, mechanical and aerospace/aeronautical engineering, this text emphasises the importance of reliability in engineering computations and understanding the process of computer aided engineering. Written with a view to promote the correct use of finite element technology and to present a detailed study of a set of essential computational tools for the practice of structural dynamics, this book is a ready-reckoner for an in-depth discussion of finite element theory and estimation and control of errors in computations. It is specifically aimed at the audience with interest in vibrations and stress analysis. Several worked out examples and exercise problems have been included to describe the various aspects of finite element theory and modelling. The exercise on error analysis will be extremely helpful in grasping the essence of posteriori error analysis and mesh refinement. KEY FEATURES • Thorough discussion of numerical algorithms for reliable and efficient computation. • Ready-to-use finite element system and other scientific applications. • Tips for improving the quality of finite element solutions. • Companion DVD containing ready to use finite element applications. AUDIENCE: Senior Undergraduate and Postgraduate students of Civil, Mechanical and Aerospace/Aeronautical engineering

This book presents select proceedings of the National Conference on Advances in Sustainable Construction Materials (ASCM 2019) held at the National Institute of Technology, Warangal, India. The book includes contributions from academics and practitioners on low-energy cement technologies, innovative materials and structural technologies towards cost-effective, environment friendly, durable, energy-efficient, and sustainable construction. The topics covered emphasize on cutting-edge, economically viable, and sustainable solutions with an aim to increase profitability, and decrease construction time and overall impact on the built environment. The book will be useful for researchers and practitioners interested in sustainable construction and allied fields.

This book focuses on solar-energy-based renewable energy systems and discusses the generation of electric power using solar photovoltaics, as well as some new techniques, such as solar towers, for both residential and commercial needs. Such systems have played an important role in the move towards low-emission and sustainable energy sources. The book covers a variety of applications, such as solar water heaters, solar air heaters, solar drying, nanoparticle-based direct absorption solar systems, solar volumetric receivers, solar-based cooling systems, solar-based food processing and cooking, efficient buildings using solar energy, and energy storage for solar thermal systems. Given its breadth of coverage, the book offers a valuable resource for researchers, students, and professionals alike.

Distills key concepts from linear algebra, geometry, matrices, calculus, optimization, probability and statistics that are used in machine learning.

Metal Oxide Nanostructures as Gas Sensing Devices explores the development of an integrated micro gas sensor that is based on advanced metal oxide nanostructures and is compatible with modern semiconductor fabrication technology. This sensor can then be used to create a compact, low-power, handheld device for analyzing air ambience. The book first covers current gas sensing tools and discusses the necessity for miniaturized sensors. It then focuses on the materials, devices, and techniques used for gas sensing applications, such as resistance and capacitance variations. The author addresses the issues of sensitivity, concentration, and temperature dependency as well as the response and recovery times crucial for sensors. He also presents techniques for synthesizing different metal oxides, particularly those with nanodimensional structures. The text goes on to highlight the gas sensing properties of many nanostructured metal oxides, from aluminum and cerium to iron and titanium to zinc and zirconium. The final chapters deal with existing and future devices that are based on nanostructures. Miniaturized systems that analyze air ambience need sensors capable of identifying different gaseous species. Exploring state-of-the-art gas sensing devices, this book shows how nanostructured metal oxides are ideally suited for use as gas sensing elements.

International experts discuss how to restore degraded ecosystems and bring water resources to a level at which they can be sustained naturally. Examines the relationships between the various water-related activities of man and formulates acceptable tactics for the integrated development of river basins.

This book presents select proceedings of National Conference on Advances in Sustainable Construction Materials (ASCM 2020) and examines a range of durable, energy-efficient, and next-generation construction materials produced from industrial wastes and by-products. The topics covered include sustainable materials and construction, innovations in recycling concrete, green buildings and innovative structures, utilization of waste materials in construction, geopolymers concrete, self-compacting concrete by using industrial waste materials, nanotechnology and sustainability of concrete, environmental sustainability and development, recycling solid wastes as road construction materials, emerging sustainable practices in highway pavements construction, plastic roads, pavement analysis and design, application of geosynthetics for ground improvement, sustainability in offshore geotechnics, green tunnel construction technology and application, ground improvement techniques and municipal solid waste landfill. Given the scope of contents, the book will be useful for researchers and professionals working in the field of civil engineering and especially sustainable structures and green buildings.

Sustainable Industrial Design and Waste Management was inspired by the need to have a text that enveloped awareness and solutions to the ongoing issues and concerns of waste generated from industry. The development of science and technology has increased human capacity to extract resources from nature and it is only recently that industries are being held accountable for the detrimental effects the waste they produce has on the environment. Increased governmental research, regulation and corporate accountability are digging up issues pertaining to pollution control and waste treatment and environmental protection. The traditional approach for clinical waste, agricultural waste, industrial waste, and municipal waste are depleting our natural resources. The main objective of this book is to conserve the natural resources by approaching 100 % full utilization of all types of wastes by cradle – to – cradle concepts, using Industrial Ecology methodology documented with case studies. Sustainable development and environmental protection cannot be achieved without establishing the concept of industrial ecology. The main tools necessary for establishing Industrial Ecology and sustainable development will be covered in the book. The concept of “industrial ecology will help the industrial system to be managed and operated more or less like a natural ecosystem hence causing as less damage as possible to the surrounding environment. Numerous case studies allow the reader to adapt concepts according to personal interest/field Reveals innovative technologies for the conservation of natural resources The only book which provides an integrated approach for sustainable development including tools, methodology, and indicators for sustainable development

With the emphasis on market-led development initiatives, sustainable urbanization is a challenge, especially in growing nations. Regional administrative efforts are crucial for cities to meet the planned city operations and specific targets and objectives. The Handbook of Research on Urban Governance and Management in the Developing World is a research publication that explores contemporary issues in regional political and administrative practices and key challenges in implementing these strategies in growing nations. Featuring coverage on a wide range of topics such as urban and regional economics, supply chain management, and environmental concerns, this book is geared toward city development planners, policy makers, researchers,

academics, and students seeking current and relevant research on the regional bureaucracy and its practices and how they affect growing nations.

Ensuring that everybody has access to drinking water, sanitation and enough nutritious food, which depends on water to grow it, are prerequisites for a healthy life. Water management is not just about the technical aspects of water supply and sanitation. It is equally about our water governance systems, including policies, regulation and societal perception of water rights. This book presents many helpful examples of how different societies are dealing with these issues and of the performance of public and private sector players in this important arena. ð Colin Chartres, International Water Management Institute (IWMI), Colombo, Sri Lanka ð congratulate the Institute of Water Policy, the two editors and the contributors for a very thoughtful book on urban water governance. Our objective is to deliver sustainable water and sanitation services to our people. This book contains useful lessons on how to achieve that objective. ð Tommy Koh, Chairman, Governing Council, Asia-Pacific Water Forum This insightful book explores urban water governance challenges in different parts of the world and highlights the advantages and disadvantages of publicly run, privatized, and public-private partnership managed water facilities. The contributors expertly discuss various types of public and private water governance architectures as well as identifying the trends, challenges, opportunities and the shifts in perceptions with regard to the provision of water supply services. Many chapters are dedicated to analyzing the urban water supply scenarios in selected countries, with specific focus on legal, policy and institutional frameworks. The study reveals that while private sector participation has been largely promoted by multilateral institutions as part of institutional and financial reforms, ultimately governments bear the major responsibility for provision of water supply services either as 'service provider' or as 'regulator and policy-maker'. Containing a detailed overview and analysis of the global urban water supply sector, this timely compendium will strongly appeal to academics, researchers and university students following water-related courses. Water sector professionals, water regulators and public officers as well as managers and researchers employed by private sector water operators will also find plenty of invaluable information in this important book.

This book provides a comprehensive introduction to the physics of the photovoltaic cell. It is suitable for undergraduates, graduate students, and researchers new to the field. It covers: basic physics of semiconductors in photovoltaic devices; physical models of solar cell operation; characteristics and design of common types of solar cell; and approaches to increasing solar cell efficiency. The text explains the terms and concepts of solar cell device physics and shows the reader how to formulate and solve relevant physical problems. Exercises and worked solutions are included.

This collection of papers, which was subjected to strict peer-review by 2 to 4 expert referees, aims to collect together the latest advances in, and applications of, traditional constructional materials, advanced constructional materials and green building materials. It cannot fail to suggest new ideas and strategies to be tried in this field.

How customers and consumer behavior have been changing due to technology and other forces is of prime interest. This book addresses the central questions regarding new emerging consumer behavior; how does social media affect this behavior; how and at what points do emotions affect consumer decisions; and what triggers this is: How should engagement be conceptualized, defined and measured? How do social media and other marketing activities create engagement? The book draws on the rich, extensive knowledge of the authors who are pioneers in the field. The book's editors have identified the weakness in the current knowledge and aim to address this gap by touching on significant conceptual and empirical contributions to this emerging literature stream, providing readers with a comprehensive contemporary perspective of customer engagement. The book also endeavors to develop a richer narrative around the notion of social media and customer engagement, and the non-monetary notion of social media within new media-based social networks.

This volume presents selected papers presented during the First Asian Conference on Indoor Environmental Quality (ACIEQ). The contents cover themes of indoor air quality monitoring and modeling; the influence of confounding factors like thermal comfort parameters, such as temperature and relative humidity with respect to different building types, e.g., residential, commercial, institutional; ventilation characteristics, lighting and acoustics. It also focuses on people's performance, productivity, and behavior with respect to their exposure to various indoor air pollutants and parameters influencing the overall indoor environmental quality. This volume is primarily aimed at researchers working in environmental science and engineering, building architecture and design, HVAC and ventilation, public health, and epidemiology. The contents of this volume will also be useful to policy makers working on occupational health and building codes.

This book presents articles from the International Conference on Modelling, Simulation and Intelligent Computing (MoSiCom 2020), held at Birla Institute of Technology and Science Pilani, Dubai Campus, Dubai, UAE, in January 2020. Modelling and simulation are becoming increasingly important in a wide variety of fields, from Signal, Image and Speech Processing, and Microelectronic Devices and Circuits to Intelligent Techniques, Control and Energy Systems, and Power Electronics. Further, Intelligent Computational techniques are gaining significance in interdisciplinary engineering applications, such as Robotics and Automation, Healthcare Technologies, IoT and its Applications. Featuring the latest advances in the field of engineering applications, this book serves as a definitive reference resource for researchers, professors and practitioners interested in exploring advanced techniques in the field of modelling, simulation and computing.

This contribution to SpringerBriefs in Green Chemistry outlines and discusses the four major green chemistry metrics (atom economy, reaction mass efficiency, E factor and process mass intensity), at a level that is comprehensible by upper-level undergraduates. Such students have previously received fundamental training in organic chemistry basics, and are ideally positioned to learn about green chemistry principles, of which metrics is one foundational pillar. Following this, other green metrics in common use are discussed, along with applications that allow important calculations to be easily undertaken. Finally, an introduction to metrics in the context of life cycle analyses is presented. It should be noted that no other available publication teaches green chemistry metrics in detail with an emphasis on educating undergraduates, whilst simultaneously providing a contemporary industrial flavour to the material.

Updated with new code, new projects, and new chapters, Machine Learning with TensorFlow, Second Edition gives readers a solid foundation in machine-learning concepts and the TensorFlow library.

Summary Updated with new code, new projects, and new chapters, Machine Learning with TensorFlow, Second Edition gives readers a solid foundation in machine-learning concepts and the TensorFlow library. Written by NASA JPL Deputy CTO and Principal Data Scientist Chris Mattmann, all examples are accompanied by downloadable Jupyter Notebooks for a hands-on experience coding TensorFlow with Python. New and revised content expands coverage of core machine learning algorithms, and advancements in neural networks such as VGG-Face facial identification classifiers and deep speech classifiers.

Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the technology Supercharge your data analysis with machine learning! ML algorithms automatically improve as they process data, so results get better over time. You don't have to be a mathematician to use ML: Tools like Google's TensorFlow library help with complex calculations so you can focus on getting the answers you need. About the book Machine Learning with TensorFlow, Second Edition is a fully revised guide to building machine learning models using Python and TensorFlow. You'll apply core ML concepts to real-world challenges, such as sentiment analysis, text classification, and image recognition. Hands-on examples illustrate neural network techniques for deep speech processing, facial identification, and auto-encoding with CIFAR-10. What's inside Machine Learning with TensorFlow Choosing the best ML approaches Visualizing algorithms with TensorBoard Sharing results with collaborators Running models in Docker About the reader Requires intermediate Python skills and knowledge of general algebraic concepts like vectors and matrices. Examples use the super-stable 1.15.x branch of TensorFlow and TensorFlow 2.x. About the author Chris Mattmann is the Division Manager of the Artificial Intelligence, Analytics, and Innovation Organization at NASA Jet Propulsion Lab. The first edition of this book was written by Nishant Shukla with Kenneth Fricklas. Table of Contents PART 1 - YOUR MACHINE-LEARNING RIG 1 A machine-learning odyssey 2 TensorFlow essentials PART 2 - CORE LEARNING ALGORITHMS 3 Linear regression and beyond 4 Using regression for call-center volume prediction 5 A gentle introduction to classification 6 Sentiment classification: Large movie-review dataset 7 Automatically clustering data 8 Inferring user activity from Android accelerometer data 9 Hidden Markov models 10 Part-of-speech tagging and word-sense disambiguation PART 3 - THE NEURAL NETWORK PARADIGM 11 A peek into autoencoders 12 Applying autoencoders: The CIFAR-10 image dataset 13 Reinforcement learning 14 Convolutional neural networks 15 Building a real-world CNN: VGG-Face ad VGG-Face Lite 16 Recurrent neural networks 17 LSTMs and automatic speech recognition 18 Sequence-to-sequence models for chatbots 19 Utility landscape

The first book on the subject written by a practitioner for practitioners. Geotechnical Instrumentation for Monitoring Field Performance Geotechnical Instrumentation for Monitoring Field Performance goes far beyond a mere summary of the technical literature and manufacturers' brochures: it guides reader through the entire geotechnical instrumentation process, showing them when to monitor safety and performance, and how to do it well. This comprehensive guide: \* Describes the critical steps of planning monitoring programs using geotechnical instrumentation, including what benefits can be achieved and how construction specifications should be written \* Describes and evaluates monitoring methods and recommends instruments for monitoring groundwater pressure, deformations, total stress in soil, stress change in rock, temperature, and load and strain in structural members \* Offers detailed practical guidelines on instrument calibrations, installation and maintenance, and on the collection, processing, and interpretation of instrumentation data \* Describes the role of geotechnical instrumentation during the construction and operation phases of civil engineering projects, including braced excavations, embankments on soft ground, embankment dams, excavated and natural slopes, underground excavations, driving piles, and drilled shafts \* Provides guidelines throughout the book on the best practices A structural glass facade is a glass wall in which the glass itself is part of the building structure. The fundamental technology of structural facade systems has undergone a transition over the past decade from an emergent, experimental building form to a mature, fully robust technology. The book documents, defines, and categorizes the current state of the art in long-span glass facade design and construction, with a focus on structural systems, glass cladding options and implementation strategies for innovative design. With illustrations and case studies, the book discusses designs and design practices; engineering issues; material, process and fabrication considerations, installation means and methods, and project delivery strategies. A must for architects, industrial designers, and interior designers.

This volume contains selected papers presented during the Second International Conference on Environmental Geotechnology, Recycled Waste Materials and Sustainable Engineering, held in the University of Illinois at Chicago. It covers the recent innovations, trends, and concerns, practical challenges encountered, and the solutions adopted in geoenvironmental engineering, waste management, and sustainable engineering. This book will be useful for academics, educators, policy makers and professionals working in the field of civil engineering, chemical engineering, environmental sciences and public policy.

This volume discusses the structure and growth of the plastics industry, comprehensively displaying the complete cycle of plastics from raw materials to waste and solutions related to this waste - presenting practical cost scenarios for the collection and disposal of waste.; Examining the issue of plastics waste in a broad social and environmental context, Plastics Waste Management: considers the regulations imposed on waste disposal and aspects of pollution control acts; provides a technical overview of polymers, classifications, and properties as well as the plastics industry, polymer production, and consumption; addresses extrusion basics and polymers' compatibility in a mixture of plastic waste; describes the recycling of mixed plastics waste; and explores design considerations and product life cycles with respect to environmentally friendly products in packaging applications.; Furnishing more than 400 bibliographic citations, Plastics Waste Management is a reference for pollution control, plastics, environmental, polymer and chemical engineers; recycling facility operators; plastics designers; and upper-level undergraduate and graduate students in these disciplines.

This book offers a comprehensive reference guide to the latest developments and advances in solar drying technology, covering the concept, design, testing, modeling, and economics of solar drying technologies, as well as their impact on the environment. The respective chapters are based on the latest studies conducted by reputed international researchers in the fields of solar energy and solar drying. Offering a perfect blend of research and practice explained in a simple manner, the book represents a valuable resource for researchers, students, professionals, and policymakers working in the field of solar drying and related agricultural applications.

Design of Wind and Earthquake Resistant Reinforced Concrete Buildings explains wind and seismic design issues of RCC buildings in brief and provides design examples based on recommendations of latest IS codes essential for industrial design. Intricate issues of RCC design are discussed which are supplemented by real-life examples. Guidelines are presented for evaluating the acceptability of wind-induced motions of tall buildings. Design methodologies for structures to deform well beyond their elastic limits, which is essential under seismic excitation, have been discussed in detail. Comparative discussion including typical design examples using recent British, Euro and American codes is also included. Features: Explains wind and earthquake resistant design issues, balancing theoretical aspects and design implications, in detail Discusses issues for designing the wind and earthquake resistant RCC structures Provides comprehensive understanding, analysis, design and detailing of the structures Includes a detailed discussion on IS code related to wind and earthquake resistant design and its comparison with Euro, British and American codes Contains architectural drawings and structural drawings The book is aimed at researchers, professionals, graduate students in wind and earthquake engineering, design of RCC structures, modelling and analysis of structures, civil/infrastructure engineering.

Selling products used to be the standard way of doing business. Traditionally, it is left to the user to transform the purchase of a product into something that fulfills effectively a final-user need. Today, two streams of research – business management and sustainability – normally with very distinct perspectives on the world, have surprisingly converged to form a common conclusion: selling products is old-fashioned business. Companies should switch their focus to selling need fulfillment, satisfaction, or experiences. Or, in other words, selling integrated solutions or product-services. The business management literature argues that, by focusing on the integrated, final-client needs, and delivering integrated solutions fulfilling these needs, companies will be able to improve their position in the value chain, enhance added value of their offering, and improve their innovation potential. In a business world where many products are becoming equally well-performing commodities, this strategy is one of the ways to avoid a sheer competition on price – a type of competition that Europe never can win with emerging and low-cost economies such as China. In that sense, product-services can mean new business for old Europe. The sustainability knowledge stream argues that need-focused solutions could be inherently more sustainable than products. Product-services could offer the value of use instead of the product itself and

decrease the environmental load in two ways. First, companies offering the service would have all the incentives to make the (product-)system efficient, as they get paid by the result. Second, consumers would be encouraged to alter their behaviour as they gain insight into all the costs involved with the use. Until today, the connections and interchange between the two research streams have been quite limited. The question of whether product-services truly are the avenue to a sustainable world is still under discussion. This book aims to develop a systematic view on this issue. The potential of product-services to enhance competitiveness and contribute to sustainable development prompted the EU to invest heavily in the theme under the EU's 5th Framework Programme (FP5; 1997-2002). A variety of research and development projects in the field were supported under the umbrella of the Sustainable Product Development Network (SusProNet). These included MEPSS (Methodology Product Service Systems); Home Services; HiCS (Highly Customised Solutions); Prosecco (Product-Service Co-design); and Innopse (Innovation Studio and exemplary developments for Product-Service). The projects were undertaken by a mix of European research institutions and companies including Orange, Philips and Nokia. Some of these projects focused on developing methods that could help industries change their output from a product to a service. Others focused on the development of new product-services or solutions (HiCS, Prosecco, Innopse), and yet others tried to analyze under which circumstances product-services are likely to be implemented and accepted by consumers (Home Services). One project focused on dissemination of the concept to SMEs (Lean Services). Other projects focused purely on new product-service development, such as Brainfridge (an intelligent fridge managing its supply chain), ASP-NET (application service providers), Protex (intelligent enzymes) and IPSCON (receivers for wireless telephones). New Business for Old Europe brings together the key outputs from all of these groups to present a state-of-the-art collection on product-service development, prospects and implications for competitiveness and sustainability. The book has a number of aims. First, it attempts to bridge the gap between business and sustainability literature to lead to a better-founded understanding of the business drivers for embarking on product-service development, and its relation with sustainability and competitiveness. Second, the book reviews the large amount of studies that have developed toolkits, methods and approaches that can support marketers, product developers and strategists in business to develop product-services, selects the best-practice approaches and analyses any gaps. Third, the book examines what opportunities there are for product-service development in a variety of key areas including base materials, information and communication technologies, offices, food and households. Each chapter in this section discusses the area, developments that will stimulate or hinder the market opportunities for product-services, product-service examples, and typical implementation challenges for product-services in that area. These chapters serve as a quick introduction for companies interested in developing product-services in a specific area. Fourth, the book translates all the lessons into suggested approaches for product-service development by companies. Annexes include a lightweight "product-service development manual" and an alphabetical list of useful underlying tools.

Repackaged with a new Afterword, this "valuable and entertaining" (New York Times Book Review) book explores how scientists are adapting nature's best ideas to solve tough 21st century problems. Biomimicry is rapidly transforming life on earth. Biomimics study nature's most successful ideas over the past 3.5 billion years, and adapt them for human use. The results are revolutionizing how materials are invented and how we compute, heal ourselves, repair the environment, and feed the world. Janine Benyus takes readers into the lab and in the field with maverick thinkers as they: discover miracle drugs by watching what chimps eat when they're sick; learn how to create by watching spiders weave fibers; harness energy by examining how a leaf converts sunlight into fuel in trillionths of a second; and many more examples. Composed of stories of vision and invention, personalities and pipe dreams, Biomimicry is must reading for anyone interested in the shape of our future.

Vibration of Functionally Graded Beams and Plates uses numerically efficient computational techniques to analyze vibration problems associated with FG beams and plates. Introductory material on FG materials and structural members, as well as a range of vibration and shear deformation theories are discussed, providing a valuable summary of these broader themes. The latest research and analysis of vibration in FG materials is presented in an application-oriented manner, linking the research to its importance in fields such as aerospace, nuclear power, and automotive engineering. The book also features research on the complicating effects of thermal environments, piezoelectricity, and elastic foundations. The innovative computational procedures and simulation results are shown in full throughout, providing a uniquely valuable resource for users of numerical modeling software. This book is essential reading for any researcher or practitioner interested in FG materials, or the design of technology for the nuclear power, aerospace, and automotive industries. Defines the basic preliminaries of vibration and FG materials Introduces historical background and recent developments in functionally graded materials with references for further reading Shows computational procedures with simulation results Includes many easy to understand example problems Presents various analytical and numerical procedures for each solution

The EU-funded project "Sustainable Consumption Research Exchanges" (SCORE!) consists of around 200 experts in the field of sustainable innovation and sustainable consumption. The SCORE! philosophy is that innovation in SCP policy can be achieved only if experts that understand business development, (sustainable) solution design, consumer behaviour and system innovation policy work together in shaping it. Sustainable technology design can be effective only if business can profitably make the products and consumers are attracted to them. To understand how this might effectively happen, the expertise of systems thinkers must be added to the mix. The publication in 2008 of System Innovation for Sustainability 1 was the first result of a unique positive confrontation between experts from all four communities. It examined what SCP is and what it could be, provided a state-of-the-art review on the governance of change in SCP policy and looked at the strengths and weaknesses of current approaches. System Innovation for Sustainability 3 is the second of three books of case studies covering respectively the three key consumption areas of mobility, food and agriculture, and energy use and housing – responsible for 70% of the life-cycle environmental impacts of Western societies – with the aim of stimulating, fostering or forcing change to SCP theory in practice. The availability of healthy food for all is a basic human need. Yet, primarily due to higher food prices, the overall number of undernourished people in the world increased from 923 million in 2007 to 963 million in 2008 – the vast majority of whom live in developing countries. Experts estimate that close to half of the human impact on the environment is directly or indirectly related to food production and consumption. Food production, distribution, consumption and disposal are important in terms of land and resource use, pollution and emissions, biodiversity and landscape design. Also of key importance are health issues and issues surrounding the satisfaction of citizens' basic needs: more than

200 million adults in the European Union are overweight or even obese due to unhealthy diets and too little exercise. Sustainability issues are now clearly on the agenda for food producers and market actors, politicians and regulators, as well as being increasingly important in the decisions consumers make about food. A large number and variety of efforts to stimulate sustainability have been instigated and numerous studies, research programmes and publications have addressed such issues. Agri-food issues have also been prominent in the evolving definition of what sustainability means. This book focuses largely on providing answers to the question of how food production and consumption systems can stay within the limits of the carrying capacity of our natural environment. But it also considers the challenges of food security and nutrition in the context of sustainability and a growing world population. The book first analyses the state of the art in sustainable agriculture and food production in Europe. Eleven case studies follow, examining issues such as food policy, greening mainstream agricultural systems, organic farming, farmers' markets, sustainable food networks, eco-labelling, consumer behaviour, slow food and fair trade. Finally, a concluding chapter summarises what has been learned by the 60-plus experts active in the SCORE! food project. In brief: bottom-up and top-down processes have to be linked, industrialised nations must reduce their meat consumption, and agriculture should become a multifunctional sustainable system not only producing food but also delivering other services such as energy and material production, CO<sub>2</sub> storage and recreation – which would have the added benefit of improving farmers' socioeconomic situations. The System Innovation for Sustainability series is the fruit of the first major international research network on SCP and will set the standard in this field for some years to come. It will be required reading for all involved in the policy debate on sustainable production and consumption from government, business, academia and NGOs for designers, scientists, businesses and system innovators.

This handbook serves as a guide to deploying battery energy storage technologies, specifically for distributed energy resources and flexibility resources. Battery energy storage technology is the most promising, rapidly developed technology as it provides higher efficiency and ease of control. With energy transition through decarbonization and decentralization, energy storage plays a significant role to enhance grid efficiency by alleviating volatility from demand and supply. Energy storage also contributes to the grid integration of renewable energy and promotion of microgrid.

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This second edition of *Designing Tall Buildings*, an accessible reference to guide you through the fundamental principles of designing high-rises, features two new chapters, additional sections, 400 images, project examples, and updated US and international codes. Each chapter focuses on a theme central to tall-building design, giving a comprehensive overview of the related architecture and structural engineering concepts. Author Mark Sarkisian, PE, SE, LEED® AP BD+C, provides clear definitions of technical terms and introduces important equations, gradually developing your knowledge. Projects drawn from SOM's vast portfolio of built high-rises, many of which Sarkisian engineered, demonstrate these concepts. This book advises you to consider the influence of a particular site's geology, wind conditions, and seismicity. Using this contextual knowledge and analysis, you can determine what types of structural solutions are best suited for a tower on that site. You can then conceptualize and devise efficient structural systems that are not only safe, but also constructible and economical. Sarkisian also addresses the influence of nature in design, urging you to integrate structure and architecture for buildings of superior performance, sustainability, and aesthetic excellence.

This book comprises select papers from the International Conference on Emerging Trends in Civil Engineering (ICETCE 2018). Latest research findings in different branches of civil engineering such as structural engineering, construction materials, geotechnical engineering, water resources engineering, environmental engineering, and transportation infrastructure are covered in this book. The book also gives an overview of emerging topics like smart materials and structures, green building technologies, and intelligent transportation system. The contents of this book will be beneficial for students, academicians, industrialists and researchers working in the field of civil engineering.

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