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Geothermal Energy Systems Elsevier *Geothermal Energy Systems provides design and analysis methodologies by using exergy and enhanced exergy tools (covering exergoenvironmental, exergoeconomic, exergetic life cycle assessment, etc.), environmental impact assessment models, and sustainability models and approaches. In addition to presenting newly developed advanced and integrated systems for multigenerational purposes, the book discusses newly developed environmental impact assessment and sustainability evaluation methods and methodologies. With case studies for integrated geothermal energy sources for multigenerational aims, engineers can design and develop new geothermal integrated systems for various applications and discover the main advantages of design choices, system analysis, assessment and development of advanced geothermal power systems. Explains the ability of geothermal energy power systems to decrease global warming Discusses sustainable development strategies for using geothermal energy sources Provides new design conditions for geothermal energy sources-based district energy systems* **Geologic Fundamentals of Geothermal Energy** CRC Press *Geothermal energy stands out because it can be used as a baseload resource. This book, unlike others, examines the geology related to geothermal applications. Geology dictates (a) how geothermal resources can be found, (b) the nature of the geothermal resource (such as liquid- or vapor-dominated) and (c) how the resource might be developed ultimately (such as flash or binary geothermal plants). The compilation and distillation of geological elements of geothermal systems into a single reference fills a notable gap. **Introduction to the Numerical Modeling of Groundwater and Geothermal Systems Fundamentals of Mass, Energy and Solute Transport in Poroelastic Rocks** CRC Press *This book provides an introduction to the scientific fundamentals of groundwater and geothermal systems. In a simple and didactic manner the different water and energy problems existing in deformable porous rocks are explained as well as the corresponding theories and the mathematical and numerical tools that lead to modeling and solving them. This **Geothermal Engineering Fundamentals and Applications** Springer Science & Business Media *This book explains the engineering required to bring geothermal resources into use. The book covers specifically engineering aspects that are unique to geothermal engineering, such as measurements in wells and their interpretation, transport of near-boiling water through long pipelines, turbines driven by fluids other than steam, and project economics. The explanations are reinforced by drawing comparisons with other energy industries. **Geothermal Power Plants Principles, Applications, Case Studies and Environmental Impact** Elsevier Ron DiPippo, Professor Emeritus at the University of Massachusetts Dartmouth, is a world-regarded geothermal expert. This single resource covers all aspects of the utilization of geothermal energy for power generation from fundamental scientific and engineering principles. The thermodynamic basis for the design of geothermal power plants is at the heart of the book and readers are clearly guided on the process of designing and analysing the key types of geothermal energy conversion systems. Its practical emphasis is enhanced by the use of case studies from real plants that increase the reader's understanding of geothermal energy conversion and provide a unique compilation of hard-to-obtain data and experience. An important new chapter covers Environmental Impact and Abatement Technologies, including gaseous and solid emissions; water, noise and thermal pollutions; land usage; disturbance of natural hydrothermal manifestations, habitats and vegetation; minimisation of CO2 emissions and environmental impact assessment. The book is illustrated with over 240 photographs and drawings. Nine chapters include practice problems, with solutions, which enable the book to be used as a course text. Also includes a definitive worldwide compilation of every geothermal power plant that has operated, unit by unit, plus a concise primer on the applicable thermodynamics. * Engineering principles are at the heart of the book, with complete coverage of the thermodynamic basis for the design of geothermal power systems * Practical applications are backed up by an extensive selection of case studies that show how geothermal energy conversion systems have been designed, applied and exploited in practice * World renowned geothermal expert DiPippo has including a new chapter on Environmental Impact and Abatement Technology in this new edition **A Method of Fundamental Solutions in Poroelasticity to Model the Stress Field in Geothermal Reservoirs** Birkhäuser *This monograph focuses on the numerical methods needed in the context of developing a reliable simulation tool to promote the use of renewable energy. One very promising source of energy is the heat stored in the Earth's crust, which is harnessed by so-called geothermal facilities. Scientists from fields like geology, geo-engineering, geophysics and especially geomathematics are called upon to help make geothermics a reliable and safe energy production method. One of the challenges they face involves modeling the mechanical stresses at work in a reservoir. The aim of this thesis is to develop a numerical solution scheme by means of which the fluid pressure and rock stresses in a geothermal reservoir can be determined prior to well drilling and during production. For this purpose, the method should (i) include poroelastic effects, (ii) provide a means of including thermoelastic effects, (iii) be inexpensive in terms of memory and computational power, and (iv) be flexible with regard to the locations of data points. After introducing the basic equations and their relations to more familiar ones (the heat equation, Stokes equations, Cauchy-Navier equation), the "method of fundamental solutions" and its potential value concerning our task are discussed. Based on the properties of the fundamental solutions, theoretical results are established and numerical examples of stress field simulations are presented to assess the method's performance. The first-ever 3D graphics calculated for these topics, which neither requiring meshing of the domain nor involving a time-stepping scheme, make this a pioneering volume. **Geothermal Heat Pump and Heat Engine Systems Theory And Practice** John Wiley & Sons *A unique approach to the study of geothermal energy systems This book takes a unique, holistic approach to the interdisciplinary study of geothermal energy systems, combining low, medium, and high temperature applications into a logical order. The emphasis is on the concept that all geothermal projects contain common elements of a "thermal energy reservoir" that must be properly designed and managed. The book is organized into four sections that examine geothermal systems: energy utilization from resource and site characterization; energy harnessing; energy conversion (heat pumps, direct uses, and heat engines); and energy distribution and uses. Examples are provided to highlight fundamental concepts, in addition to more complex system design and simulation. Key features: Companion website containing software tools for application of fundamental principles and solutions to real-world problems. Balance of theory, fundamental principles, and practical application. Interdisciplinary treatment of the subject matter. Geothermal Heat Pump & Heat Engine Systems: Theory and Practice is a unique textbook for Energy Engineering and Mechanical Engineering students as well as practicing engineers who are involved with low-enthalpy geothermal energy systems. **Fundamentals of Materials for Energy and Environmental Sustainability** Cambridge University Press *How will we meet rising energy demands? What are our options? Are there viable long-term solutions for the future? Learn the fundamental physical, chemical and materials science at the heart of: • Renewable/non-renewable energy sources • Future transportation systems • Energy efficiency • Energy storage Whether you are a student taking an energy course or a newcomer to the field, this textbook will help you understand critical relationships between the environment, energy and sustainability. Leading experts provide comprehensive coverage of each topic, bringing together diverse subject matter by integrating theory with engaging insights. Each chapter includes helpful features to aid understanding, including a historical overview to provide context, suggested further reading and questions for discussion. Every subject is beautifully illustrated and brought to life with full color images and color-coded sections for easy browsing, making this a complete educational package. Fundamentals of Materials for Energy and Environmental Sustainability will enable today's scientists and educate future generations. **Geothermal Heat Pump and Heat Engine Systems Theory And Practice** John Wiley & Sons *A unique approach to the study of geothermal energy systems This book takes a unique, holistic approach to the interdisciplinary study of geothermal energy systems, combining low, medium, and high temperature applications into a logical order. The emphasis is on the concept that all geothermal projects contain common elements of a "thermal energy reservoir" that must be properly designed and managed. The book is organized into four sections that examine geothermal systems: energy utilization from resource and site characterization; energy harnessing; energy conversion (heat pumps, direct uses, and heat engines); and energy distribution and uses. Examples are provided to highlight fundamental concepts, in addition to more complex system design and simulation. Key features: Companion website containing software tools for application of fundamental principles and solutions to real-world problems. Balance of theory, fundamental principles, and practical application. Interdisciplinary treatment of the subject matter. Geothermal Heat Pump & Heat Engine Systems: Theory and Practice is a unique textbook for Energy Engineering and Mechanical Engineering students as well as practicing engineers who are involved with low-enthalpy geothermal energy systems. **Geothermal Well Test Analysis Fundamentals, Applications and Advanced Techniques** Academic Press *Geothermal Well Test Analysis: Fundamentals, Applications and Advanced Techniques provides a comprehensive review of the geothermal pressure transient analysis methodology and its similarities and differences with petroleum and groundwater well test analysis. Also discussed are the different tests undertaken in geothermal wells during completion testing, output/production testing, and the interpretation of data. In addition, the book focuses on pressure transient analysis by numerical simulation and inverse methods, also covering the familiar pressure derivative plot. Finally, non-standard geothermal pressure transient behaviors are analyzed and interpreted by numerical techniques for cases beyond the limit of existing analytical techniques. Provides a guide on the analysis of well test data in geothermal wells, including pressure transient analysis, completion testing and output testing Presents practical information on how to avoid common issues with data collection in geothermal wells Uses SI units, converting existing equations and models found in literature to this unit system instead of oilfield units **Fundamentals and Source Characteristics of Renewable Energy Systems** CRC Press *This textbook is intended for an audience with little or no power engineering or renewable energy background. The book covers electric energy from alternative energy sources, including solar, wind, water, hydropower, geothermal, and ocean energy. Core issues discussed include wind and solar resource estimates and analysis, solar thermal systems, solar collectors, photovoltaics, wind turbines, geothermal energy, energy small hydropower, wave, tide and ocean energy, and characteristics of energy conversion, control, and electrical aspects. This is one of the most comprehensive textbooks for students, engineers, and professionals who study renewable energy. There are several questions and problems, presented with increasing difficulty, most of which focus on practical applications. The materials and problems are drawn from the author's extensive experience in renewable energy analysis, assessment, design, control, and the power electronics of wind and solar energy conversion systems. Each section of the book contains several solved examples, as well as practical and advanced discussions, that instill critical thinking and apply to industrial applications. The book is divided into eight chapters and covers the most important aspects of renewable energy sources and technologies. **Geothermal Energy Update Comprehensive Energy Systems** Elsevier *Comprehensive Energy Systems provides a unified source of information covering the entire spectrum of energy, one of the most significant issues humanity has to face. This comprehensive book describes traditional and novel energy systems, from single generation to multi-generation, also covering theory and applications. In addition, it also presents high-level coverage on energy policies, strategies, environmental impacts and sustainable development. No other published work covers such breadth of topics in similar depth. High-level sections include Energy Fundamentals, Energy Materials, Energy Production, Energy Conversion, and Energy Management. Offers the most comprehensive resource available on the topic of energy systems Presents an authoritative resource authored and edited by leading experts in the field Consolidates information currently scattered in publications from different research fields (engineering as well as physics, chemistry, environmental sciences and economics), thus ensuring a common standard and language **Modern Geothermal HVAC Engineering and Control Applications** McGraw Hill Professional *Best practices for the design and engineering of geothermal HVAC systems With a focus on market needs and customer goals, this practical guide explains how to realize the full potential of geothermal***********

HVAC by integrating hydronic systems and controls at maximum capacity. Modern Geothermal HVAC: Engineering and Control Applications explains how to engineer and specify geothermal HVAC for building projects in varying geographic regions. Typical details on control parameters are provided. By using the proven methods in this innovative resource, you will be able to develop highly efficient, long-lasting, and aesthetically pleasing geothermal HVAC systems. Coverage includes: Low-temperature geothermal or earth coupling Geothermal heat-pump equipment Variations in earth coupling Application of earth coupling with regard to site conditions Closed-loop earth coupling and fusion Intermediate heat exchanger usage in geothermal applications Standing column and open geothermal systems Fundamentals of comfort, psychrometrics, and thermodynamics Hydronic and air HVAC system basics Hydronic HVAC system equipment Variations and improvements to hydronic systems Control systems Load sharing and energy recovery Calculating system efficiencies, heat gain, and loss Geothermal rebates, incentives, and renewables legislation **Dynamic Web Programming and HTML5** CRC Press With organizations and individuals increasingly dependent on the Web, the need for competent, well-trained Web developers and maintainers is growing. Helping readers master Web development, Dynamic Web Programming and HTML5 covers specific Web programming languages, APIs, and coding techniques and provides an in-depth understanding of the underlying concepts, theory, and principles. The author leads readers through page structuring, page layout/styling, user input processing, dynamic user interfaces, database-driven websites, and mobile website development. After an overview of the Web and Internet, the book focuses on the new HTML5 and its associated open Web platform standards. It covers the HTML5 markup language and DOM, new elements for structuring Web documents and forms, CSS3, and important JavaScript APIs associated with HTML5. Moving on to dynamic page generation and server-side programming with PHP, the text discusses page templates, form processing, session control, user login, database access, and server-side HTTP requests. It also explores more advanced topics such as XML and PHP/MySQL. Suitable for a one- or two-semester course at the advanced undergraduate or beginning graduate level, this comprehensive and up-to-date guide helps readers learn modern Web technologies and their practical applications. Numerous examples illustrate how the programming techniques and other elements work together to achieve practical goals. Online Resource Encouraging hands-on practice, the book's companion website at <http://dwp.sofpower.com> helps readers gain experience with the technologies and techniques involved in building good sites. Maintained by the author, the site offers: Live examples organized by chapter and cross-referenced in the text Programs from the text bundled in a downloadable code package Searchable index and appendices Ample resource listings and information updates **Geothermal Energy Sustainable Heating and Cooling Using the Ground** John Wiley & Sons Geothermal Energy: Sustainable Heating and Cooling Using the Ground Marc A. Rosen and Seama Koochi-Fayegh, University of Ontario Institute of Technology, Canada Comprehensively covers geothermal energy systems that utilize ground energy in conjunction with heat pumps to provide sustainable heating and cooling The book describes geothermal energy systems that utilize ground energy in conjunction with heat pumps and related technologies to provide heating and cooling. Also discussed are methods to model and assess such systems, as well as means to determine potential environmental impacts of geothermal energy systems and their thermal interaction. The book presents the most up-to-date information in the area. It provides material on a range of topics, from thermodynamic concepts to more advanced discussions of the renewability and sustainability of geothermal energy systems. Numerous applications of such systems are also provided. Geothermal Energy: Sustainable Heating and Cooling Using the Ground takes a research orientated approach to provide coverage of the state of the art and emerging trends, and includes numerous illustrative examples and case studies. Theory and analysis are emphasized throughout, with detailed descriptions of models available for vertical and horizontal geothermal heat exchangers. Key features: Explains geothermal energy systems that utilize ground energy in conjunction with heat pumps to provide heating and cooling, as well as related technologies such as thermal energy storage. Describes and discusses methods to model and analyze geothermal energy systems, and to determine their potential environmental impacts and thermal interactions. Covers various applications of geothermal energy systems. Takes a research orientated approach to provide coverage of the state of the art and emerging trends. Includes numerous illustrative examples and case studies. The book is key for researchers and practitioners working in geothermal energy, as well as graduate and advanced undergraduate students in departments of mechanical, civil, chemical, energy, environmental, process and industrial engineering. **Renewable Energy Engineering: Solar, Wind, Biomass, Hydrogen and Geothermal Energy Systems.** Bentham Science Publishers Researchers, politicians and lay persons around the world agree that renewable energy technologies will play an increasingly important role in strengthening national economies in the future. The renewable energy industry has the potential to significantly increase power capacity of several countries and subsequently create many jobs. This book examines recent advances in specific renewable energy systems. Readers will learn about theoretical and applied perspectives which are key to addressing the major issues associated with such systems. Chapters cover solar energy systems, thermal energy storage, bioenergy, hydrogen production, geothermal energy and measurement techniques for these energy systems. Students in engineering programs, and engineers working in academia and the renewable energy sector will be able to broaden their understanding of complex renewable energy projects through the comprehensive overview of both the fundamental concepts and the technical issues covered in the text. **Utilization of Thermal Potential of Abandoned Wells Fundamentals, Applications and Research** Academic Press Utilization of Thermal Potential of Abandoned Wells: Fundamentals, Applications and Research is a lucid treatment of the fundamental concepts related to the energy harvesting of abandoned wells. The book provides a journey through recent technological developments to harvest energy from abandoned geothermal wells and allows the reader to view the process from a thermodynamic and numerical modeling perspective. Various applications and future prospects are also discussed to help inform reader's future work and research. Students, researchers and engineers will gain a thorough understanding on how to harvest energy from abandoned geothermal wells, particularly to make sound thermodynamic and economic evaluations. System designers and others engaged in the energy sector will understand how to design and choose the most appropriate technology, how to determine its efficiency, monitor the facility, and how to make informed physical and economical decisions for necessary improvements and environmental assessments. Logically works through fundamentals, with various examples throughout Provides instruction to simulate thermodynamic models and design efficient systems Presents feasibility studies and applications **Sustainable Energy Systems and Applications** Springer Science & Business Media The concept of sustainable development was first introduced by the Brundtland Commission almost 20 years ago and has received increased attention during the past decade. It is now an essential part of any energy activities. This is a research-based textbook which can be used by senior undergraduate students, graduate students, engineers, practitioners, scientists, researchers in the area of sustainable energy systems and aimed to address some key pillars: better efficiency, better cost effectiveness, better use of energy resources, better environment, better energy security, and better sustainable development. It also includes some cutting-edge topics, such hydrogen and fuel cells, renewable, clean combustion technologies, CO2 abatement technologies, and some potential tools (exergy, constructal theory, etc.) for design, analysis and performance improvement. **Ground-Source Heat Pumps Fundamentals, Experiments and Applications** Academic Press Ground-Source Heat Pumps presents the theory and some of the most recent advances of GSHPs and their implementation in the heating/cooling system of buildings. The authors explore the thermodynamic cycle with calculation, operation regimes and economic indicators and GHG emissions of a vapor compression heat pump. They go on to examine substitution strategies of non-ecological refrigerants and types of compressors and heat pumps, before delving into the different GSHP systems, as well as their compared economic, energy and environmental performances using classical and optimized adjustment for various operating modes. Surface water heat pumps and ground water heat pumps are covered, and special focus is given to both vertical and horizontal ground-coupled heat pump systems, for which modelling and simulation is discussed, and experimental systems are described. Due to its advanced approach to the subject, this book will be especially valuable for researchers, graduate students and academics, and as reference for engineers and specialists in the varied domains of building services. Explores fundamentals and state-of-the-art research, including ground-coupled heat pump (GCHP) systems. Includes performance assessment and comparison for different types of GSHP, numerical simulation models, practical applications of GSHPs with details on the renewable energy integration, information on refrigerants, and economic analysis. **Geologic Fundamentals of Geothermal Energy** CRC Press Geothermal energy stands out because it can be used as a baseload resource. This book, unlike others, examines the geology related to geothermal applications. Geology dictates (a) how geothermal resources can be found, (b) the nature of the geothermal resource (such as liquid- or vapor-dominated) and (c) how the resource might be developed ultimately (such as flash or binary geothermal plants). The compilation and distillation of geological elements of geothermal systems into a single reference fills a notable gap. **Fundamental and Advanced Topics in Wind Power** BoD - Books on Demand As the fastest growing source of energy in the world, wind has a very important role to play in the global energy mix. This text covers a spectrum of leading edge topics critical to the rapidly evolving wind power industry. The reader is introduced to the fundamentals of wind energy aerodynamics; then essential structural, mechanical, and electrical subjects are discussed. The book is composed of three sections that include the Aerodynamics and Environmental Loading of Wind Turbines, Structural and Electromechanical Elements of Wind Power Conversion, and Wind Turbine Control and System Integration. In addition to the fundamental rudiments illustrated, the reader will be exposed to specialized applied and advanced topics including magnetic suspension bearing systems, structural health monitoring, and the optimized integration of wind power into micro and smart grids. **Topical Themes in Energy and Resources A Cross-Disciplinary Education and Training Program for Environmental Leaders** Springer This book combines issues several critical ones in the energy field (low-energy technologies, renewable energies such as the hydrogen economy, and geothermal energy). Moving towards a more sustainable world requires a complete revolution in the way we manage energy and resources. However, from an academic perspective, this theme is so broad that most educators and researchers tend to focus on just one aspect, and maintaining the broad viewpoint which is necessary for making strategic judgments becomes difficult. Tohoku University addressed this challenge when developing a new education and training program for environmental leaders and brought together the extensive range of expertise available in specific fields into one special course which forms the basis of this book. Now in one volume, both students and educators can be brought up to date on a wide range of critical issues currently being addressed in the field of energy and resources. Chapters on resources include availability (for instance, rare earth metals), extraction and recycling of metals and plastics, and technological solutions to specific waste-disposal problems. In addition, broader strategic issues such as limits to growth and the interaction between the economic system and environmental issues are addressed. Even though each chapter provides topical data and knowledge from disparate and specialized fields, the book is written at a level that is readily understandable by students from all scientific, engineering, and humanities fields. **Advances in Electromechanical Technologies Select Proceedings of TEMT 2019** Springer Nature This book comprises select peer-reviewed papers from the International Conference on Emerging Trends in Electromechanical Technologies & Management (TEMT) 2019. The focus is on current research in interdisciplinary areas of mechanical, electrical, electronics and information technologies, and their management from design to market. The book covers a wide range of topics such as computer integrated manufacturing, additive manufacturing, materials science and engineering, simulation and modelling, finite element analysis, operations and supply chain management, decision sciences, business analytics, project management, and sustainable freight transportation. The book will be of interest to researchers and practitioners of various disciplines, in particular mechanical and industrial engineering. **Energy Research Abstracts Geothermal Energy Renewable Energy and the Environment, Second Edition** CRC Press An In-Depth Introduction to Geothermal Energy Addressing significant changes in the energy markets since the first edition, Geothermal Energy: Renewable Energy and the Environment, Second Edition expounds on the geothermal industry, exploring the expansion, growth, and development of geothermal systems. This text covers every area of geothermal ener **Low-Temperature Energy Systems with Applications of Renewable Energy** Academic Press Low-Temperature Energy Systems with Applications of Renewable Energy investigates a wide variety of low-temperature energy applications in residential, commercial, institutional, and industrial areas. It addresses the basic principles that form the groundwork for more efficient energy conversion processes and includes detailed practical methods for carrying out these critical processes. This work considers new directions in the engineering use of technical thermodynamics and energy, including more in-depth studies of the use of renewable sources, and includes worked numerical examples, review questions, and practice problems to allow readers to test their own comprehension of the material. With detailed explanations, methods, models, and algorithms, Low-Temperature Energy Systems with Applications of Renewable Energy is a valuable reference for engineers and scientists in the field of renewable energy, as well as energy researchers and academics. Features end-of chapter review sections with questions and exercises for practical study and utilization. Presents methods for a great variety of energy applications to improve their energy operations. Applies real-world data to demonstrate the impact of low-temperature energy systems on renewable energy use today. **Geothermal Energy Utilization, Technology and Financing** CRC Press "This book focuses on usage of geothermal energy in countries with low enthalpy reservoirs. It initiates with the fundamentals of geothermal energy, classification of geothermal resources and their importance including Enhanced Geothermal Systems (EGS). Further, it discusses creation, production, potential assessment, perspective analysis, life cycle and environment assessments of EGS. It describes applications in the field of geothermal energy with relevant case studies and introduces the application of Machine Learning techniques in the field of geothermal sectors. Features: Focuses on development of low- to moderate geothermal resources; Introduces machine learning tools

and artificial intelligence, as applied to geothermal energy; Provides understanding of Geothermal Energy Resources and Enhanced Geothermal Systems; Discusses possibility of Enhanced Geothermal System using spallation and laser drilling; Includes stimulation methods (thermal, hydraulic, chemical, and explosive) and case studies. This book aims at researchers and graduate students in Geology, Clean Energy, Geothermal Energy and Thermal Engineering"-- **Chemistry of Environmental Systems Fundamental Principles and Analytical Methods** John Wiley & Sons A modern guide to environmental chemistry Chemistry of Environmental Systems: Fundamental Principles and Analytical Methods offers a comprehensive and authoritative review of modern environmental chemistry, discussing the chemistry and interconnections between the atmosphere, hydrosphere, geosphere and biosphere. Written by internationally recognized experts, the textbook explores the chemistries of the natural environmental systems and demonstrates how these chemical processes change when anthropogenic emissions are introduced into the whole earth system. This important text: Combines the key areas of environmental chemistry needed to understand the sources, fates, and impacts of contaminants in the environment Describes a range of environmental analytical methodologies Explores the basic environmental effects of energy sources, including nuclear energy Encourages a proactive approach to environmental chemistry, with a focus on preventing future environmental problems Includes study questions at the end of each chapter Written for students of environmental chemistry, environmental science, environmental engineering, geoscience, earth and atmospheric sciences, Chemistry of Environmental Systems: Fundamental Principles and Analytical Methods covers the key aspects and mechanisms of currently identified environmental issues, which can be used to address both current and future environmental problems. **Geothermal Reservoir Engineering** Academic Press As nations alike struggle to diversify and secure their power portfolios, geothermal energy, the essentially limitless heat emanating from the earth itself, is being harnessed at an unprecedented rate. For the last 25 years, engineers around the world tasked with taming this raw power have used Geothermal Reservoir Engineering as both a training manual and a professional reference. This long-awaited second edition of Geothermal Reservoir Engineering is a practical guide to the issues and tasks geothermal engineers encounter in the course of their daily jobs. The book focuses particularly on the evaluation of potential sites and provides detailed guidance on the field management of the power plants built on them. With over 100 pages of new material informed by the breakthroughs of the last 25 years, Geothermal Reservoir Engineering remains the only training tool and professional reference dedicated to advising both new and experienced geothermal reservoir engineers. The only resource available to help geothermal professionals make smart choices in field site selection and reservoir management Practical focus eschews theory and basics- getting right to the heart of the important issues encountered in the field Updates include coverage of advances in EGS (enhanced geothermal systems), well stimulation, well modeling, extensive field histories and preparing data for reservoir simulation Case studies provide cautionary tales and best practices that can only be imparted by a seasoned expert **Quantifying Uncertainty in Subsurface Systems** John Wiley & Sons Under the Earth's surface is a rich array of geological resources, many with potential use to humankind. However, extracting and harnessing them comes with enormous uncertainties, high costs, and considerable risks. The valuation of subsurface resources involves assessing discordant factors to produce a decision model that is functional and sustainable. This volume provides real-world examples relating to oilfields, geothermal systems, contaminated sites, and aquifer recharge. Volume highlights include: A multi-disciplinary treatment of uncertainty quantification Case studies with actual data that will appeal to methodology developers A Bayesian evidential learning framework that reduces computation and modeling time Quantifying Uncertainty in Subsurface Systems is a multidisciplinary volume that brings together five major fields: information science, decision science, geosciences, data science and computer science. It will appeal to both students and practitioners, and be a valuable resource for geoscientists, engineers and applied mathematicians. Read the Editors' Vox: <https://eos.org/editors-vox/quantifying-uncertainty-about-earths-resources> Reviews, The Leading Edge, SEG, May 2020 The subsurface medium created by geologic processes is not always well understood. The data we collect in an attempt to characterize the subsurface can be incomplete and inaccurate. However, if we understand the uncertainty of our data and the models we generate from them, we can make better decisions regarding the management of subsurface resources. Modeling and managing subsurface resources, and properly characterizing and understanding the uncertainties, requires the integration of a variety of scientific and engineering disciplines. Five case studies are outlined in the introductory chapter, which are used to demonstrate various methods throughout the book. The second chapter introduces the basic notions in decision analysis. Uncertainty quantification is only relevant within the decision framework used. Models alone do not quantify uncertainty, but do allow the determination of key variables that influence models and decisions. Next, an overview of the various data science methods relevant to uncertainty quantification in the subsurface is provided. Sensitivity analysis is then covered, specifically Monte Carlo-based sensitivity analysis. The next three chapters develop the Bayesian approach to uncertainty quantification, and this is the focus of the book. All of this is brought together in Chapter 8, which describes a solution regarding quantifying the uncertainties for each of the problems presented in the first chapter. The authors admit that it is not the only solution. No single solution fits all problems of uncertainty quantification. The results in this chapter allow the reader to see the previously described methods applied and how choices influence models and decisions. The final two chapters discuss various software components necessary to implement the strategies presented in the book and challenges faced in the future of uncertainty quantification. The book uses a number of relevant subsurface problems to explore the various aspects of uncertainty quantification. Understanding uncertainty, and how it affects modeling and decision outcomes, is not always straightforward. However, it is necessary in order to make good, consistent decisions. The book is not an easy read. Some portions require good mathematical understanding of the underlying principles. However, the book is well documented and organized. I would say that is not a good book for a beginner, but it is a good resource for someone to get a grounding to go further into the subject. I appreciate the authors putting together this book on a complex problem that is important to our industry. -- David Bartel, Houston, Texas **State of the Art in Deep Geothermal Energy in Europe With Focus on Direct Heating** Springer Nature **Review Recent Awards in Engineering Renewable energy conversion systems** Academic Press Fundamentals of Renewable Energy Systems goes beyond theoretical aspects of advances in renewable energy and addresses future trends. By focusing on the design of developing technologies, relevant operation and detailed background and an understanding of the application of power electronics and thermodynamics processes in renewable energy, this book provides an analysis of advancing energy systems. The book will be of interest to engineering graduates, researchers, professors and industry professionals involved in the renewable energy sector and is ideal for advanced engineering courses dealing with renewable energy, sources, thermal and electrical energy production and sustainability. With increasing focus on developing low carbon energy production, audiences need to have the engineering knowledge and practical skills to develop and implement creative solutions to engineering problems encountered with renewable energy technologies. By looking at renewable energy capture and conversion, system design and analysis, project development and implementation, each modular chapter examines recent advances in specific renewable energy systems with detailed methods, calculations and worked examples. Includes recent techniques used to design and model different renewable energy sources (RES) Demonstrates how to use power electronics in renewable systems Discusses how to identify, design, integrate and operate the most suitable technologies through key problems **RENEWABLE ENERGY SYSTEMS AND DESALINATION - Volume I** Renewable Energy Systems and Desalination is a component of Encyclopedia of Water Sciences, Engineering and Technology Resources in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty one Encyclopedias. The two volumes present state-of-the art subject matter of various aspects of Renewable Energy Systems and Desalination such as: A Short Historical Review Of Renewable Energy; Renewable Energy Resources; Desalination With Renewable Energy - A Review; Renewable Energy And Desalination Systems; Why Use Renewable Energy For Desalination; Thermal Energy Storage; Electrical Energy Storage; Tidal Energy; Desalination Using Tidal Energy; Wave Energy; Availability Of Wind Energy And Its Estimation; The Use Of Geothermal Energy In Desalination; Solar Radiation Energy (Fundamentals); High Temperature Solar Concentrators; Medium Temperature Solar Concentrators (Parabolic-Troughs Collectors); Low Temperature Solar Collectors; Solar Photovoltaic Energy Conversion; Photovoltaics; Flat-Plate Collectors; Large Active Solar Systems: Load; Integration Of Solar Pond With Water Desalination; Large Active Solar Systems: Typical Economic Analysis; Evacuated Tube Collectors; Parabolic Trough Collectors; Central Receivers; Configuration, Theoretical Analysis And Performance Of Simple Solar Stills; Development In Simple Solar Stills; Multi-Effect Solar Stills; Materials For Construction Of Solar Stills; Reverse Osmosis By Solar Energy; Solar Distillation; Solar Photochemistry; Photochemical Conversion Of Solar Energy; Availability Of Solar Radiation And Its Estimation; Economics Of Small Solar-Assisted Multipleeffect Seawater Distillation Plants; A Solar-Assisted Sea Water Multiple Effect Distillation Plant 15 Years Of Operating Performance (1985-1999);Mathematical Simulation Of A Solar Desalination Plant; Mathematical Models Of Solar Energy Conversion Systems; Multiple Effect Distillation Of Seawater Using Solar Energy - The Case Of Abu Dhabi Solar Desalination Plant; Solar Irradiation Fundamentals; Water Desalination By Humidification And Dehumidification Of Air, Seawater Greenhouse Process. These volumes are aimed at the following five major target audiences: University and College Students Educators, Professional Practitioners, Research Personnel and Policy and Decision Makers **Thermal Properties of Dry Soils Fundamentals and Applications** The United States of America is the largest consumer and importer of fossil fuels in the world. The increasing demand for energy costs has forced us to look for alternative sources of clean and affordable energy. Renewable energy comes from natural resources such as solar, winds, hydropower, geothermal heat and biomass, and offers the only sustainable alternative to power the world. Geothermal energy relies on the fact that the ground temperature stays constant during the year, warmer than the atmosphere during the winter and cooler during the summer. In geothermal systems, the geothermal heat pump is used to transfer the heat stored in the earth or in ground water into a building during winter, and transferring it out the building and back into the ground during summer. Thus, the ground is a heat source in winter and a heat sink in summer. To transfer the heat from the ground to the building, a network of underground pipes is required which can affect the efficiency and cost of the system. By improving the heat transfer between the pipes and the soil, we can increase the efficiency of the geothermal system and make it more affordable. The first objective of this dissertation is to investigate the thermal properties of dry granular media and porous rocks. Knowledge of these thermal properties are important for the design of heat pumps in geothermal system. An experimental study carried out to explore the physical nature of thermal conduction in dry granular media (i.e., soils) and fused granular media (i.e., porous rocks). Electrical conductors exhibit higher thermal conductivity (IIT) than other solid materials, Differences can be as high as three orders of magnitude in IIT, and are attributed to electron heat transfer; however, thermal conduction in metallic particles decreases to values very similar to those of non-electrically conductive particles. To uncover the underlying mechanisms of heat conduction in granular media, Ottawa sand and lead shot particles were used to create specimens tested for thermal conductivity, p-wave velocity and electrical conductivity. A newly developed test chamber allowed for simultaneous measurements of the 3 parameters under increasing vertical stress in zero-lateral-strain loading. Results show that in granular media, whether electrically conductive or not, heat conduction is phononic in nature and the contribution from electron heat conduction is negligible. Potential changes in heat conduction mechanisms that arise from changes in the nature of inter-particle contacts (i.e., fused spoils or porous rocks) were monitored using sea salt and lead shot specimens subjected to high temperature and pressure (i.e., sintered). The next objective was to determine the effective thermal properties of granular mixtures of high and low thermal conductivity solid particles. Understanding the changes in thermal properties as a function of mass fractions should prove useful in the engineering of dry geo-materials for geothermal applications. Specimens made of lead shot and lead wire mixed with Ottawa sand were subjected to vertical loading while simultaneously monitoring the effective thermal conductivity, p-wave velocity and electrical conductivity. Results show that the relative mass fractions in the mixture play a very important role in the transfer thermal energy. The differences in particle density between lead and quartz explain the sensitivity of thermal conductivity to changes in the mass fraction. Again, the results highlight the dominant role of the stiffness of the particulate media. Finally, a numerical study was conducted to examine the potential improvement in heat transfer and storage in backfills that incorporate phase change materials. Results indicate that using phase change materials as part of the backfills can alter the radius of influence of the borehole and the storage and release of thermal energy. **ERDA Authorizing Legislation, Fiscal Year 1976 Hearings Before the Joint Committee on Atomic Energy, Congress of the United States, Ninety-fourth Congress, First Session, on Overall Budget Proceedings Second United Nations Symposium on the Development and Use of Geothermal Resources, San Francisco, California, USA, 20-29 May 1975 "Rapporteurs' summaries":** pages [xxxij]-cxxxii. **Computational Modeling of Shallow Geothermal Systems** CRC Press A Step-by-step Guide to Developing Innovative Computational Tools for Shallow Geothermal Systems Geothermal heat is a viable source of energy and its environmental impact in terms of CO2 emissions is significantly lower than conventional fossil fuels. Shallow geothermal systems are increasingly utilized for heating and cooling of buildings and greenhouses. However, their utilization is inconsistent with the enormous amount of energy available underneath the surface of the earth. Projects of this nature are not getting the public support they deserve because of the uncertainties associated with them, and this can primarily be attributed to the lack of appropriate computational tools necessary to carry out effective designs and analyses. For this energy field to have a better competitive position in the renewable energy market, it is vital that engineers acquire computational tools, which are accurate, versatile and efficient. This book aims at attaining such tools. This book addresses computational modeling of shallow geothermal systems in considerable detail, and provides researchers and developers in computational mechanics, geosciences, geology and geothermal

engineering with the means to develop computational tools capable of modeling the complicated nature of heat flow in shallow geothermal systems in rather straightforward methodologies. Coupled conduction-convection models for heat flow in borehole heat exchangers and the surrounding soil mass are formulated and solved using analytical, semi-analytical and numerical methods. Background theories, enhanced by numerical examples, necessary for formulating the models and conducting the solutions are thoroughly addressed. The book emphasizes two main aspects: mathematical modeling and computational procedures. In geothermics, both aspects are considerably challenging because of the involved geometry and physical processes. However, they are highly stimulating and inspiring. A good combination of mathematical modeling and computational procedures can greatly reduce the computational efforts. This book thoroughly treats this issue and introduces step-by-step methodologies for developing innovative computational models, which are both rigorous and computationally efficient.