

Groundwater Hydraulics And Pollutant Transport Solution

This rigorous and comprehensive text provides fundamental information geared to students in either engineering or natural science courses dealing with groundwater. The first four chapters consider subsurface fluid flow, while the remaining twelve chapters consider subsurface contamination and pollutant transport. Charbeneau views the application of groundwater hydraulics and pollutant transport as a quantitative field. Although quantitative methods are exact, the fields of study are usually homogeneous; laboratory field methods provide estimates for ideal (not real) fields. What impact does the use of ideal fields have on model predictions? This unknown answer places the study of subsurface flow of water and chemical mass transport in a prime position for continued research and this readily accessible text opens the door to that research. Outstanding features include: Comprehensive, rigorous, and highly accessible coverage; Includes information on groundwater flow, well hydraulics, field methods for parameter estimation, hydrologic relationships between surface water and groundwater hydrology, mass transport of contaminants by advection, dispersion, and special problems posed by nonaqueous phase liquids (oils). Strong focus on applications; Empowers readers with knowledge and methodologies that they can use in real, day-to-day practices. Includes 66 worked examples and 178 problems integrated throughout. Examination of standard software being used in the industry today; Exposes readers to the USGS MODFLOW model (the most widely used numerical simulation model for groundwater flow) and the USGS MOC3D. These models, together with the user interface (MFI), can be downloaded from the Internet.

A large part of the global population lives in arid lands which have low rainfall and often lack the water required for sustainable population and economic growth. This book presents a comprehensive description of the hydrogeology and hydrologic processes that work in arid lands. It describes the techniques that can be used to assess and manage the water resources of these areas with an emphasis on groundwater resources, including recent advances in hydrologic evaluation and the differences between how aquifers behave in arid lands versus more humid areas. Water management techniques are described and summarized to show that a more comprehensive approach to water management is required in these areas, including the need to be aware of cultural settings and conditions unique to many arid regions. The integration of existing resources with the addition of new water sources, such as desalination of brackish water and seawater, along with reusing treated wastewater, will be required to meet future water supply needs. Also, changing climatic conditions will force water management systems to be more robust so that future water supply can be met as droughts become more intense and rainfall events become more intense. A range of water management techniques are described and discussed in order to illustrate the methods for integrating these measures within the context of arid lands conditions. This volume is meant to provide the practitioner with information on the natural mixing processes occurring in aquifers as well as describe basic strategies that can be implemented to enhance mixing in particular cases. For example, when it comes to mixing liquids, one can speed up mixing in the formation by manipulating the flow such as through the use of recirculation wells. Furthermore, much of the mixing can be achieved partially within recirculation wells themselves, where contaminated water is admixed with additives, volatile products may be removed through a vapor mass exchanger, etc. Thus, adding mixing wells can significantly improve the performance of the delivery and mixing system and speed up the process of remediation.

First published in 1995, the award-winning Civil Engineering Handbook soon became known as the field's definitive reference. To retain its standing as a complete, authoritative resource, the editors have incorporated into this edition the many changes in tools, and materials that over the last seven years have found their way into civil engineering research and practice. The Civil Engineering Handbook, Second Edition is more comprehensive than ever. You'll find new, updated, and expanded coverage in every section. In fact, more than 1/3 of the handbook is new or substantially revised. In particular you'll find increased focus on computer reflecting the rapid advances in computer technology that has revolutionized many aspects of civil engineering. You'll use it as a reference of the field, you'll use it to explore a particular subject, but most of all you'll use The Civil Engineering Handbook to answer the problems, questions, and conundrums you encounter in practice.

Groundwater Hydrology

Environmental Impact Assessment of Recycled Wastes on Surface and Ground Waters

Mechanics of Groundwater in Porous Media

Engineering Modeling and Sustainability

Hydrogeology

Barrier Systems for Environmental Contaminant Containment and Treatment

Increasing demand for water, higher standards of living, depletion of resources of acceptable quality, and excessive water pollution due to urban, agricultural, and industrial expansions have caused intense environmental, social, economic, and political predicaments. More frequent and severe floods and droughts have changed the resiliency and ability of water infrastructure systems to operate and provide services to the public. These concerns and issues have also changed the way we plan and manage our surface and groundwater resources. Groundwater Hydrology: Engineering, Planning, and Management, Second Edition presents a compilation of the state-of-the-art subjects and techniques in the education and practice of groundwater and describes them in a systematic and integrated fashion useful for undergraduate and graduate students and practitioners. This new edition features updated materials, computer codes, and case studies throughout. Features: Discusses groundwater hydrology, hydraulics, and basic laws of groundwater movement; Describes environmental water quality issues related to groundwater, aquifer restoration, and remediation techniques, as well as the impacts of climate change; Examines the details of groundwater modeling and simulation of conceptual models; Applies systems analysis techniques in groundwater planning and management; Delineates the modeling and downscaling of climate change impacts on groundwater under the latest IPCC climate scenarios. Written for students as well as practicing water resource engineers, the book develops a system view of groundwater fundamentals and model-making techniques through the application of science, engineering, planning, and management principles. It discusses the classical issues in groundwater hydrology and hydraulics followed by coverage of water quality issues. It also introduces basic tools and decision-making techniques for future groundwater development activities, taking into account regional sustainability issues. The combined coverage of engineering and planning tools and techniques, as well as specific challenges for restoration and remediation of polluted aquifers sets this book apart.

The groundwater science and engineering has been closely connected with various fields (1) Groundwater Hydrology, (2) Groundwater Hydraulics or Geohydraulics, (3) Fluid Dynamics in Porous Media, (4) Groundwater Quality Engineering, (5) Soil

Physics, and (6) Hydrogeology or Geohydrology. The purpose of the book is to present an update textbook of groundwater hydraulics, which includes all of basic items in above-mentioned fields, to students (of graduate school), researchers and practitioners. The students and beginners who intend to specialize in groundwater hydraulics through one semester will master contents of the book.

Illustration of copula theory with detailed real-world case study examples in the fields of hydrology and water resources engineering. Provides a Balance between the Mathematical and Physical Aspects and the Engineering Applications Written for engineering and science students, Mechanics of Groundwater in Porous Media explains groundwater from both a mathematical and qualitative standpoint. The book builds up the theory of groundwater flow starting from basic physics and geometric intuition, and on to applied practice through real-world engineering problems. It includes graphical illustrations as well as solved illustrative problems throughout the text. Considers the Steady-State Motion of Groundwater The book starts off by introducing the overall picture of groundwater, its relationship with the hydrological cycle, and other terminology used in the mechanics of groundwater flow through porous means. It presents a synopsis of basic definitions, concepts, and the fundamental principles of fluid mechanics and soil mechanics, which are necessary prerequisites for an adequate understanding of the book's core material. The engineering applications are deduced from geometric and physical reasoning, with a minimum use of mathematical abstraction. Mechanics of Groundwater in Porous Media is written primarily to serve as a textbook for senior undergraduate and upper-level graduate students in civil and environmental engineering, environmental science, hydrogeology, and geology, as well as a resource for practicing engineers.

Systems of Frequency Distributions for Water and Environmental Engineering

Handbook of Engineering Hydrology

Hydraulic Research in the United States and Canada, 1978

Environmental Modeling and Health Risk Analysis (Acts/Risk)

Irrigation Engineering

Groundwater Science and Engineering

Groundwater Science, Second Edition—winner of a 2014 Textbook Excellence Award (Texty) from The Text and Academic Authors Association—covers groundwater's role in the hydrologic cycle and in water supply, contamination, and construction issues. It is a valuable resource for students and instructors in the geosciences (with focuses in hydrology, hydrogeology, and environmental science), and as a reference work for professional researchers. This interdisciplinary text weaves important methods and applications from the disciplines of physics, chemistry, mathematics, geology, biology, and environmental science, introducing you to the mathematical modeling and contaminant flow of groundwater. New to the Second Edition: New chapter on subsurface heat flow and geothermal systems Expanded content on well construction and design, surface water hydrology, groundwater/ surface water interaction, slug tests, pumping tests, and mounding analysis. Updated discussions of groundwater modeling, calibration, parameter estimation, and uncertainty Free software tools for slug test analysis, pumping test analysis, and aquifer modeling Lists of key terms and chapter contents at the start of each chapter Expanded end-of-chapter problems, including more conceptual questions Winner of a 2014 Texty Award from the Text and Academic Authors Association Features two-color figures Includes homework problems at the end of each chapter and worked examples throughout Provides a companion website with videos of field exploration and contaminant migration experiments, PDF files of USGS reports, and data files for homework problems Offers PowerPoint slides and solution manual for adopting faculty

This textbook provides a comprehensive treatment of irrigation engineering for advanced undergraduates and graduate students. It does not require a background in calculus, hydrology, or hydraulics, offering a one-stop overview of the entire field of study. It includes everything a student of irrigation engineering needs to know: concepts of climate, soils, crops, water quality, hydrology, and hydraulics, as well as their application to design and environmental management. To demonstrate the practical applications of the theories discussed, there are over 300 worked examples and end-of chapter exercises. The exercises allow readers to solve real-world problems and apply the information they've learned to a diverse range of scenarios. To further prepare students for their future careers, each chapter includes many illustrative diagrams and tables containing data to help design irrigation systems. For instructors' use when planning and teaching, a solutions manual can be found online alongside a suite of PowerPoint lecture slides.

This text combines the science and engineering of hydrogeology in an accessible, innovative style. As well as providing physical descriptions and characterisations of hydrogeological processes, it also sets out the corresponding mathematical equations for groundwater flow and solute/heat transport calculations. And, within this, the methodological and conceptual aspects for flow and contaminant transport modelling are discussed in detail. This comprehensive analysis forms the ideal textbook for graduate and undergraduate students interested in groundwater resources and engineering, and indeed its analyses can apply to researchers and professionals involved in the area.

Reflecting the current research and advances made in the application of numerical methods in geotechnical engineering, this volume details proceedings of the Ninth International Symposium on 'Numerical Models in Geomechanics - NUMOG IX' held in Ottawa, Canada, 25-27 August 2004. Highlighting a number of new developments in the area, papers concentrate upon the following four main areas: * constitutive relations for geomaterials * numerical algorithms: formulation and performance * modelling of transient, coupled and dynamic problems * application of numerical techniques to practical problems. Representing the most advanced, modern findings in the field, Numerical Models in Geomechanics is a comprehensive and impeccably-researched text, ideal for students and researchers as well as practising engineers.

Hydraulic Research in the United States and Canada

Groundwater Science

Subsurface Solute Transport Models and Case Histories

Handbook of Engineering Hydrology (Three-Volume Set)

Groundwater Hydraulics and Pollutant Transport

WSP Methods in Water Resources Evaluation Series No. 5

Environmental Modeling and Health Risk Analysis (ACTS/RISK) The purpose of this book is to provide the reader with an integrated perspective on several fields. First, it discusses the fields of environmental modeling in general and multimedia (the term "multimedia" is used throughout the text to indicate that environmental transformation and transport processes are discussed in association with three environmental media: air, groundwater and surface water pathways) environmental transformation and transport processes in particular; it also provides a detailed description of numerous mechanistic models that are used in these fields. Second, this book presents a review of the topics of exposure and health risk analysis. The Analytical Contaminant Transport Analysis System (ACTS) and Health RISK Analysis (RISK) software tools are an integral part of the book and

provide computational platforms for all the models discussed herein. The most recent versions of these two software tools can be downloaded from the publisher's web site. The author recommends registering the software on the web download page so that users can receive updates about newer versions of the software. The book is an overview of the diversity of anthropogenic aquifer recharge (AAR) techniques that use aquifers to store and treat water. It focusses on the processes and the hydrogeological and geochemical factors that affect their performance. This book is written from an applied perspective with a focus of taking advantage of global historical experiences, both positive and negative, as a guide to future implementation. Most AAR techniques are now mature technologies in that they have been employed for some time, their scientific background is well understood, and their initial operational challenges and associated solutions have been identified. However, opportunities exist for improved implementation and some recently employed and potential future innovations are presented. AAR which includes managed aquifer recharge (MAR) is a very important area of water resources management and there is no recent books that specifically and comprehensively addresses the subject.

Containment and permeable reactive barriers have come full circle as an acceptable environmental control technology during the past 30 years. As interest shifted back toward containment in the 1990s, the industry found itself relying largely on pre-1980s technology. Fortunately, in the past 10 years important advances have occurred in several areas of containment, most notably in the area of permeable barriers. A balanced presentation of what is known and not known, Barrier Systems for Contaminant Containment and Environmental Treatment provides a comprehensive report on the current state of the science and technology of waste containment. Comprehensive and easily read, this book is rich with discussions and references to literature. Setting the stage for how contaminants can get into the subsurface, the authors describe pathways and introduce the essential concepts of risk. They provide details on the current state of the art for performance prediction and clearly delineate the limitations in modeling specific situations. The book addresses the materials used in barriers, defines their properties, and explores how they perform in the field. It describes available technologies and addresses their applications to various types of barriers. Tackling perhaps the most challenging aspect of waste containment technology, the book includes two case studies that demonstrate the value of validating field performance. Subsurface containment and treatment barriers will continue to be a widely used environmental control technology in the years ahead. Representing the collective knowledge and efforts of leading experts from research, industry, and regulatory agencies, this book provides a valuable reference that helps to chart the way to successfully managing many contaminated sites.

up with automated systems for assessment of road condition. For example, Haas et al (1997) developed an automated algorithm for detecting cracks and joints con- tion. Smith and Lin (1997) developed a fuzzy logic classification scheme for pavement distress condition. Oh et al (1997) developed iterative algorithm for overcoming noisy images of roads due to shadows and low light conditions. Koustsopoulos and Mishalani (1997) presented a model for distress assessment in a local (microscopic) and global (macroscopic) level using captured images of pavement. Lee (1993) presented a comparison between 15 different imaging al- rithms used in crack detection. Ground Penetration Radar (GPR) has also been used for pavement assessment. Special computer algorithms were developed for quick analysis of GPR data (Adeli & Hung 1993 and Maser 1996). Heiler and McNeil (1997) proposed a modified system for analyzing the GPR data using an artificial neural network (ANN). 2.3.2 Traffic Analysis and Control Currently imaging systems provide essential data for transportation and traffic engineering planning (Anon 1999). Machine vision techniques were introduced to intersection traffic signal control in the late 1970's (Chou and Sethi 1993). No- days, many systems have been developed all over the world for traffic analysis and control applications, in addition to image based systems for traffic violations. Nallamathu and Wang (1997) developed one of the first automated systems for license plate recognition using character recognition algorithm for the use in monitoring violators at toll stations and many other traffic applications.

The Civil Engineering Handbook

Simulating radionuclide fate and transport in the unsaturated zone evaluation and sensitivity analyses of select computer models

Arid Lands Water Evaluation and Management

Water Resources and Hydraulics

NBS Special Publication

A multitude of processes in hydrology and environmental engineering are either random or entail random components which are characterized by random variables. These variables are described by frequency distributions. This book provides an overview of different systems of frequency distributions, their properties, and applications to the fields of water resources and environmental engineering. A variety of systems are covered, including the Pearson system, Burr system, and systems commonly applied in economics, such as the D'Addario, Dagum, Stoppa, and Esteban systems. The latter chapters focus on the Singh system and the frequency distributions deduced from Bessel functions, maximum entropy theory, and the transformations of random variables. The final chapter introduces the genetic theory of frequency distributions. Using real-world data, this book provides a valuable reference for researchers, graduate students, and professionals interested in frequency analysis.

Tremendous progress has been made in the field of remediation technologies since the second edition of Contaminant Hydrogeology was published two decades ago, and its content is more important than ever. Recognizing the extensive advancement and research

taking place around the world, the authors have embraced and worked from a larger global perspective. Boving and Kremer incorporate environmental innovation in studying and treating groundwater/soil contamination and the transport of those contaminants while building on Fetter's original foundational work. Thoroughly updated, expanded, and reorganized, the new edition presents a wealth of new material, including new discussions of emerging and potential contaminant sources and their characteristics like deep well injection, fracking fluids, and in situ leach mining. New sections cover BET and Polanyi adsorption potential theory, vapor transport theory, the introduction of the Capillary and Bond Numbers, the partitioning interwell tracer testing technique for investigating NAPL sites, aerial photographic interpretation, geophysics, immunological surveys, high resolution vertical sampling, flexible liner systems, groundwater tracers, and much more. Contaminant Hydrogeology is intended as a textbook in upper level courses in mass transport and contaminant hydrogeology, and remains a valuable resource for professionals in both the public and private sectors.

This exciting new textbook introduces the concepts and tools essential for upper-level undergraduate study in water resources and hydraulics. Tailored specifically to fit the length of a typical one-semester course, it will prove a valuable resource to students in civil engineering, water resources engineering, and environmental engineering. It will also serve as a reference textbook for researchers, practicing water engineers, consultants, and managers. The book facilitates students' understanding of both hydrologic analysis and hydraulic design. Example problems are carefully selected and solved clearly in a step-by-step manner, allowing students to follow along and gain mastery of relevant principles and concepts. These examples are comparable in terms of difficulty level and content with the end-of-chapter student exercises, so students will become well equipped to handle relevant problems on their own. Physical phenomena are visualized in engaging photos, annotated equations, graphical illustrations, flowcharts, videos, and tables.

This unique volume offers an up-to-date overview of all the main aspects of groundwater in the Nile Delta and its fringes, as well as latest research findings. The themes covered include:

- Nile Delta aquifer formation and its characteristics
- The use of the groundwater in the Nile Delta and its implications
- Sedimentology and hydrogeophysical characteristics
- Groundwater investigations and aquifer characterization using current direct resistivity and induced polarization
- Groundwater contamination and degradation
- Saltwater intrusion and its control
- Delineation of groundwater flow and seawater intrusion using various techniques, including one-dimensional subsurface temperature profiles, geoelectrical resistivity, and integrated subsurface thermal regime and hydrogeochemical data
- Modeling of groundwater and of saltwater intrusion in the Nile Delta aquifer
- Excessive pumping and groundwater quality assessment for irrigation and drinking purposes
- Groundwater management for sustainability in the Nile Delta.

The volume appeals to postgraduate students, researchers, scientists, professionals, decision makers and planners.

Third Edition

Visualizing Soil Structure Interaction and Multi Phase Flow, Non-Intrusively

NIST Special Publication

Hydroinformatics, Proceedings Of The 6th International Conference (In 2 Volumes, With Cd-rom)

Proceedings of the 6th International Conference on Hydroinformatics

Generalized Frequency Distributions for Environmental and Water Engineering

Volume 3: Engineering Modeling and Sustainability. This 3-volume reference presents the latest findings in impact assessment of recycled hazardous waste materials on surface and ground waters. Topics covered include chemodynamics, toxicology, modeling and information systems. The book serves as a practical guide for the monitoring, design, management, or conduct of environmental impact assessment. Each volume contains the table of contents of all volumes.

The book addresses the development of the basic knowledge of the subsurface solute transfer with a particular emphasis on field data collection and analysis coupled with modeling (analytical and numerical) tool application. The relevant theoretical developments are concerned mainly with the formulation and solution of deterministic mass-transport equations for a wide range of engineering issues in groundwater quality assessment and forecasting. The book gives many computational examples and case studies drawn from the conducted field investigations. The analyzed problems are as follows: investigation and prediction of groundwater contamination by industrial contaminants and solutions (radionuclides, chloride and nitrate brine) with special focus on the effect of (a) aquifer heterogeneity, anisotropy, and dual porosity, (b) density contrast existing between industrial waste and groundwater, or in density-stratified artesian and coastal groundwater systems; (c) physicochemical interactions that play a major role in retarding (e.g. adsorption) or enhancing (e.g. interactions between dissolved species and mobile colloids) contaminant transport; prediction of the effects of pumping on groundwater quality at wellfields; groundwater dating using stable and radioactive isotopes for prediction and assessment of contamination potential; field and laboratory tests' design and analysis, and monitoring data interpretation; partitioning of surface and subsurface flows using isotope techniques. One of the most essential topics addressed in the book is the migration and fate of radionuclides. Model development is motivated by field data analysis from a number of radioactively contaminated sites in the Russian Federation: near-surface radioactive waste disposal sites and deep-well radioactive waste injection sites. They play a unique role in the advancement of knowledge of the subsurface behavior and fate of many hazardous radionuclides and can be considered as field-scale laboratories. Thus, the book, along with theoretical findings, contains field

information, which will facilitate the understanding of subsurface solute transport and the development of a methodology for practical applications to groundwater hydrology.

Groundwater Hydraulics and Pollutant Transport Waveland Press

Increasing demand for water, higher standards of living, depletion of resources of acceptable quality, and excessive water pollution due to urban, agricultural, and industrial expansions have caused intense environmental, social, economic, and political predicaments. More frequent and severe floods and droughts have changed the ability and resiliency of water infrastructure systems to operate and provide services to the public. These concerns and issues have also changed the way we plan and manage our surface and groundwater resources. Groundwater Hydrology: Engineering, Planning, and Management presents a compilation of the state-of-the-art subjects and techniques in the education and practice of groundwater and describes them in a systematic and integrated fashion useful for undergraduate and graduate students and practitioners. The book develops a system view of groundwater fundamentals and model-making techniques through the application of science, engineering, planning, and management principles. It discusses the classical issues in groundwater hydrology and hydraulics followed by coverage of water quality issues. The authors delineate the process of analyzing data, identification, and parameter estimation; tools and model-building techniques and the conjunctive use of surface and groundwater techniques; aquifer restoration, remediation, and monitoring techniques; and analysis of risk. They touch on groundwater risk and disaster management and then explore the impact of climate change on groundwater and discuss the tools needed for analyzing future data realization and downscaling large-scale low-resolution data to local watershed and aquifer scales for impact studies. The combined coverage of engineering and planning tools and techniques as well as specific challenges for restoration and remediation of polluted aquifers sets this book apart. It also introduces basic tools and techniques for making decisions about and planning for future groundwater development activities, taking into account regional sustainability issues. An examination of the interface between groundwater challenges, the book demonstrates how to apply systems analysis techniques to groundwater engineering, planning, and management.

Singapore, 21-24 June 2004

Modelling with Transparent Soils

Copulas and Their Applications in Water Resources Engineering

Engineering, Planning, and Management

With Applications to Radionuclide Migration

Sustainable Water Technologies

Hydroinformatics addresses cross-disciplinary issues ranging from technological and sociological to more general environmental concerns, including an ethical perspective. It covers the application of information technology in the widest sense to problems of the aquatic environment. This two-volume publication contains about 250 high quality papers contributed by authors from over 50 countries. The proceedings present many exciting new findings in the emerging subjects, as well as their applications, such as: data mining, data assimilation, artificial neural networks, fuzzy logic, genetic algorithms and genetic programming, chaos theory and support vector machines, geographic information systems and virtual imaging, decision support and management systems, Internet-based technologies. This book provides an excellent reference to researchers, graduate students, practitioners, and all those interested in the field of hydroinformatics.

This book deals with the concept of moments, and how they find application in subsurface hydrologic problems-particularly those dealing with solute transport. Both temporal and spatial moments are dealt with in some detail for a wide variety of problems. Several examples using experimental data, both from laboratory columns and field experiments, are provided to give the readers a clear idea about the scope of this method.

While most books examine only the classical aspects of hydrology, this three-volume set covers multiple aspects of hydrology, and includes contributions from experts from more than 30 countries. It examines new approaches, addresses growing concerns about hydrological and ecological connectivity, new quantitative and qualitative managing techniques

In situ treatments involving the arrangement of contact between prospective reactants in complex porous media require a refined understanding of solute migration. However, the tools and methods used to predict and control fluid movement in the subsurface need significant improvement. Practitioners and regulators must develop novel methods to achieve an advanced understanding of treatment mechanisms. Remediation Hydraulics addresses the need to predict and control fluid movement in the subsurface. It demonstrates how to conduct realistic assessments of contaminant plume structure and achieve contact between injected reagents and target compounds. The book describes both the advection-dispersion and continuous random walk theories of mass transport as well as explains the practical implications of each theory in remedial

system design. In addition, it devotes an entire section to the development of conceptual site models and hydrostratigraphic characterization techniques that will aid practitioners in assessing the role of depositional environments in patterning groundwater flows and containment distributions. Based on the authors' sound experience at over one hundred groundwater treatment projects, this book provides an arsenal of relevant theories and practical applications to aid practitioners and regulators in the prediction of fluid movement in the subsurface as well as in the design of pilot to full-scale remediation systems.

Principles, Processes, Procedures, Design, and Management

Processes and Design Principles for In Situ Remediation

Anthropogenic Aquifer Recharge

Numerical Models in Geomechanics

Proceedings of the Ninth International Symposium on 'Numerical Models in Geomechanics - NUMOG IX', Ottawa, Canada, 25-27 August 2004

Contaminant Hydrogeology

While most books examine only the classical aspects of hydrology, this three-volume set covers multiple aspects of hydrology with contributions from experts from more than 30 countries. It examines new approaches, addresses growing concerns about hydrological ecological connectivity, and considers the worldwide impact of climate change

Hydroinformatics addresses cross-disciplinary issues ranging from technological and sociological to more general environmental issues including an ethical perspective. It covers the application of information technology in the widest sense to problems of the area

This two-volume publication contains about 250 high quality papers contributed by authors from over 50 countries. The publication contains many exciting new findings in the emerging subjects, as well as their applications, such as: data mining, data assimilation, artificial neural networks, fuzzy logic, genetic algorithms and genetic programming, chaos theory and support vector machines, geographic information systems and virtual imaging, decision support and management systems, Internet-based technologies. This book provides an excellent reference for researchers, graduate students, practitioners, and all those interested in the field of hydroinformatics. Contents: Vol. I: Key Issues in Hydroinformatics; Numerical Methods; Hydrodynamics, Ecology and Water Quality Modelling; Experiences with Modelling Systems; Data Acquisition and Management; Geographic Information Systems and Virtual Imaging; Optimization and Evolutionary Algorithms; Vol. II: Decision Support Systems; Management Systems; Forecasting and Data Assimilation; Artificial Neural Networks; Fuzzy Logic; Chaos Theory and Support Vector Machines; Data Mining and Knowledge Discovery; Uncertainty and Risk Analysis; Integration of Technologies and Systems; Internet-based Technologies and Applications. Readership: Graduate students, academics, researchers and practitioners in civil engineering, environmental engineering, intelligence, optimization, and probability and statistics

This book covers theoretical aspects of the physical processes, derivation of the governing equations and their solutions. It focuses on hydraulics, hydrology, and contaminant transport, including implementation of computer codes with practical examples. Python computer codes for all the solution approaches are provided for better understanding and easy implementation. The mathematical concepts are demonstrated through applications and the results are analyzed through data tables, plots, and comparison with analytical solutions and data. The concepts are used to solve practical applications like surface and ground water flow, flood routing, crop water requirement, and irrigation scheduling. Combines the area of computational hydraulics, hydrology, and water resources engineering with Python programming. Description of the basic equations and the numerical solutions of both 1D and 2D problems including the numerical codes. Includes the translation of numerical algorithms in computer codes with focus on learners and practitioners. Demonstration of theory, mathematics, and programming through practical applications. Analysis of each example through data tables, plots, and correlation with reality. This book is aimed at undergraduates and graduate students in Civil Engineering, Coastal Engineering, Hydrology, and Water Resources Engineering.

Area Studies - Regional Sustainable Development Review: Canada and USA theme is a component of Encyclopedia of Area Studies and Sustainable Development Review in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of one Encyclopedias. This theme on Area Studies - Regional Sustainable Development Review: Canada and USA reviews, in two volumes, initiatives and activities towards sustainable development in Canada and USA such as: International Cooperation in Sustainable Development; Canada and USA: Demographic Dynamics and Sustainability; Promotion and Protection of Human Health in the Context of Sustainable Development; Integration of Environment and Development in Decision Making; Protection of the Atmosphere, with Particular Reference to North America; Deforestation in North America; Protection of Fresh Water Resources - Canada and the United States of America; Waste Management; Safe and Environmentally Sound Management of Radioactive Wastes in Canada and the USA; Global Action Plan Towards Sustainable and Equitable Development: A Canada-US Perspective; Children, Youth and Sustainable Development; Strengthening the Role of Indigenous People and Their Communities in the Context of Sustainable Development; Strengthening the Role of NGOs and Authorities Initiatives in Support of Agenda 21 - Canada and USA; Strengthening the Role of Workers and Their Trade Unions; Transfer of Technology and Sustainable Development; Collaboration for Sustainable Innovation; Information for Decision Making in Sustainable Development; Climate Change and Sustainable Development Canada. Although these presentations are with specific reference to Canada and USA, they provide potentially useful lessons for other regions as well. These two volumes are aimed at the following five major audiences: University and College Students Educators, Professional Practitioners, Research Personnel and Policy Analysts, Managers and Decision Makers, NGOs and GOs.

Environmental Hydrology and Water Management

Delivery and Mixing in the Subsurface

Modelling Hydrology, Hydraulics and Contaminant Transport Systems in Python

Groundwater in the Nile Delta

Moment Analysis for Subsurface Hydrologic Applications

Groundwater Hydraulics

Development of advanced technologies is a critical component in overcoming the looming water crisis.

Stressing emerging technologies and strategies that facilitate water sustainability for future generations, the second volume in the two-volume set Sustainable Water Management and Technologies

provides current and forthcoming technologies research, development, and applications to help ensure

availability of water for all. The book emphasizes emerging nanotechnology, biotechnology, and

information technology applications as well as sustainable processes and products to protect the

environment and human health, save water and energy, and minimize material use. It also discusses such topics as groundwater transport, protection, and remediation, industrial and wastewater treatment, reuse, and disposal, membrane technology for water purification and desalination, treatment and disposal in unconventional oil and gas development, biodegradation, and bioremediation for soil and water. ? Stresses emerging technologies and strategies that facilitate water sustainability. Covers a wide array of topics including drinking water, wastewater, and groundwater treatment, protection, and remediation. Discusses oil and gas drilling impacts and pollution prevention, membrane technology for water desalination and purification, biodegradation, and bioremediation for soil and water. Details emerging nanotechnology, biotechnology, and information technology applications, as well as sustainable processes and products.

A thorough, up-to-date guide to groundwater science and technology Our understanding of the occurrence and movement of water under the Earth's surface is constantly advancing, with new models, improved drilling equipment, new research, and refined techniques for managing this vital resource. Responding to these tremendous changes, David Todd and new coauthor Larry Mays equip readers with a thorough and up-to-date grounding in the science and technology of groundwater hydrology. *Groundwater Hydrology, Third Edition* offers a unified presentation of the field, treating fundamental principles, methods, and problems as a whole. With this new edition, you'll be able to stay current with recent developments in groundwater hydrology, learn modern modeling methods, and apply what you've learned to realistic situations. **Highlights of the Third Edition** * New example problems and case studies, as well as problem sets at the end of each chapter. * A special focus on modern groundwater modeling methods, including a new chapter on modeling (Chapter 9), which describes the U. S. Geological Survey MODFLOW model. * Over 300 new figures and photos. * Both SI and U.S. customary units in the example problems. * Expanded coverage of groundwater contamination by chemicals. * New references at the end of each chapter, which provide sources for research and graduate study. Student and instructor resources for this text are available on the book's website at www.wiley.com/college/todd.

In many parts of the world, groundwater resources are under increasing threat from growing demands, wasteful use, and contamination. To face the challenge, good planning and management practices are needed. A key to the management of groundwater is the ability to model the movement of fluids and contaminants in the subsurface. The purpose of this book is to construct conceptual and mathematical models that can provide the information required for making decisions associated with the management of groundwater resources, and the remediation of contaminated aquifers. The basic approach of this book is to accurately describe the underlying physics of groundwater flow and solute transport in heterogeneous porous media, starting at the microscopic level, and to rigorously derive their mathematical representation at the macroscopic levels. The well-posed, macroscopic mathematical models are formulated for saturated, single phase flow, as well as for unsaturated and multiphase flow, and for the transport of single and multiple chemical species. Numerical models are presented and computer codes are reviewed, as tools for solving the models. The problem of seawater intrusion into coastal aquifers is examined and modeled. The issues of uncertainty in model input data and output are addressed. The book concludes with a chapter on the management of groundwater resources. Although one of the main objectives of this book is to construct mathematical models, the amount of mathematics required is kept minimal.

Modeling Groundwater Flow and Contaminant Transport

Remediation Hydraulics

Area Studies (Regional Sustainable Development Review): Canada and USA - Volume I