Application Of Soil Physics In Environmental Analyses Measuring Modelling And Data Integration Progress In Soil Science

Soil in the Environment is key for every course in soil science, earth science, and environmental disciplines. This textbook engages students to critically look at soil as the central link in the function and creation of the terrestrial environment. For the first time, Dr. Hillel brilliantly discusses soils as a natural body that is engaged in dynamic interaction with the atmosphere above and the strata below that influences the planet's climate and hydrological cycle, and serves as the primary habitat for a versatile community of living organisms. The book offers a larger perspective of soil's impact on the environment by organizing chapters among three main processes: Physical, Chemical, and Biology. It is organized in a student-friendly format with examples, discussion boxes, and key definitions in every chapter. The book provides students of geology, physical science, and environmental studies with fundamental information and tools for meeting the natural resource challenges of the 21st century, while providing students of soil science and ecology with the understanding of physical and biological interactions necessary for sustainability. First textbook to unite soil science and the environment beyond what is traditionally taught Incorporates current knowledge of such hot topics as climate change, pollution control, human expropriation of natural resources, and the prospects for harmonious and sustainable development Organized in a student-friendly format with examples, discussion boxes, and key definitions in every chapter Full color throughout

Numerical models have become much more efficient, making their application to problems increasingly widespread. User-friendly interfaces make the setup of a model much easier and more intuitive while increased computer speed can solve difficult problems in a matter of minutes. Co-authored by the software's creator, Dr. Jirka Šim?nek, Soil Physics with HYDRUS: Modeling and Applications demonstrates one- and two-dimensional simulations and computer animations of numerical models using the HYDRUS software. Classroom-tested at the University of Georgia by Dr. David Radcliffe, this volume includes numerous examples and homework problems. It provides students with access to the HYDRUS-1D program as well as the Rosetta Module, which contains large volumes of information on the hydraulic properties of soils. The authors use HYDRUS-1D for problems that demonstrate infiltration, evaporation, and percolation of water through soils of different textures and layered soils. They also use it to show heat flow and solute transport in these systems, including the effect of physical and chemical nonequilibrium conditions. The book includes examples of two-dimensional flow in fields, hillslopes, boreholes, and capillary fringes using HYDRUS (2D/3D). It demonstrates the use of two other software packages, RETC and STANMOD, that complement the HYDRUS series. Hands-on use of the windows-based codes has proven extremely effective when learning the principles of water and solute movement, even for users with very little direct knowledge of soil physics and related disciplines and with limited mathematical expertise. Suitable for teaching an undergraduate or lower level graduate course in soil physics or vadose zone hydrology, the text can also be used for self-study on how to use the HYDRUS models. With the information in this book, you can run models for different scenarios and with different parameters, and thus gain a better understanding of the physics of water flow and contaminant transport.

This second edition was undertaken to update information which has become available since the first edition and to convert completely to the SI system. The main objective of this book is to stress application of soil physics principles to real problems. The problems are heavily oriented toward the soil water-plant-atmosphere continuum. This book grew out of a course taught to upper level undergraduate and graduate students from many different disciplines and backgrounds. I have found that problems are a very good teaching tool because students need to solve them on their own and adapt them to their own understanding. I have found this problem-solving experience to be greatly enhanced if examples are available. Thus, this book is heavily laden with examples. This edition includes reference to many models, involving basic concepts discussed herein, by which it is possible to solve many more realistic--and more complex--problems such as drainage below the root zone (and associated pollution), plant growth as related to climate, soil properties, management, etc. The intent is to encourage students to advance to the next level. The book is not intended to be a complete introduction to applied soil physics, but rather to emphasize problem-solving and the important aspects of soil water and temperature.

The completely revised and updated edition of the classic guide to soil physics The revised edition of an environmental soil science classic, Soil Physics, Sixth Edition presents updated and expanded material on the latest developments in the industry, providing the best preparation for students and a state-of-the-art reference for professionals. Through a systemic use of physical principles, Soil Physics, Sixth Edition demonstrates how to simplify the general theory used in transport processes for specific applications. With broad coverage of the role soil plays in the environment, this Sixth Edition offers more than seventy worked problems illustrating specific lessons in the book, and features: * New material on soil's influence on the health of an ecosystem * Expanded coverage of modern in-site and noninvasive field-scale subsurface measurement techniques * Discussions on the latest advances in regional and watershed hydrology * Up-to-date information on the use of algorithms and computers in the study and modeling of soil processes * New coverage of preferential flow Soil Physics, Sixth Edition is an essential volume for students and professionals in soil science, natural resource management, forestry, agriculture, hydrology, and civil and environmental engineering.

The scaling issue remains one of the largest problems in soil science and hydrology. This book is a unique compendium of ideas, conceptual approaches, techniques, and methodologies for scaling soil physical properties. Scaling Methods in Soil Physics covers many methods of scaling that will be useful in helping scientists across a range of soil-rel

The book is a realistic blend of basic knowledge and understanding in soil physical properties. It will enable the reader to scientifically analyze soils to develop practical and successful means of providing sufficient drainage and to develop science-based irrigation strategies. Only basic mathematical knowledge is necessary to understand and apply the proven principles covered. With limited resources that are increasing significantly in costs, the book blends the ideal concept of providing sufficient drainage and irrigation based on using soil physical properties but with financial limitations in mind. One traditional problem with many Soil Physics, Drainage, and Irrigations-based texts is the prerequisite of understanding complicated calculus-based mathematics. Although necessary for a theory-based text, our text was developed with practitioners in mind where such complicated mathematics was avoided but referenced if the reader wishes to further explore the specific topic. Another problem with many traditional texts is the lack of practical examples or case-studies allowing readers to relate their specific scenarios to similar types of situations. We have purposely included numerous examples and practical field experiences. This is especially true when many of the theoretical ideals are covered, followed by explanations of how such ideals can be applied in the laboratory and field.

This book is not, in any case, in total defiance of the Wise Old Man's admonition, for it is not an entirely new book. Rather, it is an outgrowth of a previous treatise, written a decade ago, entitled "Soil and Water: Physical Principles and Processes." Though that book was well enough received at the time, the passage of the years has inevitably made it necessary to either revise and update the same book, or to supplant it with a fresh approach in the form of a new book which might incorporate still-pertient aspects of its predecessor without necessarily being limited to the older book's format or point of view.

Designed for undergraduate and graduate students, this book covers important soil physical properties, critical physical processes involving energy and mass transport, movement and retention of water and

solutes through soil profile, soil temperature regimes and aeration, and plant-water relations. It includes new concepts and numerical examples for an in depth understanding of these principles. The book provides readers with clear coverage of how and why water and solute flow through the soil and details how various factors influence the flow. It includes guidance on the use of the existing public domain computer models.

In 1971, the late Dr. J. Kolek of the Institute of Botany, Bratislava, organized the first International Symposium devoted exclusively to plant roots. At that time, perhaps only a few of the participants, gathered together in Tatranska Lomnica, sensed that a new era of root meetings was beginning. Nevertheless, it is now clear that Dr. Kolek's action, undertaken with his characteristic enormous enthusiasm, was rather pioneering, for it started a series a similar meetings. Moreover, what was rather exceptional at the time was the fact that the meeting was devoted to the functioning of just a single organ, the root. One possible reason for the unexpected success of the original, perhaps naive, idea of a Root Symposium might lie with the fact that plant roots have always been extremely popular as experimental material for cytologists, biochemists and physiologists whishing to probe processes as diverse as cell division and solute transport. Of course, the connection of roots with the rest of the plant is not forgotten either. This wide variety of disciplines is now coupled with the development of increasingly sophisticated experimental techniques to study some of these old problems. These factors undoubtedly contribute to the necessity of continuing the tradition of the root symposia. The common theme of root function gives, in addition, a certain unity to all these diverse activities.

This proceedings includes 33 papers presented during the International Symposium on Applied Soil Physics in Stress Environments held in 22-26 January 1989 in Islamabad, Pakistan. The papers are divided into four technical sessions. The first session (5 paper) provides an overview of irrigated and barani (rainfed) agriculture. The second session (13 papers) was focused on measurements and methodologies appropriate for use under condition prevailing in Pakistan and similar situations. Specific topics in the second session included soil water and solute movement, soil-water-plant interaction, and soil structure. The third session (9 papers) was concerned with defining the role of tillage and land use practices in soil and water conservation, and the fourth session (6 papers) was focused on conceptual and mathematical modelling applicable to stress environments. Recommendations relating to soil physics research needs, human resource development and research management in Pakistan, are also presented.

Environmental Soil Physics is a completely updated and modified edition of the Daniel Hillels previous, successful books, Introduction to Soil Physics and Fundamentals of Soil Physics. Hillel is a Pulitzer Prize-winning author, one of the true leaders in the field of environmental sciences. The new version includes a chapter and problems on computational techniques, addresses current environmental concerns and trends. Updates and expands the scope of Hillel's prior works, Fundamentals of Soil Physics (1980)and Applications of Soil Physics (1980) Explores the wide range of interactions among the phases in the soil and the dynamic interconnections of the soil with the subterranean and atmospheric domains Draws attention to historical and contemporary issues concerning the human management of soil and water resources Directs readers toward solution of practical problems in terrestrial ecology, field-scale hydrology, agronomy, and civil engineering Incorporates contributions by leading scientists in the areas of spatial variability, soil remediation, and the inclusion of land-surface processes in global climate models

The study of the physical properties and physical processes of the soil is under the domain of soil physics. It is a multidisciplinary science that integrates the principles of physics, physical chemistry, meteorology and engineering for the study of soil components, their phases and dynamics. Such investigations drive solutions to problems in agriculture, ecology and engineering. This textbook is a compilation of chapters that discuss the most vital concepts in the field of soil physics. Different approaches, evaluations and methodologies have been included in this book. As this field is emerging at a rapid pace, the contents of this book will help the readers understand the modern concepts and applications of the subject.

Vadose Zone Hydrology describes the elements of the physical processes most often encountered by hydrogeologists and ground-water engineers in their vadose zone projects. It illustrates the application of soil physics to practical problems relevant to the characterization and monitoring of the vadose zone. It includes an introduction to physical processes, including basic flow theory, and provides examples of important field-scale processes that must be recognizable by hydrogeologists. Considerable attention is given to the concepts of recharge, including how it is most accurately evaluated in the vadose zone. Field and laboratory methods for characterizing hydraulic properties in the vadose zone are also covered, and case studies illustrating these methods are provided. New and emerging technologies for monitoring the vadose zone, particularly for the purpose of detecting contaminants, are highlighted. In the last section of the book, additional case studies are presented, demonstrating applications related to seepage detection, landfill monitoring, and soil gas investigations. This book is written from the perspective of hydrogeologists and is designed to be directly applicable and to maintain continuity and consistency between chapters. It will be an invaluable primer for environmental or geotechnical consultants, regulators, or students who have no prior formal academic training in unsaturated flow concepts. Because the text contains some of the latest advances in this field, it will be an excellent reference for geologists and engineers currently working on problems of vadose zone hydrology.

Soil Health and Intensification of Agroecosystems examines the climate, environmental, and human effects on agroecosystems and how the existing paradigms must be revised in order to establish sustainable production. The increased demand for food and fuel exerts tremendous stress on all aspects of natural resources and the environment to satisfy an ever increasing world population, which includes the use of agriculture products for energy and other uses in addition to human and animal food. The book presents options for ecological systems that mimic the natural diversity of the ecosystem and can have significant effect as the world faces a rapidly changing and volatile climate. The book

explores the introduction of sustainable agroecosystems that promote biodiversity, sustain soil health, and enhance food production as ways to help mitigate some of these adverse effects. New agroecosystems will help define a resilient system that can potentially absorb some of the extreme shifts in climate. Changing the existing cropping system paradigm to utilize natural system attributes by promoting biodiversity within production agricultural systems, such as the integration of polycultures, will also enhance ecological resiliency and will likely increase carbon sequestration. Focuses on the intensification and integration of agroecosystem and soil resiliency by presenting suggested modifications of the current cropping system paradigm Examines climate, environment, and human effects on agroecosystems Explores in depth the wide range of intercalated soil and plant interactions as they influence soil sustainability and, in particular, soil quality Presents options for ecological systems that mimic the natural diversity of the ecosystem and can have significant effect as the world faces a rapidly changing and volatile climate

Soil Physics: Selected Topics covers the results in the research field of soil physics, soil mechanics, and the behavior of real soils. This book is divided into six chapters and begins with an introduction to the study of the physical characteristics of soil and the complexity of superstructure of soil mechanics. The next chapter deals with the distribution of coarse grains according to their volume and the distribution of pore sizes in fine-grained materials. This chapter also describes the properties of granular mixtures and the compatibility of transition soils. The discussion then shifts to investigation of soil strength, particularly the strength of sand and transition soils, the tensile and shear strengths of cohesive soils, and brittle failure of soils. The remaining chapters consider the classification of soil phase movement phenomena. This book is intended primarily for practicing civil engineers.

A 2004 textbook highlighting environmental concerns arising from use and misuse of soil and water resources.

From bridges and tunnels to nuclear waste repositories, structures require that soils maintain their design engineering properties if the structures are to reach their projected life spans. The same is true for earth dams, levees, buffers, barriers for landfills, and other structures that use soils as engineered materials. Yet soil, a natural resource, continues to change as a result of natural and anthropogenic stresses. As the discipline of soil properties and behaviours matures, new tools and techniques are making it possible to study these properties and behaviours in more depth. What Happens to Soil Under Weathering, Aging, and Chemical Stress? Environmental Soil Properties and Behaviour examines changes in soil properties and behaviour caused by short- and long-term stresses from anthropogenic activities and environmental forces. Introducing new concepts of soil behaviour, soil maturation, and soil functionality, it integrates soil physics, soil chemistry, and soil mechanics as vital factors in soil engineering. The book focuses on environmental soil behaviour, with particular attention to two main inter-related groups of soil–environment issues. The first is the use of soil as an environmental tool for management and containment of toxic and hazardous waste materials. The second is the impact of ageing and weathering processes and soil contamination on the properties and behaviour of soils, especially those used in geotechnical and geoenvironmental engineering projects. A Transdisciplinary Look at Soil-Changing Processes To determine short- and long-term soil quality and soil functionality, the authors emphasize the need to be aware of the nature of the stressors involved as well as the kinds of soil-changing processes that are evoked. This book takes a first step toward a much-needed transdisciplinary effort to develop a broader and deeper understanding of what happens to soil and how we can determine and quantify the effect of biogeochemical processes. It offers a timely resource for the study of soil properties and behaviours, effects of environmental changes, and remediation of contaminated soil.

Density functional theory (DFT) ranks as the most widely used quantum mechanical method and plays an increasingly larger role in a number of disciplines such as chemistry, physics, material, biology, and pharmacy. DFT has long been used to complement experimental investigations, while now it is also regarded as an indispensable and powerful tool for researchers of different fields. This book is divided into five sections that include original chapters written by experts in their fields: "Method Development and Validation," "Spectra and Thermodynamics," "Catalysis and Mechanism," "Material and Molecular Design," and "Multidisciplinary Integration." I would like to express my sincere gratitude to all contributors and recommend this book to both beginners and experienced researchers.

This book is a unified, condensed, and simplified version of the recently issued twin volumes, Fundamentals of Soil Physics and Applications of Soil Physics. Nonessential topics and complexities have been deleted, and little prior knowledge of the subject is assumed. An effort has been made to provide an elementary, readable, and self-sustaining description of the soil's physical properties and of the manner in which these properties govern the processes taking place in the field. Consideration is given to the ways in which the soil's processes can be influenced, for better or for worse, by man. Sample problems are provided in an attempt to illustrate how the abstract principles embodied in mathematical equations can be applied in practice. The author hope that the present version will be more accessible to students than its precursors and that it might serve to arouse their interest in the vital science of soil physics.

Scaling of freezing phenomena in soils; Miller similitude and generalized scaling analysis; Application of scaling to soil-water movement considering hysteresis; Application of scaling to the characterization of spatial variability in soils; Application of scaling to the analysis of unstalbe flow phenomena; Characteristic lenghts and times associated with processes in the root zone; Scaling of mechanical stresses in unsaturated granular soils; The consequences of fractal scaling in heterogeneous soils and porous media.

This innovative study presents concepts and problems in soil physics, and provides solutions using original computer programs. It provides a close examination of physical environments of soil, including an analysis of the movement of heat, water and gases. The authors employ the programming language Python, which is now widely used for

numerical problem solving in the sciences. In contrast to the majority of the literature on soil physics, this text focuses on solving, not deriving, differential equations for transport. Using numerical procedures to solve differential equations allows the solution of quite difficult problems with fairly simple mathematical tools. Numerical methods convert differential into algebraic equations, which can be solved using conventional methods of linear algebra. Each chapter introduces a soil physics concept, and proceeds to develop computer programs to solve the equations and illustrate the points made in the discussion. Problems at the end of each chapter help the reader practise using the concepts introduced. The text is suitable for advanced undergraduates, graduates and researchers of soil physics. It employs an open source philosophy where computer code is presented, explained and discussed, and provides the reader with a full understanding of the solutions. Once mastered, the code can be adapted and expanded for the user's own models, fostering further developments. The Python tools provide a simple syntax, Object Oriented Programming techniques, powerful mathematical and numerical tools, and a user friendly environment.

Applications of Soil PhysicsElsevier

Applications of Soil Physics deals with the applications of soil physics and covers topics ranging from infiltration and surface runoff to groundwater drainage, evaporation from bare-surface soils, and uptake of soil moisture by plants. Water balance and energy balance in the field are also discussed, along with tillage and soil structure management. The development and extension of Penman's evaporation formula is also described. This book is comprised of 14 chapters and begins with a systematic description of the field-water cycle and its management, with emphasis on infiltration and runoff; redistribution and drainage; evaporation and transpiration; and irrigation and tillage. Subsequent chapters focus on transpiration from plant canopies; freezing phenomena in soils; scaling and similitude of soil-water phenomena; spatial variability of soil physical properties; and movement of solutes during infiltration into homogeneous soil. Concepts of soil-water availability to plants are considered, together with principles of irrigation management and the advantages and limitations of drip irrigation. This monograph is intended for upper-level undergraduate and graduate students of the environmental, engineering, and agronomic sciences.

An abridged, student-oriented edition of Hillel's earlier published Environmental Soil Physics, Introduction to Environmental Soil Physics is a more succinct elucidation of the physical principles and processes governing the behavior of soil and the vital role it plays in both natural and managed ecosystems. The textbook is self-contained and self-explanatory, with numerous illustrations and sample problems. Based on sound fundamental theory, the textbook leads to a practical consideration of soil as a living system in nature and illustrates the influences of human activity upon soil structure and function. Students, as well as other readers, will better understand the importance of soils and the pivotal possition they occupy with respect to careful and knowledgeable conservation. Written in an engaging and clear style, posing and resolving issues relevant to the terrestrial environment Explores the gamut of the interactions among the phases in the soil and the dynamic interconnection of the soil with the subterranean and atmospheric domains Reveals the salient ideas, approaches, and methods of environmental soil physics Includes numerous illustrative exercises, which are explicitly solved Designed to serve for classroom and laboratory instruction, for self-study, and for reference Oriented toward practical problems in ecology, field-scale hydrology, agronomy, and civil engineering Differs from earlier texts in its wider scope and holistic environmental conception

Soil and Water: Physical Principles and Processes describes the physical principles governing the soil-water system and particularly the sequence of processes constituting the cycle of water in the field. Organized into two parts, with a total of 11 chapters, this book first discusses the basic physical properties of both soil and water. Some chapters deal with the state of water in soil and flow of water in saturated and unsaturated soil. The second part focuses on the aspects of field water cycle, starting from the entry of water into soil to the redistribution of soil moisture. It also describes the groundwater drainage, evaporation from bare-surface soils, uptake of soil water by plants, and the water and energy balance in the field. This work is meant for students and professional workers in soil physics and other related disciplines who need or might be interested in a fundamental and up-to-date exposition of soil physics.

An authoritative reference on soil physics, Soil Physics Companion is lavishly illustrated with graphs, charts, line drawings, and equations. The book provides a valuable source of material and reference for most contemporary topics of soil physics and the vadose zone - arguably the most comprehensive volume available. In addition to being a reliable reference, it is valuable as an advanced text from which topics of interest can be selected by the teacher and student. Topics include: Static and dynamic aspects of soils Transport processes and soil water measurements Movement of soil water in the context of overall water balance and its key role in the hydrologic cycle Energy balance and thermal regime Soil-plant-atmospheric interface Solute transport and soil-gas movement Spatial variability Building on the work begun in the bestselling Handbook of Soil Science, this reference takes soil physics one step further. Convenient and easy-to-use, it provides in-depth information at your fingertips. When you need easily accessible, readily available facts and theories, you need the Soil Physics Companion.

The importance to preserve soil and water have is increasingly recognized. Agricultural practices and ecological trends both affect and are affected by soil physical properties. The more frequency of natural disasters, as landslides and thunderstorms addresses the importance to integrate soil characteristics in predictive models. Soil physics research has grown considerably specially in the use of innovative sensors, soil databases, and modeling techniques have been introduced into soil water relationship and environmental monitoring. Those advances are thoroughly dispersed in articles and conference proceedings In this volume, the authors will bring together the effectiveness of many new field and lab sensors and examine the current state-of-the-art in modeling and data analysis. It also includes innovative approaches and case studies in tropical soils. Future directions in soil physics research are given by key researchers in this discipline.

Modeling aspects have added a new dimension in research innovations in all branches of engineering. In the field of soil and water engineering, they are increasingly used for planning, development, and management of land and water resources, including analysis of quantity and quality parameters of surface and ground water, flood forecasting and control measures, optimum allocation and utilization of irrigation water. The application of these models saves considerable time in decision support systems and helps in conservation and optimum allocations of scarce precious natural resources.

Soils are the porous skin of the Earth with variable and complex structures composed of solid, liquid and gaseous phases. This textbook (based on the 4th, German language edition) introduces the reader

gently but comprehensively to soil physical processes. The authors discuss both the origin and dynamics of soil physical properties and functions -- including volume-mass relations of the solid, water and gas phases, grain and pore size distributions, permeability and storage capacity for water, gases and heat -- and finally soil deformation and strength in relation to mechanical and hydraulic stresses resulting in structural changes through compaction, kneading, slaking and soil crusting.

Elements of Soil Physics

Designed for undergraduate and graduate students, this book covers important soil physical properties, critical physical processes involving energy and mass transport, movement and retention of water and solutes through soil profile, soil temperature regimes and aeration, and plant-water relations. It includes new concepts and numerical examples fo

Principles of Soil Physics examines the impact of the physical, mechanical, and hydrological properties and processes of soil on agricultural production, the environment, and sustainable use of natural resources. The text incorporates valuable assessment methods, graphs, problem sets, and tables from recent studies performed around the globe and offers an abundance of tables, photographs, and easy-to-follow equations in every chapter. The book discusses the consequences of soil degradation, such as erosion, inhibited root development, and poor aeration. It begins by defining soil physics, soil mechanics, textural properties, and packing arrangements . The text continues to discuss the theoretical and practical aspects of soil structure and explain the significance and measurement of bulk density, porosity, and compaction. The authors proceed to clarify soil hydrology topics including hydrologic cycle, water movement, infiltration, modeling, soil evaporation, and solute transport processes. They address the impact of soil temperature on crop growth, soil aeration, and the processes that lead to the emission of greenhouse gases. The final chapters examine the physical properties of gravelly soils and water movement in frozen, saline, and water-repellant soils. Reader-friendly and up-to-date, Principles of Soil Physics provides unparalleled coverage of issues related to soil physics, structure, hydrology, aeration, temperature, and analysis and presents practical techniques for maintaining soil quality to ultimately preserve its sustainability.

This textbook is designed for use in university courses on the subject and as a reference book for practitioners and students. The work describes the physical properties of soils and how these properties affect agriculture and the environment. It is unique in its inclusion of pedology, taxonomy and pedotransfer functions.

This book covers material taught in a graduate-level soil physics course at Washington State University. While most soil physics courses dwell mainly on deriving rather than solving the differential equations for transport, the author's approach is to focus on solutions. Graduate students in agricultural and biological sciences usually have a good working knowledge of algebra and calculus, but not of differential equations. In order to teach methods for solving very difficult differential equations with difficult boundary conditions using fairly simple mathematical tools, the author uses numerical procedures on microcomputers to solve the differential equations. Numerical methods convert differential equations into algebraic equations which can be solved using conventional methods of linear algebra. This book reflects the philosophy used in the course. Each chapter introduces soil physics concepts, generally in the conventional way. Most chapters then go on to develop simple computer programs to solve the equations and illustrate the points made in the discussion. Problems at the end of each chapter help the reader practice using the concepts introduced in the chapter. The problems and computer programs are an integral part of the presentation, and readers are strongly encouraged to experiment with each model until both the working of the model and the concepts it teaches are familiar. Although the programs are generally short and relatively simple, they are suitable for use as submodels in large, general-purpose models of the soil-plant-atmosphere system, and have been used in this way by the author and by several of his students. Teachers and students alike will welcome this new textbook. It will enable graduate students to understand and solve transport problems which exist in field situations, and will provide them with a good working knowledge of soil physics - fundamental to so many other areas in soil, plant and engineering sciences.

Now in its third edition, this textbook gives a comprehensive account of soil physics with emphasis on field applications for students and research workers engaged in water resources studies, soil sciences, and plant sciences. The authors have added chapters on soil erosion, conservation, and the role of soil in affecting water quality to this new edition. The book gives an account of how water influences the structure and strength of soil; how plants absorb water from soils; how water from rain and irrigation enters the soil and flows through it to contribute to stream flow and flow in artificial drains; how soluble salts and chemical pollutants are transported; how soils are eroded by water and wind; and how the evaporation rate from the land surface is influenced by soil water supply, the nature of the plant cover and the evaporative power of the atmosphere. This book will be useful to students and research workers in environmental sciences, hydrology, agriculture, soil science, and civil engineering.

Emphasizing pioneering achievements, this work offers a clear and systematic description of various soil-water phenomena and their applications to soil problems such as water retention and the flux of water in soils and clays. This second edition contains material on the physical properties of adsorbed water, the application of fractal theory to solute and water flows in field soils, fingering research, and more.