Drainage Engineering Lecture Notes

On the basis of instrument electrical and automatic control system, the 5th International Conference on Electrical Engineering and Automatic Control (CEEAC) was established at the crossroads of information technology and control technology, and seeks to effectively apply information technology to a sweeping trend that views control as the core of intelligent manufacturing and life. This book takes a look forward into advanced manufacturing development, an area shaped by intelligent manufacturing. It highlights the application and promotion of process control represented by traditional industries, such as the steel industry and petrochemical industry; the technical equipment and system cooperative control represented by robot technology and multi-axis CNC; and the control and support of emerging process technologies represented by laser melting and stacking, as well as the emerging industry represented by sustainable and intelligent life. The book places particular emphasis on the micro-segments field, such as intelligent micro-grids, new energy vehicles, and the Internet of Things. 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 volume comprises select peer reviewed papers presented at the international conference - Advanced Research and Innovations in Civil Engineering (ARICE 2019). It brings together a wide variety of innovative topics and current developments in various branches of civil engineering. Some of the major topics covered include structural engineering, water resources engineering, transportation engineering, geotechnical engineering, environmental engineering, and remote sensing. The book also looks at emerging topics such as green building technologies, zero-energy buildings, smart materials, and intelligent transportation systems. Given its contents, the book will prove useful to students, researchers, and professionals working in the field of civil engineering. This book comprises select proceedings of the International Conference on Sustainable Civil Engineering Practices (ICSCEP 2019). It covers several important aspects of sustainable civil engineering practices dealing with effective waste and material management, natural resources, industrial products, energy, food, transportation and shelter, while conserving and protecting the environmental quality and the natural resource base essential for future development. The book also discusses engineering solutions to sustainable development and green design issues. Special emphasis is given on qualitative guidelines for generation, treatment, handling, transport, disposal and recycling of wastes. The book is intended as a practice-oriented reference guide for researchers and practitioners, and will be useful for all working in sustainable civil engineering related fields. This book comprises selected proceedings of the International Conference on Recent Advancements in Civil Engineering and Infrastructural Developments (ICRACEID 2019). The contents are broadly divided into five areas (i) smart transportation with urban planning, (ii) clean energy and environment, (iii) water distribution and waste management, (iv) smart materials and structures, and (v) disaster management. The book aims to provide solutions to global challenges using innovative and emerging technologies covering various fields of civil engineering. The major topics covered include urban planning, transportation, water distribution, waste management, disaster management, environmental pollution and control, environmental impact assessment, application of GIS and remote sensing, and structural analysis and design. Given the range of topics discussed, the book will be beneficial for students, researchers as well industry professionals. This proceeding represents state-of-the-art trends and developments in the emerging field of engineering asset management as presented at the Eight World Congress on Engineering Asset Management (WCEAM). The Proceedings of the WCEAM 2013 is an excellent reference for practitioners, researchers and students in the multidisciplinary field of asset management, covering topics such as: Asset condition monitoring and intelligent maintenance, 2. Asset data warehousing, data mining and fusion, 3. Asset performance and level-of-service models, 4. Design and life-cycle integrity of physical assets, 5. Deterioration and preservation models for assets, 6. Education and training in asset management, 7. Engineering standards in asset management, 8. Fault diagnosis and prognostics, 9. Financial analysis methods for physical assets, 10. Human dimensions in integrated asset management, 11. Information quality management, 12. Information systems and knowledge management, 13. Intelligent sensors and devices, 14. Maintenance strategies in asset management, 15. Optimisation decisions in asset management, 16. Risk management in asset management, 17. Strategic asset management, 18. Sustainability in asset management. King WONG served as Congress Chair for WCEAM 2013 and ICUMAS 2013 is the President of the Hong Kong Institute of Utility Specialists (HKIUS) and Convener of International Institute of Utility Specialists (IIUS). Peter TSE is the Director of the Smart Engineering Asset Management laboratory (SEAM) at the City University of Hong Kong and served as the Chair of WCEAM 2013 Organising Committee. Joseph MATHEW served as the Co-Chair of WCEAM 2013 is also WCEAM's General Chair. He is the Chief Executive Officer of Asset Institute, Australia.

This book gathers the latest advances, innovations, and applications in the field of innovative biosystems engineering for sustainable agriculture, forestry and food production. Focusing on the challenges of implementing sustainability in various contexts in the fields of biosystems engineering, it shows how the research has addressed the sustainable use of renewable and non-renewable resources. It also presents possible solutions to help achieve sustainable production. The Mid-Term Conference of the Italian Association of Agricultural Engineering (AIIA) is part of a series of conferences, seminars and meetings that the AIIA organizes, together with other public and private stakeholders, to promote the creation and dissemination of new knowledge in the sector. The contributions included in the book were selected by means of a rigorous peer-review process, and offer an extensive and multidisciplinary overview of interesting solutions in the field of innovative biosystems engineering for sustainable agriculture.

A survey of the problems encountered in flood control and drainage engineering. Among the topics studied are: estimation of design flood; flood routing through reservoirs and channels; design of spillways; and flood mitigation through planning of reservoir capacities and operation of reservoirs.

This book comprises selected papers from the International Conference on Civil Engineering Trends and Challenges for Sustainability (CTCS) 2019. The book presents latest research in several areas of civil engineering such as construction and structural engineering, geotechnical engineering, environmental engineering and sustainability, and geographical information systems. With a special emphasis on sustainable development, the book covers case studies and addresses key challenges in sustainability. The scope of the contents makes the book useful for students, researchers, and professionals interested in sustainable practices in civil engineering.

Flood Control and Drainage EngineeringSecond EditionCRC Press

Reliable subsurface drainage systems for groundwater table and salinity control are needed to maintain or enhance the productivity of irrigated lands and to contribute to the rural development of lowlands in the humid tropic. This publication presents guidelines to assess the need for envelopes and for the selection of appropriate materials (i.e. pipes and envelopes) for the proper and lasting performance of subsurface drainage systems. In addition, it also contains guidelines for adequate installation and maintenance of drainage materials as well as the required specifications and standards of such materials, which may be used in tender documents for implementation of subsurface drainage works. Practical guidelines for the implementation of laboratory and field investigations to evaluate the performance of drainage materials have also been included.--Publisher's description.

This book presents the most recent innovative studies in the field of water resources for arid areas to move towards more sustainable management of the resources. It gathers outstanding contributions presented at the 2nd International Water Conference on Water Resources in Arid Areas (IWC), which was held online (Muscat, Oman) in November 2020. Papers discuss challenges and solutions to alleviate water resource scarcity in arid areas, including water resources management, the introduction of modern irrigation systems, natural groundwater recharge, construction of dams for artificial recharge, use of treated wastewater, and desalination technologies. As such, the book provides a platform for the exchange of recent advances in water resources research, which are essential to improving the critical water situation and to move towards more sustainable management of water resources.

Overview of optimization -- Introduction to meta-heuristic and evolutionary algorithms -- Pattern search (PS) -- Genetic algorithm (GA) -- Simulated annealing (SA) -- Tabu search (TS) -- Ant colony optimization (ACO) -- Particle swarm optimization (PSO) -- Differential evolution (DE) -- Harmony search (HS) -- Shuffled frog-leaping algorithm (SFLA) -- Honey-bee mating optimization (HBMO) -- Invasive weed optimization (IWO) -- Central force optimization (CFO) -- Biogeography-based optimization (BBO) -- Firefly algorithm (FA) -- Gravity search algorithm (GSA) -- Bat algorithm (BA) -- Plant propagation algorithm (PPA) -- Water cycle algorithm (WCA) -- Symbiotic organisms search (SOS) -- Comprehensive evolutionary algorithm (CEA)

This book comprises select proceedings of the International Conference on Trends and Recent Advances in Civil Engineering (TRACE 2020). The volume focuses on latest research works carried out in the area of water resources and transportation engineering. The topics include technological intervention and solution for water security, sustainability in water resources and transportation infrastructure, crop protection, resilience to disaster like flood, hurricane and drought, traffic congestion, transport planning etc. It aims to address broad spectrum of audience by covering inter-disciplinary innovative research and applications in these areas. It will be useful to graduate students, researchers, scientists, and practitioners working in water resources and transportation engineering domain.

Land Drainage – Principles, Methods and Applications presents the latest information, concepts and technology for ensuring sustainable agricultural production and environmental management by adopting land drainage measures. It focuses on a subject, central to the sustainability of irrigated agriculture. The authors' considerable field work experience and strong grip on the subject are pivotal in conceptualizing this book. This book provides an explicit description of the subject for students as well as the practicing engineers in this area. A logical sequence is followed in the presentation of chapters, beginning with the occurrence of drainage problems, their causes, remedies, design and execution of drainage systems and the benefits of drainage. The book can claim to be the only comprehensive title on the subject in India. SALIENT FEATURES 1. Follows an application-centric approach based on mathematical and statistical concepts 2. Provides a global scenario of drainage by studying different drainage models 3. Discusses drainage in the Indian context 4. Text is supported by statistical inputs and well illustrated examples 5. Includes self-assessment questions with answers and a number of solved and unsolved problems 6. Includes case studies of Drainage and Salt Management Hydroinformatics systems are systems that combine computational hydraulic modelling with information systems (including knowledge-based systems). They are gaining rapid acceptance in the areas of environmental planning, design and management. The present book focuses exclusively on sewage systems, starting with their planning and then going on to discuss their design, operation and rehabilitation. The very experienced authors discuss business and information needs in the management of urban drainage, tools for collecting and archiving such data, and their use in modelling catchment hydrology, sewer systems hydraulics, wastewater quality, wastewater treatment plant operation, and receiving waters. The control and operation of sewer systems in real time is described, followed by a discussion of their maintenance and rehabilitation. Intelligent decision support systems for managing the urban drainage business process are presented. Audience: Researchers into sewer design, municipal engineers, planners and managers interested in an innovative approach to all aspects of the planning, design and operation of sewer systems.

This book comprises select proceedings of the First International Conference on Geomatics in Civil Engineering (ICGCE 2018). This book presents latest research on applications of geomatics engineering in different domains of civil engineering, like structural engineering, geotechnical engineering, hydraulic and water resources engineering, environmental engineering and transportation engineering. It also covers miscellaneous applications of geomatics in a wide range of technical and societal problems making use of geospatial information, engineering principles, and relational data structures involving measurement sciences. The book proves to be very useful for the scientific and engineering community working in the field of geomatics and geospatial technology.

"In the research Model Predictive Control on Open Water Systems, the relatively new control methodology Model Predictive Control is configured for application of water quantity control on open water systems, especially on irrigation canals and large drainage systems. The methodology applies an internal model of the open water system, by which optimal control actions are calculated over a prediction horizon. As internal model, two simplified models are used, the Integrator Delay model and the Saint Venant model. Kalman filtering is applied to initialize the internal models. The

optimization uses an objective function in which conflicting objectives can be weighed. In most of the cases, these conflicting objectives are keeping the water levels at different locations in the water system within a range around setpoint and executing this by using as little control effort or energy as possible. To tune the weight factors in the objective function, an estimate of the maximum allowed value of each variable in the objective function is used. The optimization takes the constraints of the control structures into account. Every control time step, the optimal control actions are calculated, while only the first set of control actions is actually executed. This results in a controlled water system that is constantly maintaining the objective in an optimal way, while taking predictions, such as expected irrigation demands or extreme storm events and the constraints of the water system into account."

This volume contains selected papers presented during the International Conference on Environmental Geotechnology, Recycled Waste Material and Sustainable Engineering (EGRWSE-2018). The multidisciplinary articles in this volume discuss environment-friendly technologies and the application of 'smart' solutions and initiatives to improve infrastructure and services, with a strong emphasis on sustainability and conservation of resources. This volume will be of interest to engineers, professionals, and researchers working on improving urban infrastructure and strengthen civic amenities in a sustainable manner.

Two large international conferences on Advances in Engineering Sciences were held in Hong Kong, March 12–14, 2014, under the International MultiConference of Engineers and Computer Scientists (IMECS 2014), and in London, UK, 2–4 July, 2014, under the World Congress on Engineering 2014 (WCE 2014) respectively. This volume contains 37 revised and extended research articles written by prominent researchers participating in the conferences. Topics covered include engineering mathematics, computer science, electrical engineering, manufacturing engineering, industrial engineering, and industrial applications. The book offers tremendous state-of-the-art advances in engineering sciences and also serves as an excellent reference work for researchers and graduate students working with/on engineering sciences. Contents:Switching Boundaries for Flexible Management of Natural Resource Investment under Uncertainty (T Tarnopolskaya, W Chen and C Bao)Using Exotic Option Prices as Control Variates in Monte Carlo Pricing Under a Local-Stochastic Volatility Model (Geoffrey Lee, Zili Zhu and Yu Tian)Multi-period Dynamic Portfolio Optimization through Least Squares Learning (C Bao, Z Zhu, N Langrené and G Lee)On General Solution of Incompressible and Isotropic Newtonian Fluid Equations (A A Maknickas)On the Inversion of Vandermonde Matrix via Partial Fraction Decomposition (Yiu Kwong Man)Fractal Fourier Coefficients with Application to Identification Protocols (Nadia M G Al-Saidi, Arkan J Mohammed, Elisha A Ogada and Adil M Ahmed)Scheduling Algorithm with Inserted Idle Time for Problem P?prec?Cmax (N S Grigoreva)Iterative Scheme for a Common Solutions of Equilibrium Problems, Variational Inequality Problems and Fixed Point Problems (Wichan Khongtham)Three-steps Iterative Method for Common Fixed Points, Variational Inclusions, and Equilibrium Problems (Yaowaluck Khongtham)Euler's Constant: A Proof of its Irrationality and Transcendence by means of Minus One Factorial (Okoh Ufuoma)Solution of Problem on Heat and Mass Transfer with Chemical Reaction over an Exponentially Accelerated Infinite Vertical Plate (A Ahmed, M N Sarki and M Ahmad)Improving Human Resource Security of a Data Centre: Case Study of a Hong Kong Wines and Spirits Distribution Company (Hon Keung Yau and Alison Lai Fong Cheng)Model to Measure University's Readiness for Establishing Spin-offs: Comparison Study (Wahyudi Sutopo, Rina Wiji Astuti, Yuniaristanto, Agus Purwanto and Muhammad Nizam)Preliminary Study of Solar Electricity using Comparative Analysis (Wahyudi Sutopo, Dwi Indah Maryanie, Agus Purwanto and Muhammad Nizam)Tactile Memory for Different Shapes: Implications for Shape Coding in Man-machine Interfaces (Annie W Y Ng and Alan H S Chan)Ergonomics Recommendations for Control Station Work with Head Rotation (Steven N H Tsang, Stefanie X Q Kang and Alan H S Chan)A Methodological Approach to Affective Design (Youngil Cho and Sukyoung Kim)Data Analysis by Diminishing Rates of Change and ?1 Approximation (I C Demetriou and S S Papakonstantinou)Comparing Naïve-Bayes Network Structures over Multiple Dataset (Haruna Chiroma, Abdulsalam Ya'u Gital, Adamu I Abubakar, Sanah Abdullahi Muaz, Jaafar Z Maitama and Tutut Herawan)Route Recommendation Method Based on Driver's Estimated Intention Considering Route Selection with Car Navigation (Keisuke Hamada, Shinsuke Nakajima, Daisuke Kitayama and Kazutoshi Sumiya)Adaption of the Inertia Weight using a Novel Sine-based Chaotic Map for Particle Swarm Optimization (Yu-Huei Cheng)Fast Characterization of Intravascular Tissue by Subspace Method using Target Tissue's Neighborhood Information (Shota Furukawa, Eiji Uchino, Shinichi Miwa and Noriaki Suetake)Swarm Intelligent Control Object's Movement Simulation in Net-centric Environment using Neural Networks (Viacheslav Abrosimov)The Concept of Project Time Management with the Fuzzy Buffers Approach (B?aszczyk Pawe? and B?aszczyk Tomasz)Data Driven Methods for Adaptation of ASR Systems (Akella Amarendra Babu, Yellasiri Ramadevi and Akepogu Ananda Rao)Semantic Web Improved by Including Class Information with the TFIDF Algorithm (Jyoti Gautam and Ela Kumar)Urban Drainage in the Metropolitan Region of Belém, Brazil: An Urbanistic Study (Juliano Pamplona Ximenes Ponte and Ana Júlia Domingues Das Neves Brandão)Finger Based Techniques for Nonvisual Touchscreen Text Entry (Mohammed Fakrudeen, Sufian Yousef, Mahdi H Miraz and Abdelrahman Hamza Hussein)LTE Downlink and Uplink Physical Layer (Temitope O Takpor and Francis E Idachaba)New Dielectric Modulated Graphene (DMG) FET-Based Sensor for High-performance Biomolecule Sensing Applications (Faycal Djeffal, Abdelhamid Benhaya, Khalil Tamersit and Mohamed Meguellati)Modelling and Optimization of Avalanche Photodiode Electrical Parameters using Multiobjective Genetic Algorithm (Toufik Bendib, Lucio Pancheri, Faycal Djeffal and Gian-Franco Dalla Betta)Experimental Study of Impact of Ship Electric Power Plant Configuration and Load Variation on Power Quality in the Ship Power Systems (Tomasz Tarasiuk, Andrzej Pilat, Mariusz Szweda, Mariusz Gorniak and Zenon Troka)Studying of Electroencephalographic Signal Changes Induced by Odor Exposure (Rita Jorge Cerqueira Pinto, Isabel Patrícia Pinheiro Peixoto Xavier, Maria Do Rosário Alves Calado and Sílvio José Pinto Simões Mariano)DC Motor Speed Control using FGPA (Ahmed Telba)Pellistor Gas Sensor Performance: Interface Circuitry

Analysis (Hauwa Talatu Abdulkarim)Extended Research on Prefilter Bandwidth Effects in Asynchronous Sequential Symbol Synchronizers based on Pulse Comparison by both Transitions at Half Bit Rate (Antonio D Reis, Jose F Rocha, Atilio S Gameiro and Jose P Carvalho)Models of Organizational Change for Modernizing Pollution Warning Services (Anca Daniela Ionita and Mariana Mocanu) Readership: Professionals, academics and graduate students in electrical & electronic engineering, computer engineering, industrial engineering and mathematics. Key Features:This volume contains revised and extended research articles written by prominent researchers participating in the conferencesThe book offers the state of art of tremendous advances in engineering sciencesThe book can also serve as an excellent reference work for researchers and graduate students working with/on engineering sciencesKeywords:Engineering Mathematics;Computer Science;Electrical Engineering;Manufacturing Engineering;Industrial Engineering;Industrial Applications

This book comprises the select proceedings of the International Conference on Recent Advances in Civil Engineering (ICRACE) 2020, held at the Cochin University of Science and Technology, Cochin, Kerala, India. The book focuses on latest research in different areas of civil engineering and lays special emphasis on sustainable construction practices. It is divided into seven major themes: (i) Modern materials and sustainable construction, (ii) Environmental engineering and management, (iii) Geotechnical engineering, (iv) Health, safety and environment, (v) Irrigation, water resources and management, (vi) Structural Engineering, and (vii) Transportation engineering and traffic planning. Given the range of the topics covered, this book can be useful for students, scholars and professionals interested in the different sub-disciplines of civil engineering.

This work describes the role of sediment transport in the operation and maintenance of demand-based downstream controlled irrigation canals. Sediment deposition in these irrigation canals severely affects the operation of the automatic flow control system. The book also discusses sediment transport modelling in irrigation canals. A simplified 1-D mathematical model SETRIC (SEdiment TRansport in Irrigation Canals) has been improved with the inclusion of downstream control component for the downstream controlled irrigation canals. Based on field measurements and sediment transport modelling, a number of approaches have been proposed for sediment management in such irrigation canals by improvement in their design and operation. This book will be of interest to Irrigation Engineers and Managers, Hydraulic Engineers, Water Resources Engineers and Managers, Civil Engineers, and Agricultural Engineers.

This proceedings volume contains 38 papers presented at the 4th Working Conference on "Rel iability· and Optimization of Structural Systems", held at the Technical University of Munich, Germany, September 11- 13, 1991. The Working Conference was organised by the IFIP (Interna tional Federation for Information Processing) Working Group 7.5 of Technical Committee 7 and was the fourth in a series, following similar conferences held at the University of Aalborg, Den mark, May 1987, at the Imperial College, London, UK, September 1988 and at the University of California, Berkeley, California, USA, March 1990. The Working Conference was attended by 54 participants from 16 countries. The objectives of Working Group 7.5 are: • to promote modern structural systems optimization and reliability theory, • to advance international cooperation in the field of structural system optimization and reliability theory, • to stimulate research, development and application of structural system optimization and reli ability theory, • to further the dissemination and exchange of information on reliability and optimization of structural systems • to encourage education in structural system optimization and reliability theory. At present the members of the Working Group are: A. H.-S. Ang, U.S.A. M. Grimmelt, FRG G. A ugwti, Italy N. C. Lind, Canada M. J. Baker, UK H. O. Mad&en, Denmark P. Bjerager, Norway R. E. Melcher~, Australia C. A. Cornell, U.S.A. F. Mo~e~, U.S.A.

This volume presents selected papers presented during the 4th International Conference on Transportation Geotechnics (ICTG). The papers address the geotechnical challenges in design, construction, maintenance, monitoring, and upgrading of roads, railways, airfields, and harbor facilities and other ground transportation infrastructure with the goal of providing safe, economic, environmental, reliable and sustainable infrastructures. This volume will be of interest to postgraduate students, academics, researchers, and consultants working in the field of civil and transport infrastructure. . Fully renewed and extended, this edition is a valuable source of information for anyone involved in drainage engineering and management. It provides new theories, technologies, knowledge and experiences in combination with traditional land development practices in the humid temperature zone. Aspects covered include: management and maintenance; drainage application and design; and adverse impacts on the environment. Intended as both a handbook and a textbook, this work is of particular value to university students as well as professionals within drainage development, engineering and management.

This volume comprises the select proceedings of the Indian Geotechnical Conference (IGC) 2020. The contents focus on recent developments in geotechnical engineering for sustainable tomorrow. The volume covers the topics related advances in ground improvement of weak foundation soils for various civil engineering projects and design/construction of reinforced soil structures with different fill materials using synthetic and natural reinforcements in different forms.

Sediment transport in irrigation canals influences to a great extent the sustainability of an irrigation system. Unwanted erosion or deposition will not only increase maintenance costs, but may also lead to unfair, unreliable and unequitable distribution of irrigation water to the end users. Proper knowledge of the characteristics, including behaviour and transport of sediment will help to design irrigation systems, plan effi cient and reliable water delivery schedules, to have a controlled deposition of sediments, to estimate and arrange maintenance activities, etc. The main aim of these lecture notes is to present a detailed analysis and physical and mathematical descriptions of sediment transport in irrigation canals and to describe the mathematical model SETRIC that predicts the sediment transport, deposition and entrainment rate as function of time and place for various flow conditions and sediment inputs. The model is typically suited for the simulation of sediment transport under the particular conditions of non-wide irrigation canals where the flow and sediment

transport are strongly determined by the operation of the flow control structures. The lecture notes will contribute to an improved understanding of the behaviour of sediments in irrigation canals. They will also help to decide on the appropriate design of the system, the water delivery plans, to evaluate design alternatives and to achieve an adequate and reliable water supply to the farmers.

These proceedings showcase the best papers selected from more than 500 submissions, introducing readers to the top research topics and the latest developmental trends in the theory and application of Man-Machine-Environment System Engineering (MMESE). This research topic was first established in China by Professor Shengzhao Long in 1981, with direct support from one of the greatest modern Chinese scientists, Xuesen Qian. In a letter to Shengzhao Long from October 22nd, 1993, Xuesen Qian wrote: "You have created a very important modern science and technology in China!" MMESE primarily focuses on the relationship between Man, Machine and Environment, studying the optimum combination of related Man-Machine-Environment systems. In this paradigm, "Man" refers to working people as the subject at the workplace (e.g. operators, decision-makers); "Machine" is the general name for any object controlled by Man (including tools, machinery, computers, systems and technologies), and "Environment" describes the specific working conditions under which Man and Machine interact (e.g. temperature, noise, vibration, hazardous gases etc.). In turn, the three goals of optimization are to ensure safety, efficiency and economy in this context. These proceedings present interdisciplinary studies on the concepts and methods of physiology, psychology, system engineering, computer science, environmental science, management, education, and other related disciplines. They offer a valuable resource for all researchers and professionals whose work involves interdisciplinary areas touching on MMESE subjects.

by Professor Poul Harremoes Environmental engineering has been a discipline dominated by empirical approaches to engineering. Historically speaking, the development of urban drainage structures was very successful on the basis of pure empiricism. Just think of the impressive structures built by the Romans long before the discipline of hydraulics came into being. The fact is that the Romans did not know much about the theories of hydraulics, which were discovered as late as the mid-1800s. However, with the Renaissance came a new era. Astronomy (Galileos) and basic physics (Newton) started the scientific revolution and in the mid-1800s Navier and Stokes developed the application of Newtons laws to hydrodynamics, and later, St. Venant the first basic physics description of the motion of water in open channels. The combination of basic physical understanding of the phenomena involved in the flow of water in pipes and the experience gained by "trial and error", the engineering approach to urban drainage improved the design and performance of the engineering drainage infrastructure. However, due to the mathematical complications of the basic equations, solutions were available only to quite simple cases of practical significance until the introduction of new principles of calculation made possible by computers and their ability to crunch numbers. Now even intricate hydraulic phenomena can be simulated with a reasonable degree of confidence that the simulations are in agreement with performance in practice, if the models are adequately calibrated with sample performance data.

Streamlined to facilitate student understanding, this second edition, containing the latest techniques and methodologies and some new problems, continues to provide a comprehensive treatment of hydrology of watersheds, soil erosion problems, design and installation of soil conservation practices and structures, hydrologic and sediment yield models, watershed management and water harvesting. It also deals with the special requirements of management of agricultural and forested watersheds. This book is designed for undergraduate students of agricultural engineering for courses in hydrology, and soil and water conservation engineering. It will also be of considerable value to students of agriculture, soil science, forestry, and civil engineering. KEY FEATURES Emphasises fundamentals using numerous illustrations to help students visualise different phenomena Offers lucid presentation of field practices Presents the analysis and design of basic hydraulic structures Devotes an entire chapter to watershed management Provides numerous solved design problems and exercise problems to develop a clear understanding of the theory Gives theoretical questions, and objective type questions with answers to test the students' understanding.

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