Dynamics Of Water Waves Selected Papers Of Michael Longuet Higgins Volumes 1 3 Advanced Series On Ocean Engineering

The volume represents a lifetime's work of the author, for many years the Stephen P Timoshenko Distinguished University Professor of Fluid Mechanics of the University of Michigan. The papers selected treat the dynamics of stratified or rotating fluids, internal or surface waves, hydrodynamic stability, jets and plumes, flow in porous media, and certain aspects of hydrodynamics in magnetic or electric fields. When the papers are viewed in perspective, heterogeneity, whether in density, entropy, circulation, viscosity, or in some quantity which can be called magnetic circulation, seems to be a recurring theme in the phenomena investigated. It provides a general framework through which the understanding of the various phenomena is facilitated by the satisfying similarity underlying their seeming diversity.

Synthetic-aperture radar (SAR) as a form of radar to create images of objects, uses the motion of the radar antenna over a targeted region to provide finer spatial resolution than is possible with conventional beam-scanning radars by mounting the antenna on a moving platform such as an aircraft or spacecraft. As antenna aperture (the "size" of the antenna) is defined by the distance the SAR device travels over a target in the time taken for the radar pulses to return to the antenna, the larger the aperture is, the higher the image resolution, therefore, this enables SAR to create high resolution images with comparatively small physical antennas. This special book aims to provide the updated theories and methods for the use of synthetic aperture radar (SAR) onboard satellites to detect ocean processes, i.e., SAR ocean remote sensing. It is a hi-tech application field having been developed since late 1970s and become a powerful tool for obtaining dynamic signatures from the remote and broad ocean.

This book is a unique selection of work by world-class experts exploring the latest developments in Hamiltonian partial differential equations and their applications. Topics covered within are representative of the field’s wide scope, including KAM and normal form theories, perturbation and variational methods, integrable systems, stability of nonlinear solutions as well as applications to cosmology, fluid mechanics and water waves. The volume contains both surveys and original research papers and gives a concise overview of the above topics, with results ranging from mathematical modeling to rigorous analysis and numerical simulation. It will be of particular interest to graduate students as well as researchers in mathematics and physics, who wish to learn more about the powerful and elegant analytical techniques for Hamiltonian partial differential equations.

This book is an extended and substantially updated edition of the previous book editions published in 1996 and 2013 under the same title. The 3rd edition is a one-volume, modern and comprehensive overview of the current knowledge of

regular and random ocean surface waves in deep waters and in coastal zones. Since the previous editions many new theoretical advances have been made in the physical understanding and analytical and numerical treatment of various ocean wave problems. The revisions and supplements demanded by these advances have been substantial, therefore the scope of the book has been extended by adding a new chapter and substantially supplementing others. All chapters of the book have been rewritten to include and describe in detail many new discoveries made since the completion of the previous editions. In this 3rd edition a comprehensive and updated overview of the fundamentals of the regular wave mechanics, as well as the spectral and statistical properties of random waves are given. Except for the updated chapters dedicated to tsunami and extreme waves, a new chapter dealing with other types of impulsive waves starting from rest, are also included. The air-sea interaction processes as well as the last improvements in ocean wave modelling and presently available wave prediction models (WAM, WAVEWATCH III, UMWM, NEMO) are thoroughly discussed and their applications are demonstrated. The review of the present ocean observation methods encompasses the modern sea-truthing, as well as applications of data from presently operating marine satellites. In this revised edition, chapters on the behavior of surface waves in the vegetated environments such as coral reef, mangrove forest, seaweed and seagrass areas are substantially extended and updated to include the last discoveries. The explanations in the book are self-contained and detailed enough to capture the interest of the potential readers and to prompt them to explore the research literature. The list of rapidly growing number of the recent papers on the ocean waves has been extended substantially, up to about 900 titles. Contents: IntroductionInteraction of Surface Waves and WindSpectral Properties of Ocean WavesStatistical Properties of Ocean WavesProperties of Breaking WavesPrediction of Waves in Deep WaterPrediction of Waves in Shallow WaterRogue WavesWave Motion Starting from Rest: TsunamiWave Motion Starting from Rest: Other ExamplesWaves at Coral Reefs and IslandsWaves in Vegetated CoastsWave-induced Pressure and Flow in a Porous BottomWave Observations and Long-term StatisticsWave Measurement TechniquesData Processing and Simulation Techniques Readership: Graduate students, professionals and researchers, including marine research specialist, in ocean and coastal engineering and oceanography. Keywords: Ocean Wave Physics;Wave Mathematical Principles;Spectral Analysis of Waves;Statistics of Observed Waves;Wave Numerical Modelling;Waves in Vegetated Coasts;Extreme WavesReview: Key Features: The book presents a comprehensive, broad-scope and modern one-volume study of the ocean surface wavesAll subjects are presented with the aim of demonstrating the close link between ocean physics and wave predictions, as well as ocean engineeringThe book includes recent achievements published in languages other than English, such as Russian and Polish, with very extensive list of references encompassing more than 900 titles

Computational Wave Dynamics explains the analytical, semi-analytical and numerical methods for finding exact or approximate solutions to various linear and nonlinear differential equations governing wave-like flows. Waves exist almost everywhere in nature. Different types include water, sound, electromagnetic, seismic, and shock. This book explores the latest and most efficient linear and nonlinear differential equations that govern all waves with particular emphasis on water waves, helping the reader to incorporate a more profound numerical understanding of waves in a range of engineering solutions. Procedures, algorithms, and solutions are presented in a simple step-by-step style, helping readers with different backgrounds at various levels to engage with this topic. The breadth of different methods addressed in this one book creates a uniquely valuable resource for the comparison of equations, and acts as a very useful summary of recent research into computational wave dynamics.

A timely review of state-of-the-art tsunami research, covering case studies and recent developments from various approaches. Provides a practical guide to improving operational tsunami warning systems and mitigating coastal hazard from tsunamis.

This book, whose primary aim is to describe liquefaction processes and their implications for marine structures such as pipelines, sea outfalls, quay walls and caisson breakwaters, discusses the subject of soil liqeufaction in the marine environment. In addition, the physics of liquefaction (including examples illustrating the catastrophic consequences of soil liquefaction with regard to marine structures) are described, and the mathematical modelling of liqeufaction is treated in detail. Also, carefully selected numerical examples support the discussion of assessing liquefaction potential, and benchmark cases such as buried gas pipelines and their floatation, caisson breakwaters, cover stones and their interaction with liquefied soil along with counter measures are investigated. Contents:Introduction and Physics of LiquefactionBiot Equations and Their SolutionsResidual LiquefactionMomentary LiquefactionFloatation of Buried PipelinesSinking of Pipelines and Marine ObjectsLiquefaction Under Standing WavesLiquefaction at Gravity StructuresStability of Rock Berms in Liquefied SoilImpact of Seismic-Induced LiquefactionCounter Measures Readership: Professionals and researchers in the area of coastal, ocean and marine civil engineering; graduate and post graduate students. Key Features:Physics of liquefactionMathematical modellingAssessment of liquefaction potential, supported by numerical examplesBenchmark cases such as buried gas pipelines, caisson structures, etc.Keywords:Soil Liquefaction;Marine Environment;Mathematical Modelling;Pipelines;Caisson BreakwatersReviews: “This is a well-written and comprehensive book describing the physics and processes of seabed liquefaction around marine structures. Overall, this book is highly recommended for all professionals and researchers interested in seabed soil liquefaction and the stability of marine structures, and is indeed suitable as a textbook for graduate/postgraduate students in this field.” J.

Ocean Eng. Mar. Energy

Thoroughly updated to include the most recent and fascinating discoveries in oceanography, the Fifth Edition takes great strides to be the most up-to-date, comprehensive, and student-friendly resource available today. Its content continues to span the four major divisions of ocean science: geology, chemistry, physics and biology, while maintaining the conversational voice for which it is acclaimed. The Fifth Edition boasts many exciting updates, including a new chapter on global climate change that educates students on global warming in the 21st century and its likely impact on ocean systems. With new end-of-chapter questions, new color photographs and illustrations, and an expanded assortment of Selected Readings, Invitation to Oceanography is a must-have in any marine science classroom!

Beaches in Japan have been eroding since the 1970s because of artificial land alterations and unsustainable coastal development. Almost all causes of the beach erosion in Japan are due to anthropogenic factors — as a result of human activity. This book presents the state of the beaches throughout Japan, looking at the current reality and the classification of causes of beach erosion using real-life, illustrated examples. It then goes on to look at practical models which can be used to predict changes to different types of beaches, and concludes with investigation of beach erosion as a wider structural problem. Lessons learnt show the manner in which excessive coastal development without clearly identified measures for beach protection can have widespread global ramifications. This second edition presents new findings from field studies carried out on Japanese beaches, along with the development and improvement of the numerical model presented previously. In addition to the first edition, six new examples of the beach erosion in Japan are included, as is new analysis of the BG model (a model for predicting based on Bagnold's concept), which can be applicable to various field problems. Originally published in Japanese (2004), this updated version gives clear practical guidance to coastal engineers working to prevent irreversible beach erosion and sustainable coastal development policy.

Dynamics of Water WavesSelected Papers of Michael Longuet-Higgins

This book set is a revised version of the 2005 edition of Theory and Applications of Ocean Surface Waves. It presents theoretical topics on ocean wave dynamics, including basic principles and applications in coastal and offshore engineering as well as coastal oceanography. Advanced analytical and numerical techniques are demonstrated. In this revised version, five chapters on recent developments in linear and nonlinear aspects have been added. The first is on detailed analyses in Wave/Structure Interactions. The second is a new section on Waves through a Marine Forest, a topic motivated by its possible relevance to tsunami reduction. The third is on Long Waves in Shallow Water and the fourth is an update on Broad-Banded Nonlinear Surface Waves in the Open Sea to include new findings in this topic. The fifth is an expanded chapter on Numerical Simulation of Nonlinear Wave Dynamics to include predictions of nonlinear spectral evolution and rogue wave occurrence and dynamics using large-scale phase-resolved

simulations. This revised version also includes recent developments in precorrected-FFT accelerated O(N log N) low- and high-order boundary element methods for the computation of fully nonlinear wave-wave and wave-body interactions.Theory and Applications of Ocean Surface Waves (2016) will be invaluable for graduate students and researchers in coastal and ocean engineering, geophysical fluid dynamicists interested in water waves, and theoretical scientists and applied mathematicians wishing to develop new techniques for challenging problems or to apply techniques existing elsewhere.

The aim of this book is to present selected theoretical topics on ocean wave dynamics, including basic principles and applications in coastal and offshore engineering, all from the deterministic point of view. The bulk of the material deals with the linearized theory.

Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database.

This book describes the derivation of the equations of motion of fluids as well as the dynamics of ocean and atmospheric currents on both large and small scales through the use of variational methods. In this way the equations of Fluid and Geophysical Fluid Dynamics are re-derived making use of a unifying principle, that is Hamilton’s Principle of Least Action. The equations are analyzed within the framework of Lagrangian and Hamiltonian mechanics for continuous systems. The analysis of the equations’ symmetries and the resulting conservation laws, from Noether’s Theorem, represent the core of the description. Central to this work is the analysis of particle relabeling symmetry, which is unique for fluid dynamics and results in the conservation of potential vorticity. Different special approximations and relations, ranging from the semi-geostrophic approximation to the conservation of wave activity, are derived and analyzed. Thanks to a complete derivation of all relationships, this book is accessible for students at both undergraduate and graduate levels, as well for researchers. Students of theoretical physics and applied mathematics will recognize the existence of theoretical challenges behind the applied field of Geophysical Fluid Dynamics, while students of applied physics, meteorology and oceanography will be able to find and appreciate the fundamental relationships behind equations in this field.

Unique, cutting-edge material on structural dynamics and natural forces for offshore structures Using the latest advances in theory and practice, Dynamics of Offshore Structures, Second Edition is extensively revised to cover all aspects of the physical forces, structural modeling, and mathematical methods necessary to effectively analyze the dynamic behavior of offshore structures. Both closed-form solutions and the Mathematica(r) software package are used in many of the up-to-date example problems to compute the deterministic and stochastic structural responses for such offshore structures as buoys; moored ships; and fixed-bottom, cable-stayed, and gravity-type platforms. Throughout the book, consideration is given to the many assumptions involved in formulating a structural model and to the natural forces encountered in the offshore environment. These analyses focus on plane motions of elastic structures with linear and nonlinear restraints, as well as motions induced by the forces of currents, winds, earthquakes, and waves, including the latest theories and information on wave mechanics. Topics addressed include multidegree of freedom

linear structures, continuous system analysis (including the motion of cables and pipelines), submerged pile design, structural modal damping, fluid-structure-soil interactions, and single degree of freedom structural models that, together with plane wave loading theories, lead to deterministic or time history predictions of structural responses. These analyses are extended to statistical descriptions of both wave loading and structural motion. Dynamics of Offshore Structures, Second Edition is a valuable text for students in civil and mechanical engineering programs and an indispensable resource for structural, geotechnical, and construction engineers working with offshore projects.

Also contains brochures, directories, manuals, and programs from various College of Engineering student organizations such as the Society of Women Engineers and Tau Beta Pi.

For more than 200 years, the Fourier Transform has been one of the most important mathematical tools for understanding the dynamics of linear wave trains. Nonlinear Ocean Waves and the Inverse Scattering Transform presents the development of the nonlinear Fourier analysis of measured space and time series, which can be found in a wide variety of physical settings including surface water waves, internal waves, and equatorial Rossby waves. This revolutionary development will allow hyperfast numerical modelling of nonlinear waves, greatly advancing our understanding of oceanic surface and internal waves. Nonlinear Fourier analysis is based upon a generalization of linear Fourier analysis referred to as the inverse scattering transform, the fundamental building block of which is a generalized Fourier series called the Riemann theta function. Elucidating the art and science of implementing these functions in the context of physical and time series analysis is the goal of this book. Presents techniques and methods of the inverse scattering transform for data analysis Geared toward both the introductory and advanced reader venturing further into mathematical and numerical analysis Suitable for classroom teaching as well as research

This book provides a comprehensive description of the latest theory-supported numerical technologies, as well as scientific and engineering applications for water surface waves. Its contents are crafted to cater to a step-by-step learning of computational wave dynamics and ocean wave modeling. It provides a comprehensive description from underlying theories of free-surface flows, to practical computational applications for coastal and ocean engineering on the basis of computational fluid dynamics (CFD). The text may be used as a textbook for advanced undergraduate students and graduate students to understand the theoretical background of wave computations, and the recent progress of computational techniques for free-surface and interfacial flows, such as Volume of Fluid (VOF), Constrained Interpolation Profile (CIP), Lagrangian Particle (SPH, MPS), Distinct Element (DEM) and Euler-Lagrange Hybrid Methods. It is also suitable for researchers and engineers who wish to apply CFD techniques to ocean modeling and practical coastal problems involving sediment transport, wave-structure interaction and surf zone flows.

This book presents observations on the phenomena of fine sediment transport and their explanations under process-related divisions such as flocculation, erosion, and deposition. The text is a compilation of the author's lecture notes from nearly four decades of teaching and guiding graduate students in civil and coastal engineering. Illustrations of fine sediment transport processes and their complexities given in the book are taken from field and laboratory-based observations by the author and his students, as well as numerous investigators. The wide-ranging composition of particles (of inorganic and organic matter), their universal presence and their complex interactions with hydraulic forces make this branch of science a difficult one to deal with in a single treatise. It is therefore essential to study fine sediment transport as an independent subject rather than cover it in no more than a single chapter as many texts on coarse sediment transport have done. Even

though the entire coverage is “introductory”, the twelve chapters collectively include more material than what can be reasonably dealt with in a one semester, three-credit course. The book includes an extensive description of the components of fine-grained — especially cohesive — sediment transport. It covers the development of the subject in scientific and engineering applications mainly from the 1950s to its present state. Solved examples and chapter-end exercises are also included. This text is aimed at senior civil engineering undergraduates and graduate students who, in the normal course of their study, seldom come across the subject of fine sediment transport in their curricula. Interested students should have a basic understanding of the mechanics of fluid flow and open channel hydraulics.

This is a three-volume selection of classical papers by Michael Longuet-Higgins, who for many years has been a leading researcher in the fast-developing field of physical oceanography. Some of these papers were first published in scientific journals or in conference proceedings that are now difficult to access. All the papers are characterized by the novelty of their content, and the clarity of their style and exposition. The papers are quite varied in their approach. They range from basic theory and new computational methods to laboratory experiments and field observations. An overall feature is the frequent comparison between theory and experiment and the constant attention to practical applications. Among the many advances and achievements to be found in these three volumes are: the now generally accepted solution to the longstanding problem of how oceanic microseisms can be generated in deep water or near steep coastlines; a theoretical explanation of the strong drifting near the bottom in shallow water; the first introduction of a boundary-integral technique for calculating free surface flows; simple analytic expressions for the form and time-development of plunging breakers; and, so on. The book will be of particular interest to advanced students in ocean engineering; also more generally to fluid dynamicists and physical oceanographers concerned with the interaction of the ocean with the atmosphere and with sandy shorelines.

A review of a recent analytical investigation concerning the conditions for complete similarity of the movement of sand due to periodic gravity waves in the model and the prototype is presented. The review showed that where sand is used as the model bed material, complete similarity of the movement of sand (and consequently the erosion patterns) in the model and the prototype would be impossible to achieve in the in-shore harbor, Site X, riprap model. Analysis of some of the available experimental data on the movement of sand due to periodic gravity waves resulted in the development of criteria for qualitative similarity of the erosion patterns between the model and the prototype. Application of the developed criteria for qualitative similarity of the movement of sand due to periodic gravity waves indicated that, for the in-shore harbor, a model with a linear scale of 1:15 is capable of reproducing qualitatively the erosion pattern which will occur in the prototype. (Author).

Modern design of berm breakwaters began about thirty years ago. However, to date, there has been a lack of a well-established, formal design methodology on berm breakwaters. The authors Dr Jentsje van der Meer and Sigurdur Sigurdarson combine over 40 years of collective experience working with breakwaters to put forward a design framework in Design and Construction of Berm Breakwaters; covering the science and design practices of berm breakwater structures. The original design consisted of mass armoured berms that reshaped into statically stable S-shaped slopes.

The design was adopted in Iceland and eventually led to a development with more stable structures by using available rock sizes, large rock, and more rock gradings than just "small rock (core)" and "large rock (berm)". This more stable and only partly reshaping structure is called the Icelandic-type berm breakwater. Written for researchers and practitioners, the volume consists of chapters on geometrical designs of the berm breakwater cross-section, including berm reshaping and wave overtopping, quarry and project management, as well as blasting and sorting techniques, designs for various wave conditions and available rock classes, and case studies of already constructed berm breakwaters.

This revised and updated second edition details the vast progress that has been achieved in the understanding of the physical mechanisms of rogue wave phenomenon in recent years. The selected articles address such issues as the formation of rogue waves due to modulational instability of nonlinear wave field, physical and statistical properties of extreme ocean wave generation in deep water as well as in shallow water, various models of nonlinear water waves, special analysis of nonlinear resonances between water waves and the relation between in situ observations, experimental data and rogue wave theories. In addition, recent results on tsunami waves due to subaerial landslides are presented. This book is written for specialists in the fields of fluid mechanics, applied mathematics, nonlinear physics, physical oceanography and geophysics, and for students learning these subjects.

In September 2006, research leaders in the field of coastal engineering, fluid mechanics, and wave theory met at Cornell University to celebrate the 60th birthday of Prof. Philip L-F Liu. This volume is a compilation of the research papers presented at the symposium, and includes both review and new research papers. Topics such as nonlinear wave theory, tsunamis, wave-structure interaction, turbulence, and modeling of complex sediment transport are discussed in this volume. All of the contributing authors are research collaborators of Prof. Liu, and include leaders in coastal engineering such as Maarten Dingemans, Hwung-Hweng Hwung, Nobu Kobayashi, Inigo Losada, Hocine Oumeraci, Costas Synolakis, and Harry Yeh.

Advances in Applied Mechanics