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892J8I - JEFFERSON ZAVIER

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.

Geometrical description of photons, electrons and composite particles. Dimensional analysis of electrical charge. Quantum gravity, gravitational frequency spectrum, mass oscillator synchronization, spectral energy density modulation and phase conjugation. Origin of charge, fine structure constant and inertia. Prospects for wave-based EM propulsion.

This book focuses on: (1) the physics of the fundamental dynamics of fluids and of semi-immersed Lagrangian solid bodies that are responding to wave-induced loads; (2) the scaling of dimensional equations and boundary value problems in order to determine a small dimensionless parameter ε that may be applied to linearize the equations and the boundary value problems so as to obtain a linear system; (3) the replacement of differential and integral calculus with algebraic equations that require only algebraic substitutions instead of differentiations and integrations; and (4) the importance of comparing numerical and analytical computations with data from laboratories and/or nature. Contents:Mathematical PreliminariesFundamentals of Fluid MechanicsLong-Crested, Linear Wave Theory (LWT)Wavemaker TheoriesNonlinear Wave TheoriesDeterministic Dynamics of Small Solid BodiesDeterministic Dynamics of Large Solid BodiesReal Ocean Waves Readership: Graduate students and practitioners in ocean and coastal engineering. Keywords:Deterministic and Nondeterministic Wave-Structure Interactions;Linear and Nonlinear Wavemaker Theories;Linear and Nonlinear Wave Theories;Fundamental Fluid Mechanics;Chaotic Analysis of Cross-Waves

Dynamics of Offshore Structures provides an integrated treatment of the main subject areas that contribute to the design, construction, installation, and operation of fixed and floating offshore structures. The book begins with an overview of offshore oil and gas development and offshore structures. Separate chapters follow on the ocean environment; basic fluid mechanics; gravity wave theories; fluid loading on offshore structures; hydrostatics and dynamic response of floating bodies; and model testing of offshore structures. This book is prepared with particular emphasis on the fundamentals of oceanography, basic fluid mechanics, wave theory, hydrodynamics, naval architecture, and structural analysis to meet the needs of students reading ocean engineering or naval architecture, at both undergraduate and postgraduate levels. Basic equations and theoretical results are derived in a rigorous manner but sections on model testing, full-scale measurements, design, and certification are also induced to ensure that the book is of value to professional engineers seeking a balanced treatment of fundamental and practical issues.

This is a textbook aimed at graduate students and offshore engineering practitioners that covers basic fluid mechanics and the deterministic and statistical descriptions of infinitesimal and finite amplitude water waves. It reviews the theory of wave loading on structures and closes with a chapter on the potential of ocean wave energy and devices for extracting it. Since the 1980s there has been tremendous progress in numerical and physical modelling of coastal and offshore structures in waves. This calls for a clear understanding

of the phenomena of wave generation, propagation, deformation and its effects on marine structures. This book will help the reader to understand the many results and descriptions found in journals, reports and research papers. It is self-contained, and encompasses the fundamentals of the subject with sufficient description and illustrations.

A guide to the analysis and design of compliant offshore structures that highlights a new generation of platforms Offshore Compliant Platforms provides an authoritative guideto the analysis and design of compliant offshore structures and puts the focus on a new generation of platforms such as: triceratops, Buoyant Leg Storage and Regasification platforms. Whilst the authors – noted experts on the topic – include basic information on the conceptual development of conventional platforms, the book presents detailed descriptions of the design and development of new deep--water platforms. The book describes the preliminary design of triceratops in ultra--deep waters and presents a detailed analysis of environmental loads that are inherent in offshore locations such as wave, wind and current. The new methodology for the dynamic analysis of triceratops under ice loads, predominantly in ice-covered regions, is also examined with detailed parametric studies. In addition, the book covers the structural geometry and the various methods of analysis for assessing the performance of any other similar offshore platform under the special loads. A discussion of the fatigue analysis and service life prediction is also included. This important book: • Includes the analysis and design of compliant offshore structures with a focus on a new generation of platforms • Examines the preliminary design of triceratops in ultra-deep waters • Covers an analysis of environmental loads that are inherent in offshore locations such as wave, wind and current • Reviews the structural geometry and various methods of analysis for assessing the performance of any other similar offshore platform under special loads • Discusses fatigue analysis and service life prediction Written for engineers and researchers across engineering including civil, mechanical, structural, offshore, ocean and naval architecture, Offshore Compliant Platforms fills the need for a guide to new offshore platforms that provides an understanding of the behaviour of these structures under different loading conditions.

This book offers a timely review of wave energy and its conversion mechanisms. Written having in mind current needs of advanced undergraduates engineering students, it covers the whole process of energy generation, from waves to electricity, in a systematic and comprehensive manner. Upon a general introduction to the field of wave energy, it presents analytical calculation methods for estimating wave energy potential in any given location. Further, it covers power-take off (PTOs), describing their mechanical and electrical aspects in detail, and control systems and algorithms. The book includes chapters written by active researchers with vast experience in their respective filed of specialization. It combines basic aspects with cutting-edge research and methods, and selected case studies. The book offers systematic and practice-oriented knowledge to students, researchers, and professionals in the wave energy sector. Chapters 17 of this book is available open access under a CC BY 4.0 license at link.springer.com

After introducing the theory of the structural loading on ships and offshore struc-

tures based on the motions of wind, waves and currents, this text demonstrates its applications to conventional and non-conventional sea vessels, including extensive exercises and examples.

This book treats the subject of sediment transport in the marine environment, covering transport of non-cohesive sediment by waves and current in- and outside the surf zone. It can be read independently, but a background in hydraulics and basic wave mechanics is required. It is intended for M.Sc. and Ph.D. students. The primary aim of the book is to describe the physical processes of sediment transport and how to represent them in mathematical models. It does not present a large number of different formulae for the sediment transport rates under various conditions. The book can be divided in two main parts; in the first, the relevant hydrodynamic theory is described; in the second, sediment transport and morphological development are treated. The hydrodynamic part contains a review of elementary theory for water waves, chapters on the turbulent wave boundary layer and the turbulent interaction between waves and currents, and finally, surf zone hydrodynamics and wave driven currents. The part on sediment transport introduces the basic concepts (critical bed shear stress, bed load, suspended load and sheet layer, near-bed concentration, effect of sloping bed); it treats suspended sediment in waves and current and in the surf zone, and current and wave-generated bed forms. Finally, the modelling of cross-shore and long-shore sediment transport is described together with the development, of coastal profiles and coastlines.

KEY FEATURES: Provides researchers in Ocean engineering with a thorough review of the latest research in the field Lengthy reports by leading experts A valuable resource for all interested in ocean engineering DESCRIPTION: The International Ship and Offshore Congress (ISSC) is a forum for the exchange of information by experts undertaking and applying marine structural research. These three volumes contain the eight technical committee reports, six Specialist Committee and 2 Special Task Committee reports which were presented for the 15th International Ship and Offshore Structures Congress (ISSC 2004) in San Diego USA, between 11th and 15th August 2003. Volume III will be published in 2004 and is to contain the discussion of the reports, the chairmen's reply, the text of the invited Lecture and the congress report of ISSC 2003.

Intended for coastal engineers and marine scientists who desire to develop a fundamental physical understanding of ocean waves and be able to apply this knowledge to ocean and coastal analysis and design. Provides an introduction to the physical processes of ocean wave mechanics, an understanding of the basic techniques for wave analysis, techniques for practical calculation and prediction of waves and applied wave forecasting.

Wind turbines are one of the most promising renewable energy technologies, and this motivates fertile research activity about developments in power optimization. This topic covers a wide range of aspects, from the research on aerodynamics and control design to the industrial applications about on-site wind turbine performance control and monitoring. This Special Issue collects seven research papers about several innovative aspects of the multi-faceted topic of wind turbine power optimization technology. The seven re-

search papers deal respectively with the aerodynamic optimization of wind turbine blades through Gurney flaps; optimization of blade design for large offshore wind turbines; control design optimization of large wind turbines through the analysis of the competing objectives of energy yield maximization and fatigue loads minimization; design optimization of a tension leg platform for floating wind turbines; innovative methods for the assessment of wind turbine optimization technologies operating on site; optimization of multiple wake interactions modeling through the introduction of a mixing coefficient in the energy balance method; and optimization of the dynamic stall control of vertical-axis wind turbines through plasma actuators. This Special Issue presents remarkable research activities in the timely subject of wind turbine power optimization technology, covering various aspects. The collection is believed to be beneficial to readers and contribute to the wind power industry.

Stochastic Analysis of Offshore Steel Structures provides a clear and detailed guide to advanced analysis methods of fixed offshore steel structures using 3D beam finite elements under random wave and earthquake loadings. Advanced and up-to--date research results are coupled with modern analysis methods and essential theoretical information to consider optimal solutions to structural issues. As these methods require and use knowledge of different subject matters, a general introduction to the key areas is provided. This is followed by in-depth explanations supported by design examples, relevant calculations and supplementary material containing related computer programmers. By combining this theoretical and practical approach Stochastic Analysis of Offshore Steel Structures cover a range of key concepts in detail including: The basic principles of standard 3D beam finite elements and special connections, Wave loading - from hydrodynamics to the calculation of wave loading on structural members, Stochastic response calculations with corresponding solution algorithms including earthquakes, and Fatigue damage, reliability calculation and reliability based design optimization. The broad and detailed coverage makes this a solid reference for research oriented studies and practical sophisticated design methods. Students, researchers, insuring bodies and practical designer offices can turn to Stochastic Analysis of Offshore Steel Structures to broaden their theoretical understanding and develop their practical designs and applications of 3D finite analysis in fixed offshore steel structures.

Concrete is commonly regarded as a mundane, prosaic material whilst the sea is perceived as a fearsome environment, endowed with mystery. Mystery stems from lack of knowledge, and to that extent both concrete and sea have something in common-we fall a long way short of knowing enough about them. Fortunately we have learned enough from our investigations and experiences to be able to set the limits within which we should operate. It is important for the engineer to seek to quantify the effects of the environment on materials and structures so that these can be made safe and adequately durable for their intended economic life. This is especially true for marine structures. Thus the primary purpose of this book is to provide a useful synthesis of the behaviour of concrete and concrete structures in the marine environment. An outline of the content of the book is provided in the latter

part of the first chapter and so will not be anticipated here. The chief aim throughout, however, is to work as far as possible within a context of the appropriate governing physical phenomena, giving due consideration to the mathematical relationships between them. Moreover, without intending to be a design manual, an introduction is given to the sources of information which designers are likely to use, as well as to structural achievements. It is hoped that there should emerge an implicit integration between structure and constituent materials and the surrounding environment.

This book provides a thorough understanding of the interaction of waves and currents with offshore structures.

This book is open access under a CC BY-NC 2.5 license. This book offers a concise, practice-oriented reference-guide to the field of ocean wave energy. The ten chapters highlight the key rules of thumb, address all the main technical engineering aspects and describe in detail all the key aspects to be considered in the techno-economic assessment of wave energy converters. Written in an easy-to-understand style, the book answers questions relevant to readers of different backgrounds, from developers, private and public investors, to students and researchers. It is thereby a valuable resource for both newcomers and experienced practitioners in the wave energy sector.

This book is based on the author's experiences in engineering practice and in the classroom. The introductory topics in wave mechanics and the presentation of such have their foundations in the courses taught at the U.S. Naval Academy. The advanced topics have their origins in the postgraduate courses taught at the Johns Hopkins University.

Opening with recent advances in both the theoretical and physical models for wave-seabed-structure interactions, this book provides an updated look at the mathematics behind the interactions between sea, soil and man-made structures. The main models are broken down into key equations, and their strengths and challenges are discussed. These models are then placed in context with industry-relevant examples, in both two and three dimensions. From seabed instability around offshore wind turbines, to soil conditions in response to the laying of submarine pipelines, this book takes a comprehensive look at a variety of wave-seabed-structure interactions. With important implications for the future of offshore infrastructure, this is an ideal resource for industry workers, undergraduate students, and researchers.

This title presents recent advances in the theoretical and numerical aspects of problems arising in ocean waves engineering and links theoretical developments with practical applications. With contributions from experts, topics include: hydrodynamic forces on fixed and floating structures, wave loads and response of tension--leg platforms, linearized theory of water waves, Painleve analysis, non-linear evolution equations, numerical modelling of nonlinear propagation of water waves and variational inequalities in physical oceanography.

The analysis, design and construction of offshore structures is arguably one of the most demanding sets of tasks faced by the engineering profession. Over and above the usual conditions and situations met by land-based structures, offshore structures have the added complication of being

placed in an ocean environment where hydrodynamic interaction effects and dynamic response become major considerations in their design. A basic understanding of a number of key subject areas is essential to an engineer likely to be involved in the design of offshore structures. Wave Mechanics and Wave Loads on Marine Structures provides a broad overview of some of the key factors in the analysis and design of offshore structures to be considered by an engineer uninitiated in the field of offshore engineering. Topics covered range from water wave theories, structure-fluid interaction in waves to the prediction of extreme values of response from spectral modeling approaches. It presents a new outlook on the measurement of wave forces on ocean structures, uniting the deterministic and probabilistic methodologies to wave theory and linking the methods used in field and experimental measurement.

This book consists of select proceedings of the National Conference on Wave Mechanics and Vibrations (WMVC 2018). It covers recent developments and cutting-edge methods in wave mechanics and vibrations applied to a wide range of engineering problems. The book presents analytical and computational studies in structural mechanics, seismology and earthquake engineering, mechanical engineering, aeronautics, robotics and nuclear engineering among others. This book can be useful for students, researchers, and professionals interested in the wide-ranging applications of wave mechanics and vibrations.

Mathematical Models is a component of Encyclopedia of Mathematical Sciences in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty one Encyclopedias. The Theme on Mathematical Models discusses matters of great relevance to our world such as: Basic Principles of Mathematical Modeling; Mathematical Models in Water Sciences; Mathematical Models in Energy Sciences; Mathematical Models of Climate and Global Change; Infiltration and Ponding; Mathematical Models of Biology; Mathematical Models in Medicine and Public Health; Mathematical Models of Society and Development. These three volumes are aimed at the following five major target audiences: University and College students Educators, Professional practitioners, Research personnel and Policy analysts, managers, and decision makers and NGOs.

This volume gathers select proceedings of the 10th International Conference on Wave Mechanics and Vibrations (WMVC), held in Lisbon, Portugal, on July 4-6, 2022. It covers recent developments and cutting-edge methods in wave mechanics and vibrations applied to a wide range of engineering problems. It presents analytical and computational studies in structural mechanics, seismology and earthquake engineering, mechanical engineering, aeronautics, robotics and nuclear engineering among others. The volume will be of interest for students, researchers, and professionals interested in the wide-ranging applications of wave mechanics and vibrations.

This book is intended as an introduction to classical water wave theory for the college senior or first year graduate student. The material is self-contained; almost all mathematical and engineering concepts are presented or derived in the text, thus making the book accessible to practicing engineers as well.The book commences with a review of fluid mechanics and basic

vector concepts. The formulation and solution of the governing boundary value problem for small amplitude waves are developed and the kinematic and pressure fields for short and long waves are explored. The transformation of waves due to variations in depth and their interactions with structures are derived. Wavemaker theories and the statistics of ocean waves are reviewed. The application of the water particle motions and pressure fields are applied to the calculation of wave forces on small and large objects. Extension of the linear theory results to several nonlinear wave properties is presented. Each chapter concludes with a set of homework problems exercising and sometimes extending the material presented in the chapter. An appendix provides a description of nine experiments which can be performed, with little additional equipment, in most wave tank facilities.

"This book not only brings together existing guidance on hydraulic design, including design wave conditions, prediction of scour and vessel mooring loads, but also presents new methods (developed from extensive laboratory testing) for the prediction of wave loading, including forces on the underside of jetty decks. These guidelines will help maritime designers to optimise jetty designs, and are an essential reference resource."--BOOK JACKET.

The subject of hydrodynamics applied to offshore structures is vast. The topics covered in this book aim to help the reader understand basic principles while at the same time giving the designer enough information for particular designs. Thus, results are given with derivations, and applications are discussed with the aid of examples, with an overview of the advantages and limitations of the method involved. This makes the book suitable as a text for undergraduate and graduate students specializing in offshore and ocean engineering.

Explains the physical principles of wave propagation and relates them to ultrasonic wave mechanics and the more recent guided wave techniques that are used to inspect and evaluate aircraft, power plants, and pipelines in chemical processing. An invaluable reference to this active field for graduate students, researchers, and practising engineers.

Waves in Oceanic and Coastal Waters describes the observation, analysis and prediction of wind-generated waves in the open ocean, in shelf seas, and in coastal regions with islands, channels, tidal flats and inlets, estuaries, fjords and lagoons. Most of this richly illustrated book is devoted to the physical aspects of waves. After introducing observation techniques for waves, both at sea and from space, the book defines the parameters that characterise waves. Using basic statistical and physical concepts, the author discusses the prediction of waves in oceanic and coastal waters, first in terms of generalised observations, and then in terms of the more theoretical framework of the spectral energy balance. He gives the results of established theories and also the direction in which research is developing. The book ends with a description of SWAN (Simulating Waves Nearshore), the preferred computer model of the engineering community for predicting waves in coastal waters.

This book is a compilation of papers covering advanced topics in the potential flow of fluids by leading authorities in the field. The book covers the subject of reflection

and transmission of solitary waves, methods of estimating wave effects on large offshore structures, gravity waves on the surface of deep water from the viewpoint of nonlinear mechanics, wave breaking in shallow water, finite difference techniques for 2D and 3D wave breaking phenomena, the development of a powerful numerical method for computing the second-order wave load on 3D bodies, and finally, mathematical models and solutions of different theories related to the interaction between water waves and different offshore structures, in particular, circular cylinders and spherical structures.

In a unitary way, this monograph deals with a wide range of subjects related to the mechanics of sea waves. The book highlights recent theoretical results on the dynamics of random wind-generated waves, on long-term wave statistics, and on beach planform evolution. A fresh approach is given to more traditional concepts. For example, new evidence from a recent series of small-scale field experiments is used to introduce some crucial topics like wave forces. Also, the book gives some worked examples for the design of offshore or coastal structures. An exciting subject dealt with in the book is the quasi-deterministic mechanics of three--dimensional wave groups in sea storms, and the loads exerted by these wave groups on offshore structures. The text is intended for researchers and graduate students in ocean engineering, but may also be understood by undergraduates. The more complex concepts are explained with examples or more extensive case studies.

Wave Mechanics and Wave Loads on Marine Structures provides a new perspective on the calculation of wave forces on ocean structures, unifying the deterministic and probabilistic approaches to wave theory and combining the methods used in field and experimental measurement. Presenting his quasi-determinism (QD) theory and approach of using small-scale field experiments (SSFEs), author Paolo Boccotti simplifies the findings and techniques honed in his ground-breaking work to provide engineers and researchers with practical new methods of analysis. Including numerous worked examples and case studies, Wave Mechanics and Wave Loads on Marine Structures also discusses and provides useful FORTRAN programs, including a subroutine for calculating particle velocity and acceleration in wave groups, and programs for calculating wave loads on several kinds of structures. Solves the conceptual separation of deterministic and stochastic approaches to wave theory seen in other resources through the application of quasi-determinism (QD) theory Combines the distinct experimental activities of field measurements and wave tank experiment using small-scale field experiments (SSFEs) Simplifies and applies the ground-breaking work and techniques of this leading expert in wave theory and marine construction

An in-depth look at the mechanics of combined stresses imposed on the seabed from wave action and marine infrastructure.