

## Marine Hydrodynamics

*Fundamentals of Ship Hydrodynamics: Fluid Mechanics, Ship Resistance and Propulsion* Lothar Birk, University of New Orleans, USA Bridging the information gap between fluid mechanics and ship hydrodynamics Fundamentals of Ship Hydrodynamics is designed as a textbook for undergraduate education in ship resistance and propulsion. The book provides connections between basic training in calculus and fluid mechanics and the application of hydrodynamics in daily ship design practice. Based on a foundation in fluid mechanics, the origin, use, and limitations of experimental and computational procedures for resistance and propulsion estimates are explained. The book is subdivided into sixty chapters, providing background material for individual lectures. The unabridged treatment of equations and the extensive use of figures and examples enable students to study details at their own pace. Key features: • Covers the range from basic fluid mechanics to applied ship hydrodynamics. • Subdivided into 60 succinct chapters. • In-depth coverage of material enables self-study. • Around 250 figures and tables. Fundamentals of Ship Hydrodynamics is essential reading for students and staff of naval architecture, ocean engineering, and applied physics. The book is also useful for practicing naval architects and engineers who wish to brush up on the basics, prepare for a licensing exam, or expand their knowledge.

The Department of the Navy maintains a vigorous science and technology (S&T) research program in those areas that are critically important to ensuring U.S. naval superiority in the maritime environment. A number of these areas depend largely on sustained Navy Department investments for their health, strength, and growth. One such area is naval hydromechanics, that is, the study of the hydrodynamic and hydroacoustic performance of Navy ships, submarines, underwater vehicles, and weapons. A fundamental understanding of naval hydromechanics provides direct benefits to naval warfighting capabilities through improvements in the speed, maneuverability, and stealth of naval platforms and weapons. An Assessment of Naval Hydromechanics Science and Technology is an assessment of S&T research in the area of naval hydromechanics. This report assesses the Navy's research effort in the area of hydromechanics, identifies non-Navy-sponsored research and development efforts that might facilitate progress in the area, and provides recommendations on how the scope of the Navy's research program should be focused to meet future objectives.

**Handbook of MARINE CRAFT HYDRODYNAMICS AND MOTION CONTROL** The latest tools for analysis and design of advanced GNC systems Handbook of Marine Craft Hydrodynamics and Motion Control is an extensive study of the latest research in hydrodynamics, guidance, navigation, and control systems for marine craft. The text establishes how the implementation of mathematical models and modern control theory can be used for simulation and verification of control systems, decision-support systems, and situational awareness systems. Coverage includes hydrodynamic models for marine craft, models for wind, waves and ocean currents, dynamics and stability of marine craft, advanced guidance principles, sensor fusion, and inertial navigation. This important book includes the latest tools for analysis and design of advanced GNC systems and presents new material on unmanned underwater vehicles, surface craft, and autonomous vehicles. References and examples are included to enable engineers to analyse existing projects before making their own designs, as well as MATLAB scripts for hands-on software development and testing. Highlights of this Second Edition include: Topical case studies and worked examples demonstrating how you can apply modeling and control design techniques to your own designs • A Github repository with MATLAB scripts (MSS toolbox) compatible with the latest software releases from Mathworks New content on mathematical modeling, including models for ships and underwater vehicles, hydrostatics, and control forces and moments New methods for guidance and navigation, including line-of-sight (LOS) guidance laws for path following, sensory systems, model-based navigation systems, and inertial navigation systems This fully revised Second Edition includes innovative research in hydrodynamics and GNC systems for marine craft, from ships to autonomous vehicles operating on the surface and under water. Handbook of Marine Craft Hydrodynamics and Motion Control is a must-have for students and engineers working with unmanned systems, field robots, autonomous vehicles, and ships. MSS toolbox: https://github.com/cybergalactic/mss Lecture notes: https://www.fossen.biz/wiley Author's home page: https://www.fossen.biz

Numerical Modelling of Marine Hydrodynamics

Practical Ship Hydrodynamics

Proceedings of the 6th International Conference on Hydrodynamics, Perth, Western Australia, 24-26 November 2004

Uncertainty Analysis in Experimental Marine Hydrodynamics (EMH)

Hydrodynamics of High-Speed Marine Vehicles

The value of analytical solutions relies on the rigorous formulation, and a strong mathematical background. This comprehensive volume unifies the most important geometries, which allow for the development of analytical solutions for hydrodynamic boundary value problems. It offers detailed explanations of the Laplace domain and numerical results associated with such problems, providing deep insight into the theory of hydrodynamics. Extended numerical calculations are provided and discussed, allowing the reader to use them as benchmarks for their own computations and making this an invaluable resource for specialists in in various disciplines, including hydrodynamics, acoustics, optics, electrostatics, and brain imaging.

A textbook that offers a unified treatment of the applications of hydrodynamics to marine problems. The applications of hydrodynamics to naval architecture and marine engineering expanded dramatically in the 1960s and 1970s. This classic textbook, originally published in 1977, filled the need for a single volume on the applications of hydrodynamics to marine problems. The book is solidly based on fundamentals, but it also guides the student to an understanding of engineering applications through its consideration of realistic configurations. The book takes a balanced approach between theory and empirics, providing the necessary theoretical background for an intelligent evaluation and application of empirical procedures. It also serves as an introduction to more specialized research methods. It unifies the seemingly diverse problems of marine hydrodynamics by examining them not as separate problems but as related applications of the general field of hydrodynamics. The book evolved from a first-year graduate course in MIT's Department of Ocean Engineering. A knowledge of advanced calculus is assumed. Students will find a previous introductory course in fluid dynamics helpful, but the book presents the necessary fundamentals in a self-contained manner. The 40th anniversary of this pioneering book offers a foreword by John Grue. Contents Model Testing \* The Motion of a Viscous Fluid \* The Motion of an Ideal Fluid \* Lifting Surfaces \* Waves and Wave Effects \* Hydrodynamics of Slender Bodies.

"Vive la Revolution!" was the theme of the Twenty-Third Symposium on Naval Hydrodynamics held in Val de Reuil, France, from September 17-22, 2000 as more than 140 experts in ship design, construction, and operation came together to exchange naval research developments. The forum encouraged both formal and informal discussion of presented papers, and the occasion provides an opportunity for direct communication between international peers. This book includes sixty-three papers presented at the symposium which was organized jointly by the Office of Naval Research, the National Research Council (Naval Studies Board), and the Bassin d'Essais des Carènes. This book includes the ten topical areas discussed at the symposium: wave-induced motions and loads, hydrodynamics in ship design, propulsor hydrodynamics and hydroacoustics, CFD validation, viscous ship hydrodynamics, cavitation and bubbly flow, wave hydrodynamics, wake dynamics, shallow water hydrodynamics, and fluid dynamics in the naval context.

Naval Hydrodynamics : Unsteady Hydrodynamics of Marine Vehicles

Hydrodynamics of High-Performance Marine Vessels:

Twenty-Fourth Symposium on Naval Hydrodynamics

Marine Hydrodynamics

Proceedings

*A textbook that offers a unified treatment of the applications of hydrodynamics to marine problems. The applications of hydrodynamics to naval architecture and marine engineering expanded dramatically in the 1960s and 1970s. This classic textbook, originally published in 1977, filled the need for a single volume on the applications of hydrodynamics to marine problems. The book is solidly based on fundamentals, but it also guides the student to an understanding of engineering applications through its consideration of realistic configurations. The book takes a balanced approach between theory and empirics, providing the necessary theoretical background for an intelligent evaluation and application of empirical procedures. It also serves as an introduction to more specialized research methods. It unifies the seemingly diverse problems of marine hydrodynamics by examining them not as separate problems but as related applications of the general field of hydrodynamics. The book evolved from a first-year graduate course in MIT's Department of Ocean Engineering. A knowledge of advanced calculus is assumed. Students will find a previous introductory course in fluid dynamics helpful, but the book presents the necessary fundamentals in a self-contained manner. The 40th anniversary of this pioneering book offers a foreword by John Grue. Contents Model Testing \* The Motion of a Viscous Fluid \* The Motion of an Ideal Fluid \* Lifting Surfaces \* Waves and Wave Effects \* Hydrodynamics of Slender Bodies.*

*The form, hydrodynamic design, and predicted performance of the 190-ton Stable Semisubmerged Platform (SSP) are described and analyzed. Design criteria are presented for the twin submerged hulls, four surface-piercing struts, bow section of the above-water cross structure, aft stabilizing fin and flaps, forward-mounted canard control surfaces, rudders, and the controllable and reversible propellers. Hydrodynamic loads and motion in waves are analyzed. The overall design is evaluated in light of design experience, model test results, and preliminary operating experience with the 190-ton SSP. The 190-ton SSP is shown to have significantly reduced motion in waves, increased rough-water speed and more deck space and internal volume than conventional monohulls. (Author).*

*The demands of modeling and computation in engineering are rapidly growing as a multidisciplinary area with connections to engineering, mathematics and computer science. Modeling and Computation in Engineering III contains 45 technical papers from the 3rd International Conference on Modeling and Computation in Engineering (CMCE 2014, 28-29 June 201*

Marine hydrodynamics

Computer-assisted Teaching of Marine Hydrodynamics

Naval Hydrodynamics

Naval Hydrodynamics, Fifteenth Symposium

Practical Ship Hydrodynamics provides a comprehensive overview of hydrodynamic experimental and numerical methods for ship resistance and propulsion, maneuvering, seakeeping and vibration. Beginning with an overview of problems and approaches, including the basics of modeling and full scale testing, expert author Volker Bertram introduces the marine applications of computational fluid dynamics and boundary element methods. Expanded and updated, this new edition includes: Otherwise disparate information on the factors affecting ship hydrodynamics, combined to provide one practical, go-to resource. Full coverage of new developments in computational methods and model testing techniques relating to marine design and development. New chapters on hydrodynamic aspects of ship vibrations and hydrodynamic options for fuel efficiency, and increased coverage of simple design estimates of hydrodynamic quantities such as resistance and wake fraction. With a strong focus on essential background for real-life modeling, this book is an ideal reference for practicing naval architects and graduate students.

Hydrodynamics of High-Speed Marine Vehicles, first published in 2006, discusses the three main categories of high-speed marine vehicles - vessels supported by submerged hulls, air cushions or foils. The wave environment, resistance, propulsion, seakeeping, sea loads and manoeuvring are extensively covered based on rational and simplified methods. Links to automatic control and structural mechanics are emphasized. A detailed description of waterjet propulsion is given and the effect of water depth on wash, resistance, sinkage and trim is discussed. Chapter topics include resistance and wash; slamming; air cushion-supported vessels, including a detailed discussion of wave-excited resonant oscillations in air cushion; and hydrofoil vessels. The book contains numerous illustrations, examples and exercises.

The early development of the screw propeller. Propeller geometry. The propeller environment. The ship wake field, propeller performance characteristics.

Analytical Methods in Marine Hydrodynamics

Naval Hydrodynamics: Unconventional ships, Ocean engineering

Proceedings of the 3rd International Conference on Modeling and Computation in Engineering (CMCE 2014), 28-29 June, 2014

Marine Propellers and Propulsion

Wakes, Free Surface Effects, Boundary Layers and Viscous Flows, Two-phase Flow, Propeller/appendage/hull Interaction

Numerical Modelling of Marine Hydrodynamics

The International Conference on Hydrodynamics is an increasingly important event at which academics, researchers and practitioners can exchange new ideas and their research findings. This volume contains papers from the 2004 conference covering a wide range of subjects within hydrodynamics, including traditional engineering, architectural and mechanical issues as well as significant new technologies and methodologies such as bio-fluid mechanics and computational fluid mechanics.

Marine HydrodynamicsMIT Press

Readings in Marine Hydrodynamics

Seminar on Numerical Models and Their Applications in Shallow Water Areas : Papers

Naval Hydrodynamics: Frontier problems

An Assessment of Naval Hydromechanics Science and Technology

Unsteady Hydrodynamics of Marine Vehicles

This is a comprehensive two-volume set of books devoted to the hydrodynamics of high-performance marine vessels. These vessels may also be generally referred to as high-speed or advanced marine craft. Types of craft addressed include monohulls, catamarans, trimarans and other multihull vessels, air-cushion vehicles, surface-effect ships and planing craft.The hydrodynamic aspects dealt with are the steady-state resistance, wave generation, sinkage and trim, unsteady effects and motions in waves. Separate chapters are devoted to viscous resistance, transom sterns and the behavior of skiffs for air-cushion vehicles and seals for surface-effect ships. Effects of the finite depth of the water and the possible lateral restriction on the width of the waterway feature prominently in the books. In each case, the presentation includes a full analytical development of the theory accompanied by a comparison of the theoretical predictions with extensive experimental data.In the two volumes there is a total of 888 full-color Letter-size pages. The text is accompanied by 433 photographs of ships and ship models, 1155 graphs, 1295 equations and 1249 references.The work represents the author's research, consulting and professional experience in both universities and research centers spanning a period of over fifty years. The books are targeted at university-level students and specialized industry engineers in the field of naval architecture and associated areas.

The Twenty-Second Symposium on Naval Hydrodynamics was held in Washington, D.C., from August 9-14, 1998. It coincided with the 100th anniversary of the David Taylor Model Basin. This international symposium was organized jointly by the Office of Naval Research (Mechanics and Energy Conversion S&T Division), the National Research Council (Naval Studies Board), and the Naval Surface Warfare Center, Carderock Division (David Taylor Model Basin). This biennial symposium promotes the technical exchange of naval research developments of common interest to all the countries of the world. The forum encourages both formal and informal discussion of the presented papers, and the occasion provides an opportunity for direct communication between international peers.

Practical Ship Hydrodynamics, Second Edition, introduces the reader to modern ship hydrodynamics. It describes experimental and numerical methods for ship resistance and propulsion, maneuvering, seakeeping, hydrodynamic aspects of ship vibrations, and hydrodynamic options for fuel efficiency, as well as new developments in computational methods and model testing techniques relating to marine design and development. Organized into six chapters, the book begins with an overview of problems and approaches, including the basics of modeling and full-scale testing, prediction of ship hydrodynamic performance, and viscous flow computations. It proceeds with a discussion of the marine applications of computational fluid dynamics and boundary element methods, factors affecting ship hydrodynamics, and simple design estimates of hydrodynamic quantities such as resistance and wake fraction. Seakeeping of ships is investigated with respect to issues such as maximum speed in a seaway, route optimization (routing), structural design of the ship with respect to loads in seaways, and habitation comfort and safety of people on board. Exercises and solutions, formula derivations, and texts are included to support teaching or self-studies. This book is suitable for marine engineering students in design and hydrodynamics courses, professors teaching a course in general fluid dynamics, practicing marine engineers and naval architects, and consulting marine engineers. Combines otherwise disparate information on the factors affecting ship hydrodynamics into one practical, go-to resource for successful design, development and construction. Updated throughout to cover the developments in computational methods and modeling techniques since the first edition published more than 10 years ago. New chapters on hydrodynamic aspects of ship vibrations and hydrodynamic options for fuel efficiency, and increased coverage of simple design estimates of hydrodynamic quantities such as resistance and wake fraction.

Applications to Dynamic Physical Processes

Lecture Notes

An International Symposium

Advances in Marine Hydrodynamics

Fundamentals of Ship Hydrodynamics

*This book unifies the most important geometries used to develop analytical solutions for hydrodynamic boundary value problems.*

*CFD is an emerging area and is gaining popularity due to the availability of ever-increasing computational power. If used accurately, CFD methods may overcome the limitations of experimental and other numerical methods, in some respects. This Special Issue focuses on Computational Fluid Dynamics (CFD) Simulations of Marine Hydrodynamics with a specific focus on the applications of naval architecture and ocean engineering, and it comprises 24 original articles that advance state-of-the-art CFD applications in marine hydrodynamics and/or review the progress and future directions of research in this field. The published articles cover a wide range of subjects relevant to naval architecture and ocean engineering, including but not limited to; ship resistance and propulsion, seakeeping and maneuverability, hydrodynamics of marine renewable energy devices, validation and verification of computational fluid dynamics (CFD), EFD/CFD combined methods, fouling/coating hydrodynamics.*

*This report is part of a series of reports that summarize this regular event. The report discusses research developments in ship design, construction, and operation in a forum that encouraged both formal and informal discussion of presented papers.*

*Special Issue in Honor of Professor J. Nicholas Newman*

*Fluid Mechanics, Ship Resistance and Propulsion*

*Seakeeping Problems, Hull-propeller Interactions, Nonlinear Free-surface Problems, Frontier Problems in Hydrodynamics*

*Twenty-Third Symposium on Naval Hydrodynamics*

*Hydrodynamics of the 190-ton Stable Semisubmerged Platform (SSP)*