

## COASTAL PROCESSES

The world's coastlines, dividing land from sea, are geological environments unique in their composition and the physical processes affecting them. Humans have been building structures throughout history at these dynamically active intersections of land and the oceans. Although coastlines were initially used for naval and commercial purposes, more recently recreation and tourism have increased activity in the coastal zones dramatically. Shoreline development is now causing a significant conflict with natural coastal processes.

This text on coastal engineering will help the reader understand these coastal processes and develop strategies to cope effectively with shoreline erosion. The book is organized into four parts: (1) an overview of coastal engineering using case studies to illustrate problems; (2) a consideration of the hydrodynamics of the coastal zone reviewing storm surges, water waves, and low-frequency motions within the nearshore and surf zone; (3) a discussion of coastal responses, including equilibrium beach profiles and sediment transport; and (4) a presentation of applications such as erosion mitigation, beach nourishment, coastal armoring, tidal inlets, and shoreline management.

Students, practicing engineers, and researchers in coastal engineering and coastal oceanography will find this book an invaluable resource for understanding the mechanisms of erosion and designing shoreline structures.

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# **COASTAL PROCESSES**

**with Engineering Applications**

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## Preface

This book is written for graduate students, researchers, and practitioners in the fields of coastal engineering, nearshore oceanography, and marine geology. Although the treatment in many chapters is rather mathematical, it is hoped that our message does not get swamped by the delivery.

The book, which deals primarily with sandy coastlines, is divided into four parts. The first, Introduction to Coastal Processes, provides an overview of the problems of coastal engineering based on examples and a geological perspective of the field. Part 2, Hydrodynamics of the Coastal Zone, reviews storm surges, water waves, and low-frequency motions within the nearshore and surf zone. The third part, Coastal Response, discusses the equilibrium beach profile and sediment transport. Finally, the last section, Shoreline Modification and Analysis, covers aspects of erosion mitigation such as beach nourishment and coastal armoring, tidal inlets, and shoreline management.

We have attempted to include much of the important work in the field, but, given a book with such a broad scope, we have been forced to omit (or overlook) a considerable amount of the literature. An attempt has been made to reference those contributions that clarified the physics of the processes or provided a model for engineering applications. Nevertheless, the book is biased toward our own experiences, which means that much of our work and many U.S. examples are presented. To our colleagues and friends whose work we have used, thanks, and to those whom we have egregiously omitted, our apologies.

The field of coastal engineering is changing rapidly. Perforce, this book is a snapshot of the field (albeit with a long exposure, when one considers how long it took us to write the book!), and many parts of it are subject to becoming outmoded soon. The reader is cautioned to review the recent literature before drawing conclusions. The bulk of the literature in the field of coastal engineering appears in such journals as *Coastal Engineering*; *Journal of Waterway, Port, Coastal and Ocean Engineering*; *Coastal Engineering Journal*; and the *Journal of Geophysical Research*, as well as a variety of conference proceedings. Chief among these conferences is the biennial International Conference on Coastal Engineering, which is hosted by



different countries around the world. The reader is referred to these original sources to provide a fuller explication of the field.

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