

BOOK REVIEWS

MATHEMATICAL MODELS IN COASTAL ENGINEERING, Christopher G. Koutitas, Pentech Press, distributed by Wiley, 1988. No. of pages: 156 (hardback). ISBN 0-7273-1313-4. Price £22.50

The contents in four large chapters are as follows:

- 'Mathematical theory of waves';
- 'Mathematical models of coastal circulation';
- 'Transport of pollutants in coastal regions';
- 'Mathematical models for sediment transport in coastal areas'.

Each section is broken into numerous subsections (a total of about 50) and the topics are developed comprehensively.

The blurb claims that 'The book provides a basic methodology for the formulation and numerical solution of mathematical models in coastal engineering. First, the mathematical theory of waves is considered; then coastal circulation due to various generating factors such as tide, wind, density variation and waves; finally pollutant advective diffusion and sediment transport in the surf zone and wider coastal domain. The book contains numerous illustrative worked examples with the corresponding computer listings in BASIC. The book will enable engineering consultants, researchers and postgraduate students in coastal engineering and oceanography to apply the sophisticated techniques used in major coastal engineering works to small scale design using microcomputers'. This is a good description, except for the last sentence. The book is more appropriate for final year undergraduate, and taught M.Sc., course options in coastal engineering. Engineering consultants and researchers really need much more sophisticated programs, written in a fast language, such as FORTRAN. The wealth of BASIC programs in the book (there are 20 covering too many applications to list) will be very useful, but not for serious work. The circulation models, for example, will be very imprecise, unless the coastline, and breakwaters follow an orthogonal (finite difference) layout.

The author has packed a large range of topics and programs into a relatively short book and there is more material present than first meets the eye. The author aims for the heart of the matter and does not discuss the underlying physics, or get distracted by simplifying assumptions. Inevitably then there are omissions and points which are skimmed over. Some examples: the author states, but does not derive, or give references for, the free

surface kinematic and dynamic conditions for waves. In discussing the Stokes waves he does not mention non-linear terms in the dynamic free surface condition. He does not derive the Sommerfeld radiation boundary condition, and uses it in the form for a normally incident plane wave without pointing out that this is an approximation. The author uses expressions for radiation stress in progressive waves. In regions around breakwaters because reflected waves are present, the progressive wave expressions are not exact.

All these points are perfectly acceptable in an undergraduate teaching text, though not in a book for researchers. If one's objective is to get a feel for this subject by comparing the results of simple theory applied to different configurations, this is an admirable book (even for consulting engineers). If one wishes to understand the physical processes of the real life situation this book might be too superficial.

Consequently it is an excellent reference for anyone (including consultants and researchers) wanting a quick handle on the subject using linear or simple theory. But the author does not give sufficient warning to the reader that non-linear methods required for solving the non-linear equations presented in the book (but not programmed) are very different from the linear methods he gives. (Some of these difficulties are hinted at in his comparison of finite difference schemes for the one dimensional advection equation, applied to the transport of pollutants.) In general, the author's methods are practical and straightforward.

There is a disappointingly short list of 23 references, for the whole book, and these are not linked into the text, in effect thus reducing to a bibliography. Important concepts, for example the Lax-Wendroff finite difference scheme and the Shields sediment diagram are mentioned briefly (fair enough), but with no references where the reader can find further information. The index is rather terse.

We do not know of a comparable book on the same subject which is so concise, covers so many topics and gives so much BASIC software for use as a teaching tool. Unfortunately, the book is somewhat expensive to use as a text on which to base a microcomputer course on coastal engineering.

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