

## BOOK REVIEW

**Engineering Hydrology—Principles and Practices**—by Victor Miguel Ponce, Published by M/s Prentice Hall, Englewood Cliffs, New Jersey 07632, U.S.A. Hard Bound, Cost US \$ 59.95 Pages 640, Year 1989.

This is a very much welcome publication providing under one cover a balanced treatment of basic principles and current practices in engineering hydrology, particularly to cater for students at undergraduate level. The Author has departed from the classical approach of coverage of hydrology subject involving organisation of the topics accordingly to the various hydrological cycle. The subject matter has been arranged in this book on the concept of catchment scale covering small, medium and large catchment. The subject material in each chapter has been organised in a systematic manner and also include examples, questions, and problems as well as large number of references for further studies. Various conventional approaches such as rational method, curve number method, unit hydrograph method, frequency analysis, Muskingum Cunge method, etc. have been dealt with in detail. The Author has also introduced the concept of regional analysis and included treatment of snow hydrology, sub-surface water and sediment in the hydrological cycle. The concept of routing has been covered in 3 separate chapters dealing with reservoir routing, stream channel routing, and catchment routing. The chapter on hydrologic design criteria gives a very useful coverage of criteria adopted for engineering applications by various U.S. Federal Agencies namely: (i) NOAA National Weather Services, (ii) U.S. Army Corps of Engineers, (iii) U.S.D.A. Soil Conservation Services, (iv) U.S. Bureau of Reclamation, (v) Tennessee Valley Authority, (vi) U.S. Geological Survey.

This book has a very important feature i.e. inclusion of computer program documentation and listing. Ten computer programs as follows have been provided:

1. Program EH500 — SCS TR-55 Graphical Method for Peak Discharge Determination in Small and Midsize Urban Catchments
2. Program EH600A — Flood Frequency Analysis by the Log Pearson III method
3. Program EH600B — Flood Frequency Analysis by the Gumbel Method
4. Program EH700A — Correlation Coefficient of the Joint Probability Distribution of Monthly (or seasonal) Runoff volume
5. Program EH700B — Two-Predictor-Variable Nonlinear Regression
6. Program EH800 — Reservoir Routing by Storage Indication Method
7. Program EH900 — Stream Channel Routing with the Constant-Parameter Muskingum-Cunge
8. Program EH1000A — Catchment Routing by the Method of Cascade of Linear Reservoirs
9. Program EH1000B — Two-plane Linear Kinematic Catchment Routing Model
10. Program EH1000C — Two-plane Linear Diffusion Catchment Routing Model

This book is not only a good text book for undergraduate study or a reference source for graduate students, but it also is a very useful reference source for practising engineers, and is highly recommended.

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**PRINCIPLES OF SURFACE WATER QUALITY MODELLING AND CONTROL**—by Robert, V. Thomann and John. A. Mueller, Happer & Row Publishers, New York, USA, 1987, pages 644.

Water quality in flowing water is closely linked to the total water quality in the basin and hence it becomes imperative that water quality assessment and river basin planning are closely related. For any proper river basin planning, whether long range or short term, before going into alternative plans for development it is very essential to combine it with water quality problems hydrology and analyses. Development of the computer and the mathematical techniques that accompanied it, especially numerical methods for solving previously intractable problems, quickly effected a change in water resources technology. Methods were developed for solving large sets of simultaneous algebraic equations and finite difference representations of more complex linear and non-linear differential equations. Researchers and field engineers at once recognized the potential of the methods to reduce the burden of work and to expedite solutions to the more difficult problems posed by a society that was becoming exponentially more complex. This was a bright beginning of water quality modelling. Water quality modelling assists decision makers.

The modelling of surface water quality has a two fold result :

1. A better understanding of the mechanisms and interactions that give rise to various types of water quality behaviour, such understanding to be sharpened by the formulation and testing of hypothesis of the cause-effect relationships between residual inputs and cause-resulting water quality,
2. A more rational basis for making water quality control decisions, such a basis to include a defensible, credible, predictive framework within the larger framework of cost-benefit analysis.

This book has been written to meet a very simple need—dissemination of the fundamentals and principles which underline the mathematical modelling techniques used to analyze the quality of surface waters.

The book opens with an introductory chapter on water quality engineering and its objectives. The principal desirable uses of water, principal pollution problems, the uses affected and associated water quality variables have been discussed. The waste load allocation (WLA) principles and WLA steps are lucidly described. The basic definitions like model, calibration and verification are explained. The point source mass loading, tributary mass loading rates, intermittent mass loading rates have been presented with actual numerical examples. The examples which have been taken for illustration are easily understandable and can be simply used for specific problems. Chapter 2 brings out the river hydrology and flow giving low-flow frequency analysis, empirical flow estimation, hydrologic geometry and concept of travel time, depth and velocity estimates including effect of land use on river flow. A very practical application of discharge of residual material into rivers with numerical example has been explained. The changes in water quality downstream of point source for conservative and non-conservative substances with solved examples is given. Water quality response to distributed sources and effect of spatial flow variations on water quality with multiple sources is explained. Time variable analysis and planning of dye studies with engineering controls is brought out.

The chapter 3 is devoted to 'Estuaries, Bays and Harbours'. Physical aspects of estuaries, estuarine hydrology, tides and tidal currents are lucidly explained. Distribution of water quality in estuaries with water quality due to point sources, distributed sources, multiple sources is brought out. Estimation of tidal dispersion coefficient with intricate mathematics is brought out.

Sample problems of finite difference modelling of estuarine water quality using mass balance technique is arrived at. Time variable aspects of estuaries are also given. The chapter shall find use by engineers engaged in estuarine management. The chapter 4 is focussed at 'Lakes' bringing out physical and hydrologic characteristics of lakes, lake wise water quality response to inputs and finite difference steady state lake models. The concepts of evaporation from lakes, temperature stratification, lakes as completely mixed system, response to an impulse inputs, lakes in series etc. are brought out. The explanation of two layered, lakes, embayment of lakes and multi-dimensional lakes is nicely given.

The chapter 5 is devoted to indicator bacteria, pathogens and viruses. The indicator bacteria, bacteriological standards, pathogenic bacteria, viruses are defined. The inputs of organisms with point source inputs combined and separate sewer inputs and input load calculations are given. The organisms decay rate with bottom sediments as a reservoir of organisms is attended to. Fate of organisms in rivers and stream, estuaries and lakes are lucidly explained with sample problems. The environmental controls are also given. The most important concept of 'Dissolved oxygen' (DO) has been stressed in Chapter 6. Principal components of DO analysis like DO criteria and standards, sources and sinks of DO, dissolved oxygen analysis in streams and rivers with single point source, multiple point source, distributed sources sinks of DO and BOD, total DO deficit response are nicely explained. Similar analysis for tidal rivers and estuaries; lakes and reservoirs are also given. Practical applications like engineering control for DO are also explained. This chapter is very useful for any person who is even remotely interested in water quality.

The chapter 7 is concentrating on phenomena of 'Eutrophication' giving mechanism of eutrophication, external sources of nutrients, controlling nutrients for different water bodies, simplified lake phytoplankton models, nutrient and phytoplankton interactions, phytoplankton-DO relationships and some simplified modelling exercises. Various eutrophication control techniques are also brought out. The chapter 8 details the description of 'Toxic substances'. Various chemical water quality criteria and standards, principal physico-chemical components of toxic substances analysis, and toxic substances modelling in various water bodies is brought out with methods to control toxic substances. The last chapter i.e. chapter '9' is devoted to 'Temperature modelling'. The significance of water temperature, sources and sinks of temperature, heat balance equations, temperature models and practical methods to reduce excess temperature are clearly explained.

The book is an excellent treatise for water quality modellers. The book will definitely find favour with the undergraduated and postgraduate students because of its well thought information and sample examples. The book has been written in a format so that it can serve as a text book for postgraduate students and reference material for the undergraduate students. The book is highly recommended for anybody who is responsible for maintaining the water quality of surface water. The presentation is simple and lucid for advanced as well as developing countries however major portion of book uses advanced mathematics; the task has been simplified by giving number of practical sample examples.

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