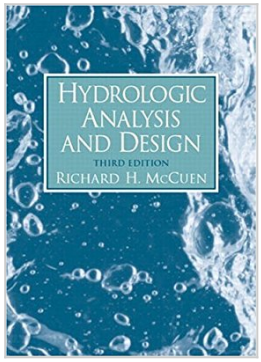

Hydrologic Analysis and Design (3rd Edition)

By Richard H. McCuen

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This book provides a real-world, applications-oriented introduction to engineering hydrology with an emphasis on design. Coverage includes the important hydrologic processes (highlighting watersheds), the effects of land use change (including its detection and modeling), and the ethics and professionalism of a practicing hydrologist. For professionals in civil engineering, geology, environmental science, forestry, or geography who need a good reference on hydrologic analysis and design.

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Hydrologic Analysis and Design (3rd Edition) By Richard H. McCuen Bibliography

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Editorial Review

From the Back Cover

Hydrologic Analysis and Design provides an introduction to the development and use of engineering design methods. With an emphasis on application, both students and practicing professionals will benefit from the detailed procedures for design. Realistic case-study examples demonstrate the application of widely used hydrologic models, including peak discharge, hydrograph, and design-storm computer methods. The TR-55 and TR-20 computer methods based on runoff curve number hydrology are presented. All phases of the hydrologic cycle are discussed, with an emphasis placed on small watershed design, urban hydrology, and storm water management. Methods for river reach and reservoir storage routing are detailed.

Outstanding features of the text include:

- Design orientation, enabling the student to make the transition from classroom to professional practice.
- Up to 25 worked examples per chapter, with many of these detailing real-world applications.
- Practical application exercises with end-of-book answers in most sections of the book.
- Up to 77 end-of-chapter quantitative assignments that will help students practice analysis and design procedures.
- An introduction to professional ethics and an ethics discussion question that involves technical issues of the chapter.

Readers of this book will learn to:

- Statistically analyze hydrologic data for the development of prediction models.
- Delineate a watershed and compute important watershed characteristics, including the time of concentration.
- Develop regionalized peak discharge equations.
- Design drainage systems for small developing watersheds.
- Design storm water detention basins to control the hydrologic effects of land development.
- Develop design hydrographs for large watershed analyses or measure the effects of land use change.
- Route design hydrographs through stream channels and storage structures.
- Estimate quantities of erosion from land surfaces.

Hydrologic Analysis and Design is intended for a first course in hydrology. It introduces the student to the physical processes of the hydrologic cycle, the computational fundamentals of hydrologic analysis, and the elements of design hydrology. Although the sections of the book that introduce engineering design methods are intended for the engineering student, the concepts and methods will also be of interest to, and readily understood by, students in other disciplines including geology, geography, forestry, and planning. The material is appropriate for undergraduate and graduate students as well as for the practitioner interested in reviewing the fundamentals of hydrology. While computers are widely used in the practice of hydrology, knowledge of computer hardware, software, or programming languages is not necessary to use this book; however, computer literacy will certainly facilitate problem solving.

A number of factors influenced the structure of the book. Chapter 3 introduces watershed characteristics,

Chapter 4 addresses precipitation, Chapter 6 deals with topics in ground water hydrology, Chapter 14 provides a brief overview of evaporation, and Chapter 15 discusses erosion. Given the interdependence of these processes, other factors also determined the book's structure. Because of the diverse ways that hydrology can be taught, flexibility was a criterion used in structuring the book. The need for flexibility led to a book comprising 15 chapters. To the extent possible, I tried to make the chapters self-contained so that the order in which the topics are presented is not constrained by the book's structure. Given the orientation of the book towards design, I carefully examined the type of design problems that were to be emphasized. Land development and urban hydrology are very important aspects of hydrology, and therefore many of the topics that are used in such design work were placed at the beginning of the book. Thus, topics such as flood frequency analysis (Chapter 5) and hydrograph separation and synthesis (Chapter 9) were placed before snowmelt runoff estimation (Chapter 12) and evaporation (Chapter 14). I hope that the criteria that influenced my decision on how to structure the book resulted in a favorable balance for both teaching and learning hydrology.

Material for most topics in the fundamentals of hydrology can be divided into four areas: physical processes, measurement and collection of data, model conceptualization and data analysis, and design or solution synthesis. A basic knowledge of the physical processes is necessary to properly analyze data or perform design work. Thus, I have tried to provide a discussion of the physical processes associated with the components of the hydrologic cycle. The discussion is limited to the dominant factors, especially those measurable characteristics that are used in design. The measurement and collection of data is one area of hydrology where many hydrologists are employed. This fact is not emphasized here because the book is intended to be a student's first exposure to topics in hydrology. The title, "Hydrologic Analysis and Design," indicates that the emphasis has been placed on the last two of the four areas identified, namely model conceptualization and data analysis, and design or solution synthesis. In most chapters a brief section that discusses analysis and synthesis is included. Emphasis has been placed on analysis and synthesis because I believe that knowledge of these subjects is most important for the beginning student. Also, it is these topics that students usually find most interesting; thus, by emphasizing these areas I hope that the book will motivate students toward hydrologic practice. I believe that detailed discussions of the physical processes and data collection should follow the introductory discussion of the methods of analysis and design. This belief shaped the emphasis that is placed on the topics covered.

Educational programs in engineering and the sciences are often criticized as being too theoretical. Practitioners often complain that recent graduates of engineering programs cannot perform basic design computations. *Hydrologic Analysis and Design* has been structured to overcome this problem. While the text is not intended to be a design manual, a number of design methods are included. Although all of the details of these design methods are not given, the material provided should demonstrate to the student that design computations are not difficult and that the design methods have a basis in the fundamental concepts of the hydrologic cycle.

Students of engineering hydrology and the hydrologic sciences often fail to recognize the interconnection between topics discussed in an introductory course in hydrologic analysis and design. Engineering design requires knowledge of watershed characteristics, rainfall, frequency concepts, and the processes that control runoff. In an attempt to alleviate this problem, I have developed a series of projects that are presented in a supplementary manual. I have used these projects over the last few years with much success. While a few students complain of the effort required, almost all of them agree that the project approach is both interesting and educational. The "real world" flavor of the project approach to learning hydrology definitely serves to inspire interest in hydrologic analysis and design. I highly recommend the project approach.

In addition to the project approach to learning, I have included two other items that are different from most books on hydrologic analysis and design. Each chapter includes a series of multiple-choice review questions.

These are designed to encourage the student to understand that the qualitative concepts of hydrology are just as important as the quantitative design methods. If these review questions are assigned at the end of the discussion of a chapter, they can also serve to tie together the different concepts discussed in the chapter. I have included material on ethical issues in hydrology (the last few sections of Chapter 1). The purpose of the material is to introduce the student to another side of hydrologic practice, namely the societal or value element that accompanies every hydrologic analysis and design. While the book is devoted to the quantitative aspects of hydrology, the practitioner should always give consideration to the societal effects of a project. Those involved in the practice of hydrologic analysis and design do not work in a social vacuum: The presented material will make this point to the student. Students always enjoy the lecture that is associated with Chapter 1, and some former students have told me that it was the most important lecture. Additionally, each chapter includes a discussion question that poses a situation that requires knowledge of values and value decision making.

I want to acknowledge the help of the following people who reviewed drafts of selected chapters of the first edition: Henry Anderson, Mark Hawley, David Murray, Walter Rawls, and Peter Waldo. Their comments contributed to the success of the first edition. I also greatly appreciate the helpful suggestions of the following reviewers of a prospectus of this third edition: Arthur C. Miller, Pennsylvania State University; Paul Sturdevant Rees, University of Massachusetts; Jeffery D. Niemann, Pennsylvania ^-..~State University; Oktay Guven, Auburn University; and Fritz R. Fiedler, University of Idaho. Of course, I remain responsible for all errors or omission of topics. I also want to acknowledge the many students who have read drafts of various sections of the manuscript. The final product is much improved because of their efforts.

RICHARD H. McCUEN
College Park, MD

Users Review

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