# Table of Contents

## Volume I

1. Introduction
   1.1 Book Overview
   1.2 The role of hydraulics experiments
   1.3 Approach
   1.4 Structure of volume I
   References

2. Hydraulic Flows: Overview
   2.1 Introduction
   2.2 Turbulent flows in hydraulic engineering
   2.3 Turbulence mechanics: Concepts and descriptive frameworks
   2.4 Open-channel flows
   2.5 Complex flows
   2.A Appendix
   Notation
   References

3. Similitude
   3.1 Introduction
   3.2 Basics
   3.3 Dynamic similitude from flow equations
   3.4 Water flow
   3.5 Multi-phase flow and transport processes
   3.6 Addressing similitude shortcomings
   3.A. Appendix: Dimensional analysis
   Notation
   References

4. Selection and design of the experimental setup
   4.1 The experimental process
   4.2 Experimental setup components
   4.3 Laboratory facilities
   4.4 Instrument selection
   4.5 From signals to data references

5. Experiment execution
   5.1 Instrument-flow and facility-flow interactions
   5.2 Conducting the experiment
   5.3 Field experiments
   5.4 Complex experiments
   5.5 Interaction of experiments with numerical modeling
   References

6. Data analysis
   6.1 Introduction
   6.2 Basic concepts, terminology, and notation in probability and statistics
6.3 Descriptive statistics and exploratory data analysis
6.4 Hypotheses, statistical significance, and interval estimates
6.5 Bootstrapping
6.6 Regression
6.7 Bayesian inference
6.8 Extended examples in regression
6.9 Classification analysis: Logistic regression, linear discrimination analysis, and tree classification
6.10 Machine (or statistical) learning approaches
6.11 Data conditioning: Time series and filtering
6.12 Time series and spectral analysis
6.13 Spatial interpolation, kriging, and spatial derivatives
6.14 Identification of coherent structures
6.15 Final comments
6.A Appendix
References

7. Uncertainty analysis for hydraulic measurements
7.1 Introduction
7.2 Concepts and terminology
7.3 UA implementation
7.4 Uncertainty inferences using intercomparison experiments
7.5 Practical issues
References

8. Hydroinformatics applied to hydraulic experiments
8.1 Introduction
8.2 Hydroinformatics
8.3 Digital environmental observatories
8.4 Outlook
References