

Preface

My aim in writing this book is to introduce the fundamentals of environmental monitoring based on electronic sensors, instruments, systems, and software that allow continuous and long-term ecological and environmental data collection. I have tried to accomplish two objectives, as reflected in the two sections of this book. In Section I, starting with sensors, I progressively develop the concepts of transducers, signal conditioning, data acquisition, transmission, leading to entire systems and ending with database servers, web servers, and data repositories. After laying this foundation, in Section II, I cover a variety of sensors and systems employed to measure environmental variables in air, water, soils, vegetation canopies, and wildlife observation and tracking.

I present state-of-the-art technology, using a practical and comprehensive approach in my discussions, which include applications to many environmental and ecological systems. My preference has been to explain the fundamentals behind many sensors and systems, so that the reader can gain an understanding of the basics. As with any other endeavor, specialized references supplement this basic material according to specific interests.

This book is based on my experience developing systems for ecological and environmental studies, particularly those leading to Environmental Conditions Online for the DFW MetroPLEX (ECOPLEX) (<http://www.teo.unt.edu/ecoplex/>) and the Texas Environmental Observatory (TEO; <http://www.teo.unt.edu>). It is my intent to provide detailed coverage while offering a broad perspective of environmental monitoring; naturally, I emphasize those topics with which I am more familiar. In the last few years, I employed successive drafts of this book, while developing a course in environmental monitoring for undergraduate and graduate students in electrical engineering and environmental science.

Although I designed this book to serve as a textbook, I have structured the material in such a way that it could serve as a reference book for the monitoring practitioner. The material is organized into 14 chapters; therefore, when used as a textbook, it can be covered on a chapter-per-week basis in a typical 14-week semester. Section I includes problems that can be assigned as homework exercises.

I hope to reach out to students and practitioners worldwide who are interested and engaged in efforts to develop, employ, and maintain environmental monitors. This book includes examples of low-cost and open-access systems that can serve as the basis for learning tools for the concepts and techniques described in this book.