

# PREFACE

Research and development over the past four decades has led to significant advances in the field of *Digital Signal Processing*. A single textbook covering the basics of linear continuous-time and discrete-time systems and their applications along with MATLAB programs is the need of the day. The authors have made a sincere attempt to meet these requirements.

The authors have developed this book from their lecture notes prepared for teaching the undergraduate- and postgraduate-level courses over the past several years. This book is suitable as a text for two subjects—*Signals and Systems*, and *Digital Signal Processing* in BE, AMIE and Grade IETE degree programs, and for the subject *Advanced Digital Signal Processing* in the ME degree program. It will also serve as a useful reference to those preparing for competitive examinations.

The various concepts of the subject are arranged logically and explained in a simple reader-friendly language. For proper understanding of the subject, a large number of problems with their step-by-step solutions are provided for every concept. Illustrative examples are discussed to emphasize the conceptual clarity thereby presenting typical applications. Solutions to university problems have been included in many of the chapters in this edition. A set of questions and exercises at the end of each chapter will help the readers test their understanding of the subject.

The book is divided into 16 chapters. **Chapter 1** introduces classification of signals and systems. A section on continuous-time and discrete-time signals is newly added and state-variable technique has been elaborated with examples in this chapter. **Chapter 2** is devoted to the Fourier analysis of periodic and aperiodic continuous-time signals and systems. **Chapter 3** focuses on the application of Laplace transform to system analysis. **Chapter 4** is concerned with the evaluation of  $z$ -transform and inverse  $z$ -transform. **Chapter 5** discusses linear time-invariant systems. Additional sections such as discrete convolution, solution of linear constant coefficient difference equation, frequency domain representation of discrete-time signals and systems have been included in this chapter. **Chapter 6** concentrates on discrete and fast Fourier transforms. **Chapter 7** explains finite impulse response (FIR) filters. **Chapter 8** discusses infinite impulse response (IIR) filters. **Chapter 9** deals with realisation of digital linear systems. **Chapter 10** includes effects of finite word length in digital filters. **Chapter 11** describes multirate digital signal processing. **Chapter 12** covers spectral estimation. Also, optimum digital filters are discussed in this chapter. **Chapter 13** contains adaptive filters. **Chapter 14** presents the applications of digital signal processing. Application of DSP in Biomedical Engineering and Wireless Communication is added in this chapter. **Chapter 15** discusses about digital signal processors. **Chapter 16** elaborates on MATLAB programs with additional programs.

The website for this book can be accessed at <http://www.mhhe.com/salivahanan/dsp2e> and contains the following material:

**For Instructors**

- Solution manual
- Power Point lecture slides

**For Students**

- Algorithmic problems

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Readers are welcome to give constructive suggestions for the improvement of the book.

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