Preface

This book is designed and developed as an introductory text on the fundamental aspects of rocket propulsion for both undergraduate and graduate students. It is believed that the practicing engineers in the field of space engineering can benefit from the topics covered in this book. A basic knowledge of thermodynamics, combustion, and gas dynamics is assumed.

I have been teaching courses in aerospace propulsion to undergraduate and graduate students for the last 20 years. I felt a need to codify my accumulated lecture notes, which have undergone considerable modifications, in a textbook form for the benefit of students who have completed the course. The main motivation for writing this book was to emphasize the basic principles of rocket propulsion, which may encourage students to take up this subject, while inculcating in students confidence in their innate capabilities.

Chapter 1 starts with a brief introduction to rocket propulsion, covering its application both in aerospace and nonaerospace branches. A bird's-eye view of nonchemical rocket engines is provided in this chapter so that students can gauge the entire gamut of rocket propulsion. Subsequently, Chapter 2 covers aerothermodynamics, which is essential for an analysis of rocket engines. The basic principles of rocket propulsion, fundamentals of thermodynamics, chemistry and gas dynamics are discussed briefly in this chapter. The elements of rocket propulsion are discussed in Chapter 3. Performance parameters that are useful in characterizing rocket engines, namely, specific impulse, impulse-to-weight ratio, specific propellant flow rate, mass flow coefficient, thrust coefficient, characteristic velocity, and propulsive efficiencies, are defined and discussed. The main purpose of a nozzle in a rocket engine is to expand the high-pressure hot gases generated by the burning of a propellant to a higher jet velocity for producing the requisite thrust. This important component of the rocket propulsion system is covered in Chapter 4.