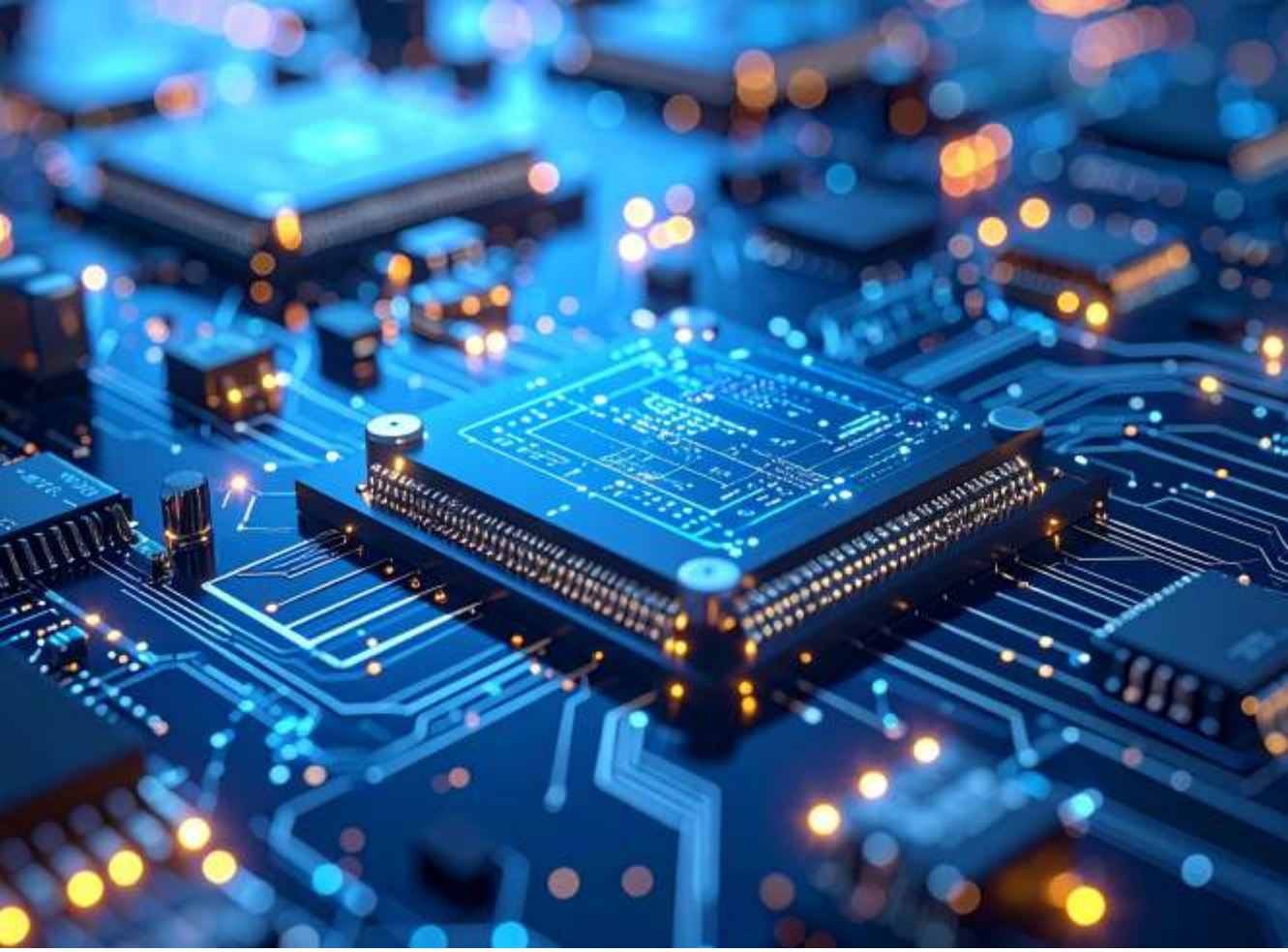

Applied Mathematics for Electronics and Communication Systems

Applications in Signal Processing, Circuit Design, and Deep Learning

Kirti Verma
M. Sundarajan
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Editors

DeepScience

Applied Mathematics for Electronics and Communication Systems: Applications in Signal Processing, Circuit Design, and Deep Learning

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Preface

Mathematics is the silent architect behind every pulse of signal, every modulated wave, and every digital circuit in the world of electronics and communication engineering. It provides not only the language through which complex physical phenomena are expressed but also the foundation upon which modern technologies are built. From Fourier analysis and linear algebra to probability theory and differential equations, mathematical principles empower engineers to analyze, model, optimize, and innovate with precision and confidence.

This book "Mathematical Foundations and Their Pivotal Role in Electronics and Communication Systems" aims to bridge the often-perceived gap between abstract mathematical theory and its real-world application in electronics. It is designed for students, educators, researchers, and industry professionals who seek a deeper understanding of how core mathematical concepts drive progress in areas such as signal processing, communication systems, control theory, embedded systems, and semiconductor technology.

Each chapter focuses on a key mathematical domain and its specific contributions to engineering applications. Real-life examples, case studies, and practical illustrations are integrated to show how theory transforms into technology. Whether it is the use of Laplace transforms in system analysis, matrix operations in MIMO communications, or calculus in analog circuit designs this book unfolds the indispensable synergy between mathematics and engineering.

We hope this work inspires readers to appreciate the elegance of mathematics as not just a tool, but as a critical enabler of innovation in electronics and communication engineering.

KIRTI VERMA
M. SUNDARAJAN
M. ARUNKUMAR

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Writing this book has been a journey of exploration, reflection, and deep appreciation for the foundational role that mathematics plays in the world of electronics and communication engineering. This endeavor would not have been possible without the support, encouragement, and inspiration of many individuals and institutions.

First and foremost, we express our sincere gratitude to our mentors and teachers, whose guidance over the years shaped our understanding of both mathematics and engineering. Their passion for teaching and clarity of thought served as a strong motivation to undertake this work.

We extend our heartfelt thanks to our academic institutions for providing a stimulating environment conducive to research and learning. The resources, facilities, and scholarly community played a key role in the development of this manuscript.

We are also grateful to the students, whose curiosity and insightful questions continually inspired us to delve deeper and connect mathematical theory with practical applications. Their enthusiasm reminded us of the importance of presenting complex concepts in a clear, accessible manner.

Special thanks to our families and loved ones for their unwavering patience, understanding, and encouragement throughout the writing process. Their support gave us the strength to stay focused and committed to this project.

Lastly, we acknowledge the countless mathematicians, scientists, and engineers past and present whose pioneering work laid the foundation for the knowledge shared in this book.

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