

Modern Control Methods for Power Electronics

Theories and Applications

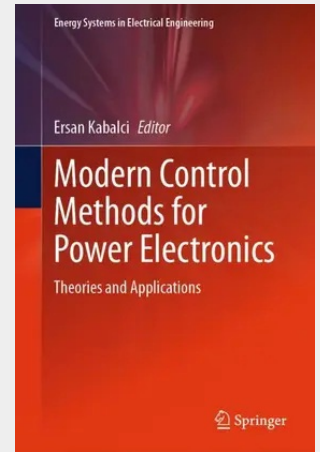
This book is designed to serve both beginners and experienced professionals, offering a balanced blend of theoretical foundations, practical applications, and state-of-the-art control techniques. It investigates a wide range of control methods essential for managing power converters, beginning with an introduction to their operation and fundamental principles. The chapters on Linear and Nonlinear Control establish the essential groundwork, guiding readers through the core concepts and highlighting the challenges associated with controlling the inherently complex and nonlinear behavior of power electronic systems. Building on these fundamentals, this book explores Digital Control, explaining how digital controllers, microprocessors, and DSPs have transformed power electronics by enabling high precision, greater flexibility, and improved reliability compared to traditional analog approaches.

To address stability in nonlinear environments, a dedicated chapter on Lyapunov-based Control introduces advanced stability analysis techniques that are crucial for ensuring reliable operation under diverse conditions. This book also presents a practical discussion of the Extended Kalman Filter, covering its role in state estimation and noise reduction—an essential tool for sensorless control of converters, drives, and renewable energy systems.

As modern power systems increasingly depend on automation and adaptability, the chapters on Fuzzy Logic Control and Artificial Neural Networks provide insights into intelligent control strategies that do not rely exclusively on precise mathematical models. These soft-computing approaches offer enhanced robustness and adaptability, allowing power converters to respond efficiently to real-time operating changes and environmental uncertainties.

This book further examines Adaptive and Robust Control methods, which are indispensable in systems with parameter variations, unknown disturbances, or high operational variability. A detailed discussion of sensorless control highlights cost-effective approaches that reduce dependence on physical sensors while improving system reliability and efficiency—particularly relevant in motor drives and renewable energy applications.

This book is designed to serve both beginners and experienced professionals, offering a balanced blend of theoretical foundations, practical applications, and state-of-the-art control techniques. It investigates a wide range of control methods essential for managing power converters, beginning with an introduction to their operation and fundamental principles. The chapters on Linear and Nonlinear Control establish the essential groundwork, guiding readers through the core concepts and highlighting the challenges associated with controlling the inherently complex and nonlinear behavior of power electronic systems. Building on these fundamentals, this book explores Digital Control, explaining how digital controllers, microprocessors, and DSPs have transformed power electronics by enabling high precision, greater flexibility, and improved reliability compared to traditional analog approaches. To address stability in nonlinear environments, a dedicated chapter on Lyapunov-based Control introduces advanced stability analysis techniques that are crucial for ensuring reliable operation under diverse conditions. This book also presents a practical discussion of the Extended Kalman Filter, covering its role in state estimation and noise reduction—an essential tool for sensorless control of converters, drives, and renewable energy systems. As modern power systems increasingly depend on automation and adaptability, the chapters on Fuzzy Logic Control and Artificial Neural Networks provide insights into intelligent control strategies that do not rely exclusively on precise mathematical models. These soft-computing approaches offer enhanced robustness and adaptability, allowing power converters to respond efficiently



192,59 €

179,99 € (zzgl. MwSt.)

vorbestellbar, Erscheinungstermin ca. August 2026

Artikelnummer: 9789819219735

Medium: Buch

ISBN: 978-981-9219-73-5

Verlag: Springer Nature Singapore

Erscheinungstermin: 22.08.2026

Sprache(n): Englisch

Auflage: Erscheinungsjahr 2026

Serie: Energy Systems in Electrical Engineering

Produktform: Gebunden

Seiten: 520

Format (B x H): 155 x 235 mm

