Dr. Mohammad Atif Siddiqui, *Associate Professor & Head of the Department of Electrical Engineering, Integral University, Lucknow, is a dedicated academician and researcher in Control & Automation Engineering within the broader domain of engineering and applied sciences. He earned his PhD from the National Institute of Technology (NIT) Silchar, India, which providing him with a strong foundation in control systems, automation, and interdisciplinary research. His interests include emerging technologies, intelligent control, and sustainable, application-oriented engineering solutions. Dr. Siddiqui has actively contributed to research through peer-reviewed journal publications and conference presentations. He has supervised many PhD scholars, postgraduate dissertations, and undergraduate-level projects. Additionally, he has been actively involved in academic program development, professional training, and collaborative research initiatives.*

Dr. Mohd Khursheed Siddiqui *is an Associate Professor in the Department of Electrical Engineering at Integral University, Lucknow, India, with over 15 years of experience in teaching, research, and academic administration. He holds a PhD in Electrical Engineering from Integral university, Luckow in the field of Renewable Energy and earned his postgraduate and undergraduate degrees in Electrical Engineering, from Aligarh Muslim University, Aligarh, India, with a strong academic foundation in power systems and Drives. He previously served as Head of the Department of Electrical Engineering for three years Dr. Khursheed has supervised numerous PhD scholars, postgraduate dissertations, and undergraduate-level projects. He has published several research papers in peer reviewed reputed journals and IEEE-indexed conferences and has edited one academic book. His research interests include renewable energy integration, electric vehicle technology, DC microgrids, multilevel inverters, EV-to-grid systems, and AI-based power management.*

BOOK RIVERS
WE CREATE READERS

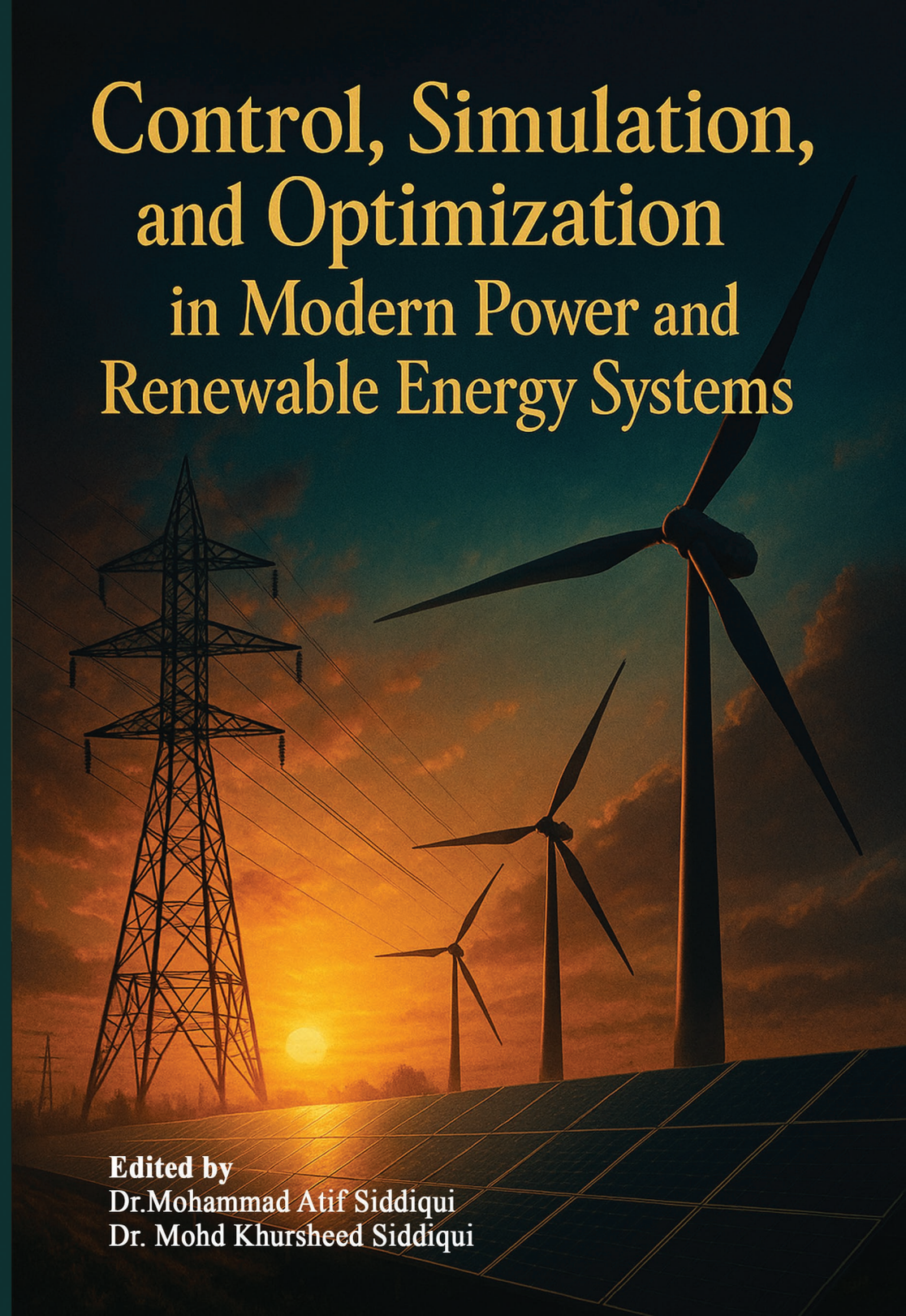
BOOK AVAILABLE
GET IT ON Google Play
Flipkart
amazon

9 789368 846130

₹ 375/-

CONTROL, SIMULATION, AND OPTIMIZATION IN MODERN POWER AND RENEWABLE ENERGY SYSTEMS

Control, Simulation, and Optimization in Modern Power and Renewable Energy Systems



Edited by
Dr.Mohammad Atif Siddiqui
Dr. Mohd Khursheed Siddiqui

Control, Simulation, and Optimization in Modern Power and Renewable Energy Systems

Edited by

Mohammad Atif Siddiqui
Department of Electrical Engineering, Integral University, Lucknow, UP, India

Mohd Khursheed Siddiqui
Department of Electrical Engineering, Integral University, Lucknow, UP, India

BOOK RIVERS
WE CREATE READERS

No part of this publication may be reproduced, transmitted or stored in a retrieval system, in any form or by any means, electronic, mechanical, photocopying recording or otherwise, without the prior permission of the author.

Published by: - Book Rivers

Website: - **https://www.bookrivers.com/**

Email: **publish@bookrivers.com**

First Print Edition - 2026

Copyright©: Authors

Title: Control, Simulation, and Optimization in Modern Power and Renewable Energy Systems

Authors: Mohammad Atif Siddiqui, Mohd Khursheed Siddiqui

All Rights Reserved

ISBN: 978-93-6884-613-0

MRP: 375/-INR

(Printed in India)

CONTENT

Chapter. No.	Title of the Chapter	Name of Authors	Pg. No.
1.	Load Frequency Control of Single Area Power System through PID Controller	Mohammad Atif Siddiqui Adab Ishtiyaq	1 - 21
2.	Proportional Integral Controller Based Electric Vehicle Charging System	Mohd Khursheed Siddiqui Gayanedar Bahadur Singh	22 - 36
3.	Performance Analysis of Transformer less Inverter Topologies for PV Applications	Yasmeen Fatima Mohammad Asim Atif Siddiqui	37 - 58
4.	Modeling and Analysis of Switch Reluctance Motor Drive for Hybrid Electric Vehicles Application	Prabhat Ranajan Sarkar Ujjawal Tripathi	59 - 74
5.	Modelling, Simulation and Dynamic Performance Analysis of Synchronous Generator	Mirza Mohd Shadab, Mohammed Asim	75 - 93
6.	Transformerless Inverter Topologies for Grid-Connected PV System	Mohammed Asim Mohd Amaan Khan	94 - 116

7.	Analysis and Implementation of Cascaded Multilevel Inverter Topologies for Solar PV Applications	Israr Amad Mohd Khursheed Salman Ahmad	117 - 132
8.	Fixed Head Multi-Hour Optimal Scheduling of Hydro-Thermal Power Plants Using Teaching-Learning-Based Optimization Algorithm	Israr Amad Kundan S	133 - 154
9.	Modulation and Control of Packed U Cell 7 Level Multilevel Inverter for Solar PV Applications	Prabhat Ranjan Sakar	155 - 175

Chapter – 7

Analysis and Implementation of Cascaded Multilevel Inverter Topologies for Solar PV Applications

Israr Amad, Mohd Khursheed, Salman Ahmad

[1,2,3] *Department of Electrical Engineering, Integral University, Lucknow, UP, India, 226026*

Abstract: This paper presents a five level and seven level cascaded multilevel inverters. Seven level inverter has fewer harmonics as compared to three level and five level inverters. Also due to reduced number of components count, the cost of inverter is reduced as compared to normal same level inverter. As we go to the higher level of inverter the total harmonic distortion (THD) decreases. The requirement for filters is reduced when the voltage level is raised, and efficiencyis increased. This device is utilized in applications with larger power requirements, such as compound systems, solar systems, and flexible AC transmission systems. Switching frequencies are not as restricted in low-power applications as they are in high-power ones. For minimizing harmonics in staircase waveforms, several control approaches can be used. In comparison to the diode clamp and flying capacitor, controlling a cascaded multilayer inverter is relatively simple.

In this study the performance of three, five and seven level cascaded H- bridge multilevel inverters have been analyzed with the help of MATLAB/SIMULINK.

1. Introduction

Connecting one power semiconductor switch directly to medium voltage grids is difficult due to low rating, production of common mode voltage, switching losses, requirement of switch with very low turn-on and turn-off time, problem of voltage sharing in series connected devices and introduction of large amount of higher order