ADVANCED PARADIGMS IN TRANSDISCIPLINARY RESEARCH

Edited by

Dr. Ranjan Kumar
Head of the Department & Associate Professor
Department of Mechanical Engineering
Swami Vivekananda University, Kolkata

Dr. Ashes Banerjee
Assistant Professor
Department of Civil Engineering
Swami Vivekananda University, Kolkata

MGM PUBLISHING HOUSE
JAIPUR – DELHI

Published by

MGM Publishing House
Durgapura, Jaipur-302015
Rajasthan, India

ISBN: 978-93-49468-95-5

DOI: 10.62823/MGM/2025/9789349468955

Edition: February 2025

Price: Rs. 1360/-

Printed by:
In-house-Digital
Jaipur-302018

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Thanks

Publisher

Preface

As science, technology, and sustainability continue to evolve, the need for groundbreaking solutions to global challenges has never been more pressing. The fusion of diverse fields—ranging from advanced engineering techniques to environmental conservation—has sparked innovative research with practical implications.

This book, Advanced Paradigms in Transdisciplinary Research, showcases a wide array of studies that emphasize the vital connections between sustainability, technological progress, and scientific exploration. The chapters present a rich tapestry of ideas, covering everything from solving complex mathematical equations to understanding the societal shifts brought about by urbanization. Key areas of focus include advancements in renewable energy, earthquake-resistant architecture, and the integration of additive manufacturing with Industry 4.0. Research on green manufacturing, lithium-ion battery impacts on soil, and industrial waste repurposing highlights efforts to reduce environmental harm while enhancing material performance.

Interdisciplinary exploration is at the core of this volume, addressing topics such as 3D lighting in animation, bioactive glass in medicine, and theoretical developments in topology and wave mechanics. This diversity underscores the broad applicability of scientific discovery across multiple domains. A strong emphasis on sustainability runs throughout the book, featuring discussions on energy-efficient technologies, AI-powered eco-friendly building designs, and visible light communication systems. By tackling urgent global issues like climate change, resource scarcity, and urban expansion, this collection contributes to the ongoing pursuit of a more sustainable future. The research compiled here reflects the dedication of scholars and professionals from diverse fields, all united by a shared commitment to advancing knowledge for the benefit of both society and the environment. We hope this book serves as an invaluable resource for academics, researchers, and industry leaders seeking to drive innovation and sustainability forward. We sincerely thank all contributors for their insights and efforts. Their dedication to progress and sustainability has enriched this work and will continue to inspire future collaborations and discoveries. Advanced Paradigms in Transdisciplinary Research is more than a compilation of ideas—it is an invitation to take part in the global movement toward a greener, more sustainable world.

Dr. Ranjan Kumar
Dr. Ashes Banerjee

Acknowledgement

I extend my heartfelt gratitude to Swami Vivekananda University, Kolkata, India, for their unwavering support and encouragement during the creation of “Advanced Paradigms in Transdisciplinary Research”. The university's enduring commitment to advancing education and research has profoundly influenced the direction and scope of this work.

We are especially grateful for the collaborative environment, resources, and inspiration provided by Swami Vivekananda University, Kolkata. Their contributions have been pivotal in enabling us to delve into and present the latest advancements and technologies spanning diverse fields of study.

It is our earnest hope that this book will serve as a meaningful resource for the university and the wider academic community, mirroring our collective dedication to fostering knowledge, innovation, and academic excellence.

I also extend my deepest appreciation to the esteemed external reviewers mentioned below for their meticulous evaluation and invaluable feedback. Their dedication to maintaining the highest scholarly standards has been instrumental in ensuring the academic rigor of this publication.

With sincere gratitude,

Dr. Ranjan Kumar
Dr. Ashes Banerjee

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