FOUNDATION OF MODERN PHYSICS

Concepts, Laws and Applications

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Foundation of Modern Physics: Concepts, Laws and Applications

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Foundation of Modern Physics: Concepts, Laws and Applications

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Preface

Physics forms the backbone of modern science and technology, providing a systematic understanding of nature through fundamental principles, mathematical formulations, and experimental evidence. Foundation of Modern Physics: Concepts, Laws, and Applications is designed to offer a comprehensive and coherent introduction to the core ideas that define contemporary physics and their relevance in today's scientific and technological landscape.

This book aims to bridge the gap between classical foundations and modern developments in physics. It covers essential topics such as classical mechanics, electromagnetism, thermodynamics, quantum mechanics, atomic and nuclear physics, and introductory concepts of relativity. Emphasis has been placed not only on theoretical understanding but also on practical applications that demonstrate how physical laws govern real-world phenomena and technological innovations.

The content is structured in a logical and student-friendly manner, beginning with fundamental concepts and gradually progressing to more advanced ideas. Mathematical treatments are presented with clarity, supported by illustrative examples, diagrams, and problem-solving approaches to strengthen conceptual understanding. Wherever possible, connections between theory and applications in engineering, material science, electronics, energy systems, and emerging technologies have been highlighted.

This book is primarily intended for undergraduate students of physics, engineering, and allied sciences. It will also serve as a valuable reference for postgraduate students, educators, and researchers seeking a concise yet thorough overview of modern physics. The authors hope that this text will not only enhance academic understanding but also inspire curiosity, critical thinking, and a deeper appreciation of the physical laws that shape our universe.

Acknowledgement

The completion of this book has been made possible through the support, guidance, and encouragement of many individuals and institutions. The authors express their sincere gratitude to all those who contributed directly or indirectly to the development of Foundation of Modern Physics: Concepts, Laws, and Applications.

We are deeply thankful to our teachers and mentors, whose insights, scholarly guidance, and passion for physics laid the foundation for this work. Their influence continues to shape our understanding of both classical and modern physics.

We also acknowledge the valuable support of our colleagues and peers for their constructive feedback, thoughtful discussions, and encouragement throughout the preparation of this manuscript. Special thanks are extended to the academic community and researchers whose pioneering work and publications served as key references and inspiration.

Our heartfelt appreciation goes to the publisher and editorial team for their professional support, meticulous review, and dedication in bringing this book to fruition. Their efforts have greatly enhanced the clarity, organization, and presentation of the content.

Finally, we extend our sincere gratitude to our families and well-wishers for their patience, motivation, and unwavering support during the course of this work. Any errors or omissions that may remain are solely the responsibility of the authors, and we welcome constructive suggestions for improvement in future editions.

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Dr. Ghamendra Kumar Sahu is an Educator and Researcher in Biophysics. He was born on 8 October in Rajnandgaon, Chhattisgarh. He Serving in Higher Education Department Government of Chhattisgarh. He holds an M.Sc. in Physics, Ph.D., and B.Ed. His achievements include five granted design patents, one utility patent, one UK design patent, and one copyright. He has published ten research papers in SCI, UGC CARE and peer reviewed journals and has contributed three book chapters. He has participated in ten national and three international conferences, and serves as a member of the editorial board of two science journals. Dr. Sahu has received several awards, Including the Young Scientist Award (CGCOST, Government of Chhattisgarh; Government Digvijay PG Autonomous College, Rajnandgaon, Chhattisgarh, and 360 Research Foundation), Bharat Gaurav Samman, Golden Peacock Rashtriya Ratna Award, and Rashtriya Pratishtha Puraskar. He is also the author of the books Research Methodology (Hindi Language), Wireless Communication and Network, Bastar – Kal, Aaj aur Kal, and Physical Chemistry in Practice: Thermodynamics, Kinetics and Quantum Theory.

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