Indian Knowledge Systems and Emerging Technologies

From Ancient Wisdom to Modern Innovations

Dr. Roop Raj
Dr. Rajendra K. Jain
Dr. Amitava Biswas
Venu Gopal Mutyala

NOTATION TRENDPLUS PUBLISHING PVT. LTD.

Indian Knowledge Systems and Emerging Technologies: From Ancient Wisdom to Modern Innovations

Authors

Dr. Roop Raj
Associate Professor in Economics, Hemvati Nandan Bahuguna Garhwal University, Uttarakhand.

Dr. Rajendra K. Jain

Professor of Chemistry, Gyan Sagar College of Engineering, Sagar, Madhya Pradesh.

Dr. Amitava Biswas

Faculty, Department of Computer Science, Vivekananda College Thakurpukur, 269, Diamond Harbour Road, Thakurpukur, Kolkata, West Bengal, India.

Venu Gopal Mutyala

Associate Professor of Mathematics, Ramachandra College of Engineering (Autonomous), Eluru, Andhra Pradesh, India.

NOTATION TRENDPLUS PUBLISHING
WHERE IDEAS MEET IMPACT

Published, marketed, and distributed by:

NOTATION TRENDPLUS PUBLISHING PRIVATE LIMITED

Odisha, India.

Website: https://notationpublishing.com

E-Mail Id: editor@notationpublishing.com

WhatsApp: +91 8260243321, 8018243321

Price: 299/-

ISBN: 978-81-17045-07-7

Copyright © Dr. Roop Raj, Dr. Rajendra K. Jain, Dr. Amitava Biswas, Venu Gopal Mutyala, 2026. All rights reserved.

No part of this publication may be reproduced, stored or transmitted in any form without written permission, except as permitted by applicable law or license.

Published by: NOTATION TRENDPLUS PUBLISHING PRIVATE LIMITED

PREFACE

The rich intellectual heritage of India has made remarkable contributions to the development of human civilization through its profound understanding of mathematics, astronomy, philosophy, linguistics, medicine, logic, and scientific reasoning. Indian Knowledge Systems (IKS) represent a comprehensive body of traditional knowledge that has evolved over centuries through observation, experimentation, systematic inquiry, and practical experience. In the contemporary era, the integration of this ancient wisdom with emerging technologies offers new opportunities for innovation, interdisciplinary research, and sustainable development. The book Indian Knowledge Systems and Emerging Technologies: From Ancient Wisdom to Modern Innovations has been developed to provide students, teachers, researchers, and knowledge enthusiasts with a systematic understanding of India's traditional intellectual contributions and their relevance to modern science and technology. It aims to establish meaningful connections between classical Indian concepts and contemporary developments in artificial intelligence, computational sciences, mathematical modeling, natural language processing, and intelligent systems.

The book begins with an introduction to Indian Knowledge Systems, exploring their historical evolution, philosophical foundations, and traditional methods of knowledge transmission. It subsequently examines Indian epistemology, logical reasoning, mathematical algorithms, numeration systems, and computational thinking. Special attention is given to the contributions of renowned Indian scholars such as Pāṇini, Piṅgala, Āryabhaṭa, Brahmagupta, Bhāskarācārya, and Mādhava, whose intellectual achievements continue to inspire mathematical and computational research. A distinctive feature of this book is its interdisciplinary approach to understanding the relationship between traditional knowledge and emerging technological applications. Topics such as Pāṇinian grammar and natural language processing, Nyāya reasoning and knowledge representation, ancient mathematical algorithms and modern computing, and traditional logical frameworks

and artificial intelligence are presented to encourage critical thinking and conceptual understanding.

The content has been organized in a student-friendly manner, with clearly defined chapter learning objectives, systematically numbered sections, relevant illustrations, chapter summaries, learning outcomes, multiple-choice questions, and descriptive review questions. These features are intended to facilitate independent learning, classroom teaching, examination preparation, and further academic exploration.

It is sincerely hoped that this book will inspire readers to explore the scientific and philosophical richness of Indian Knowledge Systems and recognize their potential contributions to modern innovation, responsible technological development, and the advancement of human knowledge.

Authors

Dr. Roop Raj

Dr. Rajendra K. Jain

Dr. Amitava Biswas

Venu Gopal Mutyala

ABOUT THE BOOK

Indian Knowledge Systems and Emerging Technologies: From Ancient Wisdom to Modern Innovations is a comprehensive and interdisciplinary textbook that explores the rich intellectual heritage of India and its relevance to contemporary scientific and technological advancements. The book establishes meaningful connections between traditional Indian knowledge, mathematical principles, logical reasoning, computational thinking, and emerging technologies.

The book introduces readers to the historical development and philosophical foundations of Indian Knowledge Systems, highlighting significant contributions in mathematics, astronomy, linguistics, and scientific reasoning. It examines the pioneering works of ancient Indian scholars, including Pāṇini, Piṅgala, Āryabhaṭa, Brahmagupta, Bhāskarācārya, and Mādhava, while exploring their conceptual relevance to modern computing, artificial intelligence, and natural language processing.

Special emphasis is placed on the integration of traditional knowledge with modern technological applications, encouraging interdisciplinary learning, critical thinking, and innovation. Each chapter includes clearly defined learning objectives, structured explanations, relevant illustrations, learning outcomes, multiple-choice questions, and descriptive review questions to strengthen conceptual understanding.

Aligned with the educational vision of **National Education Policy (NEP) 2020**, this book is designed for undergraduate and postgraduate students, educators, researchers, and readers interested in Indian Knowledge Systems. It serves as a valuable academic resource for connecting India's intellectual traditions with modern scientific innovation.

Table of Content

PREFACE III
ABOUT THE BOOK V
CHAPTER 1: Introduction to Indian Knowledge Systems (IKS) 1
CHAPTER 2: Indian Epistemology, Logic and Computational Thinking 13
Chapter 2: The Architecture of Indian Logic and Computational Thinking 13
CHAPTER 3: Numeration, Algorithms and Modern Computing 24
Chapter 3: Numeration Algorithms and Modern Computing 24
CHAPTER 4: Panininan Grammar, Natural Language Processing and Language AI 35
Chapter 4: The Formalism of Pāṇinian Grammar and its Computational Synthesis 35
CHAPTER 5: Nyaya Reasoning, Knowledge Representation and Expert Systems 46
Chapter 5: Nyāya Reasoning, Knowledge Representation, and Expert Systems 46
CHAPTER 6: Ayurveda, Digital Health and Biomedical Innovation 56
CHAPTER 7: Yoga, Mind-Body Science and Wearable Technologies 67
CHAPTER 8: Agriculture Ecology and Climate Smart Technologies 76
CHAPTER 9: Architecture, Engineering and Smart Habitats 83
CHAPTER 10: Astronomy, Calendars and Space Technologies 90
CHAPTER 11: Textiles, Crafts and Advanced Manufacturing 100
CHAPTER 12: Education, Pedagogy and Digital Learning 110
CHAPTER 13: Ethics, Governance, Intellectual Property and Data Sovereignty 121
CHAPTER 14: Innovation, Entrepreneurship and Future Roadmaps 133
CHAPTER 15: Economic Thought and Development in Ancient India 144
CHAPTER 16: Indian Economic Knowledge Systems and Emerging Financial Technologies 151