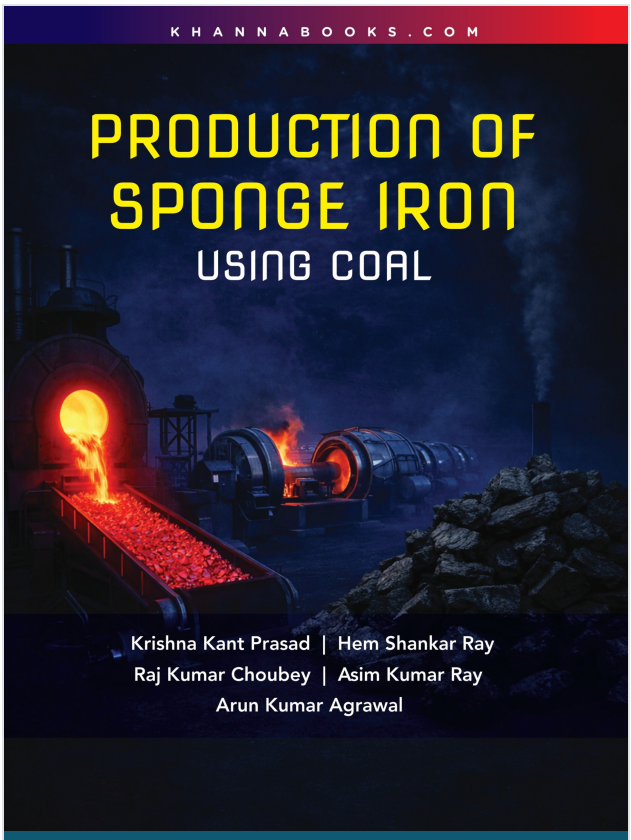

Krishna Kant Prasad, Hem Shankar Ray, Raj Kumar Choubey, Asim Kumar Ray, Arun Kumar Agarwal

Production of Sponge Iron Using COAL

Author :	Krishna Kant Prasad, Hem Shankar Ray, Raj Kumar Choubey, Asim Kumar Ray, Arun Kumar Agarwal
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Product Description

Production of Sponge Iron Using COAL

Production of Sponge Iron using Coal: Rotary Kiln, Tunnel Kiln and using Gas from Coal is a definitive technical guide that explores India's global leadership in the coal-based direct reduction of iron ore. While international markets often rely on gas-based shaft processes, this book highlights how India has pioneered and perfected the use of rotary kilns to utilize abundant, high-ash non-coking coal-resources often dismissed by foreign experts as "muck". The text provides an exhaustive analysis of the thermodynamic, kinetic, and aerodynamic principles that govern the solid-state reduction of iron oxides.

The book serves as a vital bridge between theoretical research and industrial application, documenting decades of expertise from leading metallurgists. It broadens the traditional focus on rotary kilns to include emerging commercial successes in tunnel kiln technology and coal gasification-based shaft furnaces. Beyond technical specifications, the authors connect modern engineering with India's ancient metallurgical heritage, such as the storied Iron Pillar of Delhi. This work is an essential resource for metallurgical students, researchers, industry professionals, and entrepreneurs seeking to understand the economic and technical nuances of sustainable ironmaking in coal-rich regions.

Salient Features

- Rotary Kiln Dominance: Detailed analysis of the rotary kiln's primary role in India, covering its versatility in processing lump hematite and its unique operational strengths and weaknesses.
- Scientific Process Modeling: Comprehensive chapters on mathematical modeling, CFD analysis, and reaction kinetics that allow for precise control over heat transfer and solid movement.

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- Alternative Reduction Technologies: In-depth exploration of tunnel kilns as a viable solution for reducing magnetite and iron ore fines, filling a critical gap in traditional kiln operations.
- Coal Gasification Insights: Evaluation of the economic and technical feasibility of converting coal into reducing gas (CO and H) to supplement production in shaft furnaces.
- Resource Optimization: Strategies for utilizing high-ash Indian coal and recirculating char to enhance energy efficiency and reduce the environmental footprint of ironmaking.
- Practical Engineering Focus: Guidance on plant design, refractory management, and overcoming common industrial hurdles like accretion or "ring formation" inside kilns.
- Historical Contextualization: A unique addendum on India's ancient ironmaking legacy, offering a perspective on the longevity and evolution of sponge iron technology.
- Future-Ready Strategies: Critical projections on hydrogen-based ironmaking and the integration of sponge iron into blast furnaces to reduce costly metallurgical coke consumption.

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- Addendum

Author

Krishna Kant Prasad

Dr. Krishna Kant Prasad (born on 24th January 1945 in Bhagalpur, Bihar), after completing B.Sc. Hons. (Chem.) from Bhagalpur University, he did his B.E., M.E. and Ph.D. in Metallurgical Engineering from the Indian Institute of Science, Bangalore. After brief teaching stints at the Banaras Hindu University and MR Engineering College, Jaipur he joined R&D Division of Tata Steel, Jamshedpur in 1972. He moved to RDCIS, SAIL, Ranchi in 1981 as in-charge of R&D activities in the Sponge Iron Pilot Plant Complex and since then he was actively involved in steering R&D activities both in Sponge Iron Making and Alternate Iron Making areas. He retired from SAIL, in January 2006. Thereafter, he served as a visiting professor in the Department of Metallurgical Engineering in IT (now IIT), BHU, Varanasi, for two and then joined NITK (National Institute of Technology Karnataka) in Surathkal, initially as the Ministry of Steel Chair Professor, and then in various capacities - all equivalent to a visiting professor - for seven and a half years. Dr. Prasad has guided four Ph.D. students. He has to his credit over 130 research papers, five registered copyrights and holds two patents on sponge iron making. He has authored four books entitled Sponge Iron Making in Rotary Kiln, Chemical and Metallurgical Thermodynamics, Advances in Rotary Kiln Sponge Iron Plant and Integrated Iron- and Steelmaking. He has also edited two books - "Trends in Beneficiation and Agglomeration of Iron Ore' and 'Steel Plant Technologies: An Overview. He is life member of the Indian Institute of Metals, Electrochemical Society of India and the Computer Society of India. E-mail: kkpmprnc@gmail.com. Professor

Hem Shankar Ray

Hem Shankar Ray (born on 19th June 1940, Jabalpur, Madhya Pradesh) unfortunately left for his heavenly abode on 28th April 2023 just as the preparation of the manuscript

started. Prof. H. S. Ray is widely regarded as one of the greatest minds of the Indian scientific community and a very well-known name in the field of Extractive Metallurgy. He obtained his B.Tech. (Hons.) in Metallurgical Engineering from the Indian Institute of Technology, Kharagpur (1962) and M.A.Sc. and Ph.D. degrees from the University of Toronto, Canada (1963, 67). He was with I.I.T. Kanpur from 1967-80 as Lecturer and Asst. Professor. In between he served as Manager/Senior Technologist - Research and Development, Pilkington Research Centre, Lathom, England (1977-1979). He then served as Professor of Metallurgical Engineering (1980-1990) and Dean of Students Affairs (1988-90) at the Indian Institute of Technology, Kharagpur. Prof. Ray served the Regional Research Laboratory, Bhubaneswar (now IMMTD) as Director from 1990-2000 (two terms). On retirement he served as an Emeritus Scientist at the Central Glass and Ceramic Research Institute, Calcutta. He holds several patents including 2 U.S. patents to his credit. His areas of interest included thermal analysis, kinetics, extractive metallurgy, energy and R&D administration. He guided about 40 Ph.D. students and 20 M.Tech. students for their thesis work. He has published about 500 papers in reviewed journals and conference proceedings and over 26 books. He also edited 15 Conference proceedings and written about 50 technical reports. He also wrote numerous other non-technical articles, editorials, etc. Prof. Ray received several awards in recognition of his work and these include the National Metallurgists Day Award, G.D. Birla Award and two Kamani Gold Medals of the Indian Institute of Metals. He received the Distinguished Alumni award from IIT Kharagpur, which, interestingly, he shared that year with the Google CEO, Sundar Pichai. He served several companies and R&D laboratories as consultant or member of Boards/Research Councils. He was associated with several Professional Bodies and served as President, Indian Institute of Mineral Engineers and Indian Thermal Analysis Society; also, as a Vice President of the Millennium Institute of Energy and Environment Management and was an Editor of a popular science magazine Everyman's Science. He also served in several other institutions in various capacities. He was deeply involved with professional bodies such as IIM (Indian Institute of Metals),

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Raj Kumar Choubey

Raj Kumar Choubey , was born on August 11, 1954 at Sikariya, Bhojpur, Bihar (unfortunately he passed away on February 19, 2024). He passed B.Sc. from the University of Burdwan in 1974 and Bachelor of Engineering from MREC (now MNIT) in Jaipur Rajasthan in the year 1980. He joined M/s Jaipur Metals and Electricals in 1980 and operated the first induction furnace of India. In 1982 he joined M/s Hindustan Motors and served till the year 2000. There he developed various grades of automobile grade steel and was a part of the team who fabricated the first Diesel Engine for automobiles in India. Thereafter he decided to be a start-up entrepreneur. His portfolio lately read: Owner -

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Asim Kumar Ray

Dr. Asim Kumar Ray was born at Calcutta in 1952. He graduated with Honours in Chemical Engineering from Jadavpur University in 1974. He did his Masters in Chemical Engineering from IIT Kanpur and Ph. D. in Metallurgical Engineering from IIT Kharagpur. After a brief stay of about one and a half year each at Indian Iron and Steel Company, Burnpur and Indian Oil Corporation, he joined Research & Development Centre for Iron & Steel (RDCIS), SAIL, Ranchi in 1978. After a long stay at RDCIS, SAIL, Ranchi, he assumed charge of General Manager (Quality) at Durgapur Steel Plant (DSP), SAIL in 2008. Dr Ray was instrumental in commissioning Sponge Iron Pilot Plant and associated Process Research Laboratory and carried out R & D activities related to Sponge Iron & other Alternate Iron Making processes, Steelmaking and Continuous Casting. He established Computational Laboratory at RDCIS and carried out mathematical and physical simulation of different metallurgical processes. He steered several projects on process improvement and product development in all SAIL plants. Under his leadership, DSP had received several awards on Quality including prestigious Golden Peacock Award on Quality -2010 of Institution of Directors (IOD). Dr. Ray retired from SAIL in December 2012. Presently, Dr. Ray is with M/s Lechler (India) Pvt. Ltd. Dr. Ray has co-authored the Book on "Rotary

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Product Description

“Mathematics-I” is included as a paper for the first year Diploma program. Syllabus of this book is strictly aligned as per model curriculum of AICTE, and academic content is combined with the concept of outcome-based education.

Book cover five Units Trigonometry, Functions and Limit, Differential Calculus, Complex numbers and partial Fraction, Permutation and Combination and Binomial Theorem. In every unit each topic is written in easy and lucid manner. A set of exercise at the end of each unit is clubbed to test the student’s comprehension.

Some salient features of the book:

· Content of the book aligned with the mapping of Course Outcomes, Programs Outcomes and Unit Outcomes.

· Book provides lots of real-world applications, interesting facts, QR Code for E-resources, mini projects, curiosity topics, sample specification table etc.

· Students and teacher centric subject materials included in book with balanced and chronological manner.

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Author

Deepak Singh

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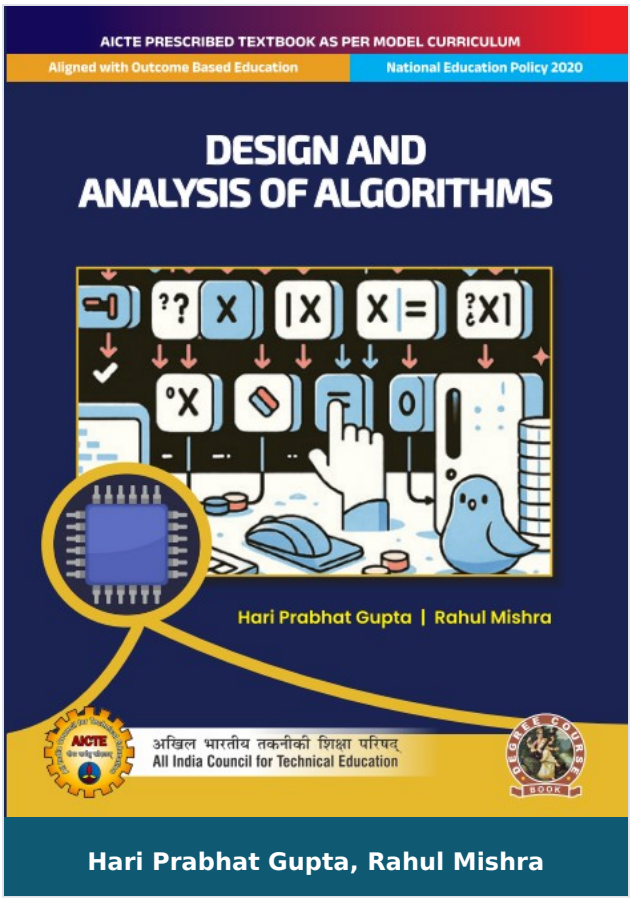

Design and Analysis of Algorithms

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Product Description

Design and Analysis of Algorithms

This book offers an in-depth exploration of designing and analysing algorithms. It covers topics such as algorithmic analysis, design principles, theoretical proofs, and practical applications. The content includes a logical example explaining the concepts, accompanied by a diverse range of solved and unsolved problems. Each problem is accompanied by step-by-step solutions, providing readers with a comprehensive understanding of algorithmic design and analysis. With its systematic approach, programming-based solutions, and thorough examples, this book serves as an ideal resource for those curious to learn basic to high level concept of algorithm design.

Salient Features:

- Content of the book aligned with the mapping of Course Outcomes, Programs Outcomes and Unit Outcomes.
- In the beginning of each unit learning outcomes are listed to make the student understand what is expected of him/ her after completing that unit.
- Book provides lots of recent information, interesting facts, logical examples, and solved programming exercises. Theorems and their proofs are added to provide detailed insight of analysis.
- Student and teacher centric subject material included in book in balanced and chronological manner.
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- Short and long answer questions are given for practice of students after every chapter for practice of students after every chapter.

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- Solved and Unsolved programming exercises are included in the appendix of the book.
- QR Code at the start of every chapter provide convenient access to electronic resources, including solutions to programming problems, discussions on key concepts, and project topics for students

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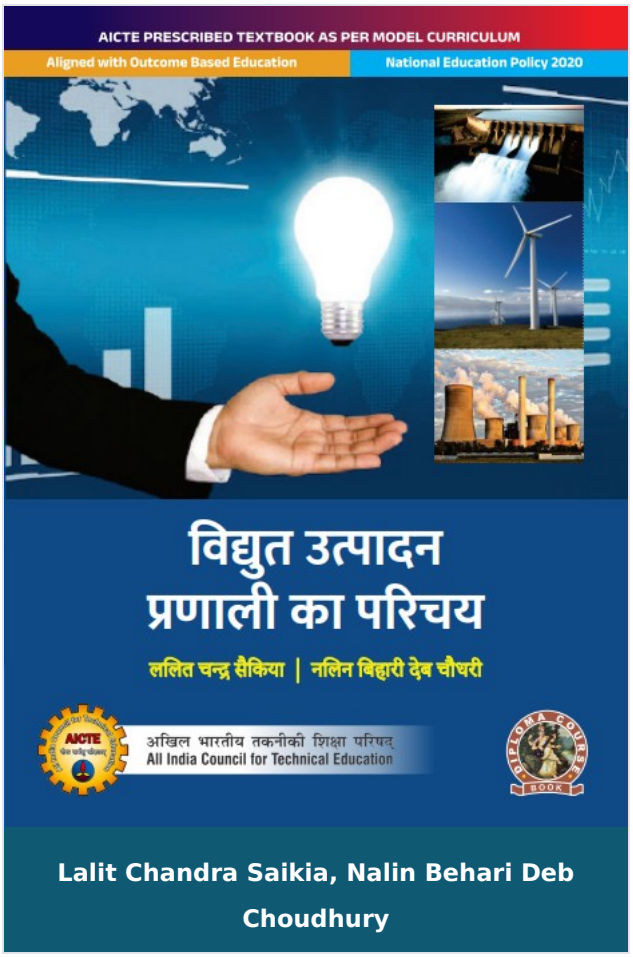

Introduction to Electric Generation Systems

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Case Studies in Construction Project Management

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Product Description

Case studies in this book show how project were completed because of initiatives and out-of- the -box thinking.

This book is to provide young architects and engineers insight into evolving innovates solution in dealing with complex situations that during implementation of construction projects.

Majority of cases reflect personal experience of the authors in their professional career.

Engineering profession is difficult and exciting as solutions are to be found at each & every stage of the project.

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- Yingkiyong Damroh Road Arunachal Pradesh.
- ISBT Flyover and Yudhister Setu Across River Yamuna Delhi.

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- The Signature Bridge on River Yamuna.

Author

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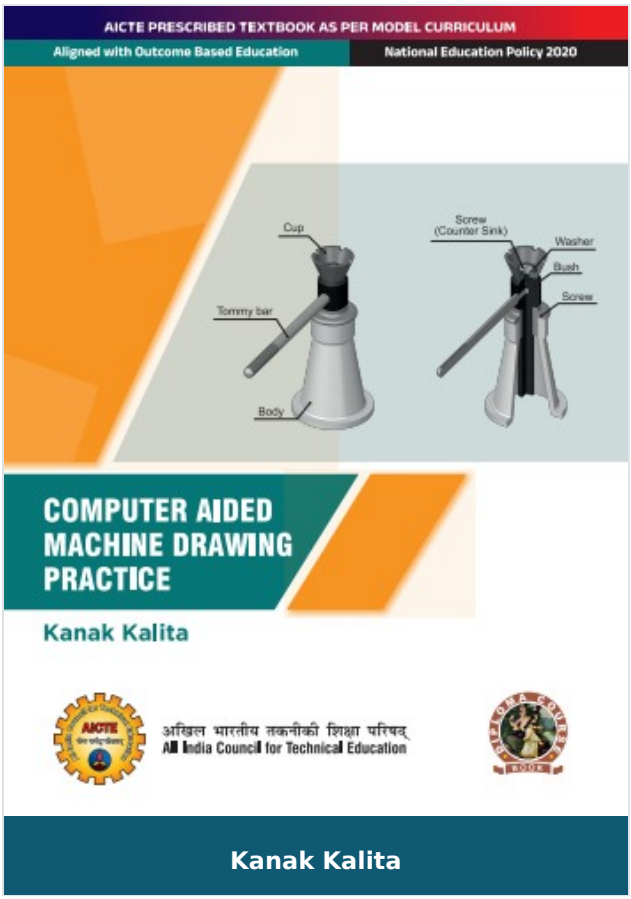
K. B. RAJORIA K B Rajoria did BE (Hons) in Civil Engineering from MBA Engineering College, Jodhpur in 1961 and ME (Gold Medallist) , in Soil Mechanics and Foundation Engineering from Indian Institute of Technology Roorkee in 1963. He was also a faculty member in this Institute. He joined Central PWD in 1963, and worked in different capacities in the Government including hill road project in Nepal, prestigious Parliament Secretariat Building in New Delhi, several building and hill road projects in Arunachal Pradesh, Water Research Center Project at Bagdad (Iraq), projects for Delhi Development Authority etc. He worked at the Government of Delhi where projects to his credit include Delhi College of Engineering, Hospital Projects, Delhi Secretariat Building and a number of flyover projects. The Super animated as Engineer-in- Chief Government of Delhi. He was bestowed with important honorary positions such as Presidents, Indian Buildings Congress, President, and Indian Roads Congress as also Chairman, Quality and Safety Forum, the Institution of Engineers. He was awarded Gold Medal for outstanding services in Arunachal Pradesh, Certificate of Outstanding Achievements by Govt. of Delhi and Award for 'Outstanding Engineer' by the Institution of Engineers. He has published several

technical papers in professional journals and authored books on various aspects of construction. A book titled; "ISO 9000 Practices in Construction" authored by him has been published recently.

H. K. Srivastava

H. K. SRIVASTAVA H K Srivastava did B Tech (Hons) in Civil Engineering in 1969, and Masters in Structures in 1917, both from IIT Kharagpur. He joined faculty at IIT, BHU for one year prior to joining CPWD in 1972. He worked in different capacities for more than 38 years from Assistant Executive Engineer to Additional DG, CPWD. H K Srivastava has worked in different geographical areas as well as across different organizational cultures within the country and abroad. Worked on road project in Arunachal Pradesh, East-West Highway Project Nepal, Delhi PWD, Indo Bangla Border Road Project and Rural Roads for PMGSY. He has carried out design of multi storied building at Delhi, as also bridges in Nepal and West Bengal. He experience of working for Ministry of Finance real estate investments for Income tax purposes, and as also with NBCC on projects in Iraq at Kirkuk, Mosul and Baghdad during mid-eighties. He is a member of various professional bodies. He has a number of technical papers to this credit. As an active member to Humane Resource Development Committee of IRC, he has been closely associated with the development of 'Guidelines on Skill development of Workmen in Road Sector (IRC:128-2019).



Computer Aided Machine Drawing Practice

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Product Description

Computer Aided Machine Drawing Practice

Computer Aided Machine Drawing Practice offers a comprehensive guide into the world of computer-aided design (CAD) with a focus on machine drawing. As technology evolves, the importance of CAD in the fields of mechanical engineering, automotive design and manufacturing is paramount. This book serves as an essential resource for students and professionals in these domains. Starting with the basics of AutoCAD, the book gradually introduces the reader to its intricacies, with practical insights into 2D and 3D modelling.

Salient features:

- Content of the book aligned with the mapping course outcomes, programs and Units Outcomes.
- In the beginning of each unit learning outcomes are listed to make the student understand what is expected out of him/her after completing that unit.
- Book provides lots of recent information, interesting facts, QR code for E-resources, QR code for use of ICT, projects, group discussion etc.
- Student and teacher centric subject materials included in book with balanced and chronological manner.
- Figures, tables, and software screen shots are inserted to improve clarity of the topics.
- Apart from essential information a ‘know more’ section is also provided in each unit to extend the learning beyond syllabus.
- Short questions, objective questions and long answer exercises are given for practice of students after every chapter.
- This book is not just an academic tool, but a bridge to the professional world of machine drawing design, making it a must-have for anyone stepping into the realm

of computer-aided design

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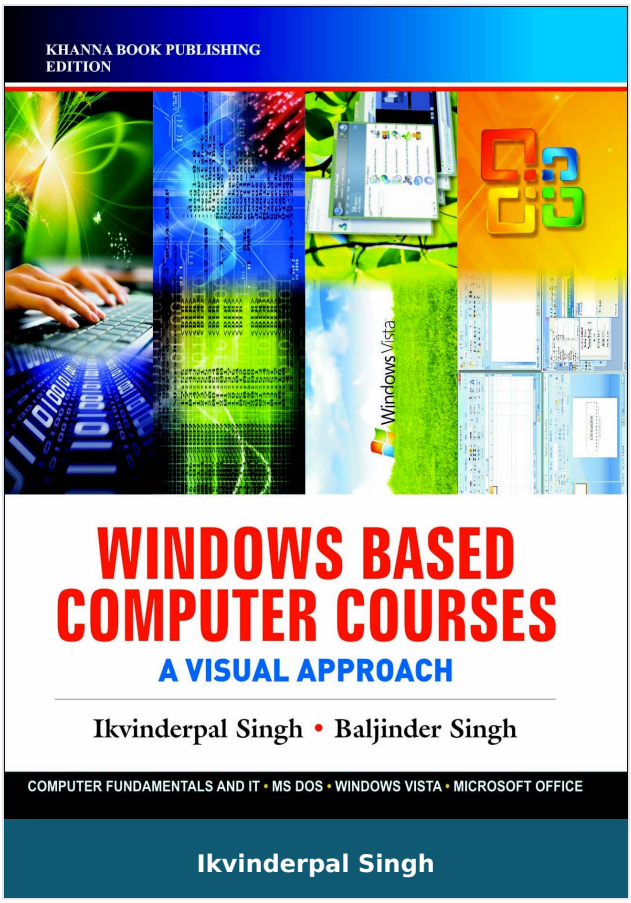

Windows Based Computer Courses

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Product Description

This book is meant for a wide range of readers who with to learn the basic concepts of computer fundamentals, MS DOS, window vista and Microsoft office 2003. In this book we cover all basic concepts of first year computer courses of various Indian Universities in a systematic and simplified manner. While writing this book, it was kept in mind to include only the relevant topics so that it is useful both for learning and reference purpose.

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- Microsoft Excel 2003
- Microsoft PowerPoint 2003
- Microsoft Access 2003

Author

Ikvinderpal Singh

Dr. Ikvinderpal Singh is an Assistant Professor at Trai Shatabdi Guru Gobind Singh Khalsa college Amritsar, bringing 17+ years of academic leadership and research experience to the field of computer science. A Gold Medalist in B.Sc. IT, with an MCA (Distinction) and a Ph.D. in Neural Networks and Image Processing, he is known for blending rigorous research with practical innovation. A prolific academic creator, he has authored 37 books, published 82+ research papers, and designed 100+ industry-aligned skill-development courses. His expertise extends to doctoral evaluation, supervision, and active participation on 100+ editorial and review boards worldwide.

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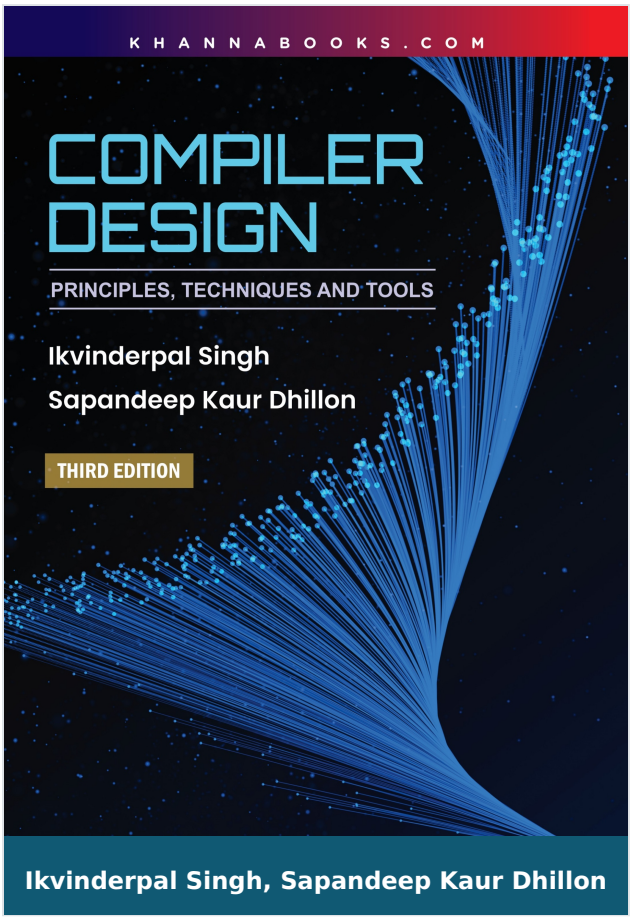

Compiler Design

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Product Description

Compiler design

Compiler design is a subject which many believe to be fundamental and vital to computer science. It is subject which has been studied intensively since the early 1950’s and continues to be an important research field today. It is intended for both students and practitioners, retaining its appeal as a guide to the industry professional and a comprehensive introduction to the student at the upper level undergraduate or first year graduate level. This book will be useful for student of BE (Computer/Electronics), B. Tech, ME(Computer/Electronics), M. Tech, MCA, BCA, M.Sc., B.Sc., and also to students pursuing A/B/C-level course of DOEACC.

Salient Features

- Gives an introduction the basics of compiler design
- Describes the lexical and syntax analysis.
- Deals with symbol table management.
- Describes the storage management.
- Gives the details of code generation and optimization.
- Gives a detailed explanation of various types of compilers.
- Gives a case study of YACC and its implementation.

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- Syntax Analysis
- Symbol Table Handling
- Storage Management
- Intermediate Code Generation
- Code Generation
- Code Optimization
- Types Of Compilers

Author

Ikvinderpal Singh

Dr. Ikvinderpal Singh is an Assistant Professor at Trai Shatabdi Guru Gobind Singh Khalsa college Amritsar, bringing 17+ years of academic leadership and research experience to the field of computer science. A Gold Medalist in B.Sc. IT, with an MCA (Distinction) and a Ph.D. in Neural Networks and Image Processing, he is known for blending rigorous research with practical innovation. A prolific academic creator, he has authored 37 books, published 82+ research papers, and designed 100+ industry-aligned skill-development courses. His expertise extends to doctoral evaluation, supervision, and active participation on 100+ editorial and review boards worldwide.

Sapandeep Kaur Dhillon

Sapandeep Kaur Dhillon is an assistant professor in the department of computer science, Guru Nanak Dev University, Amritsar, bringing 12+ years of dedicated academic experience to the discipline. She has authored 4 books, published 10+ research papers

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across national and international journals, reflecting her steady engagement with emerging trends in computing. Her academic interests span data structures, Compiler Design, and Artificial Intelligence, where she integrates foundational theory with practical, algorithmic thinking.

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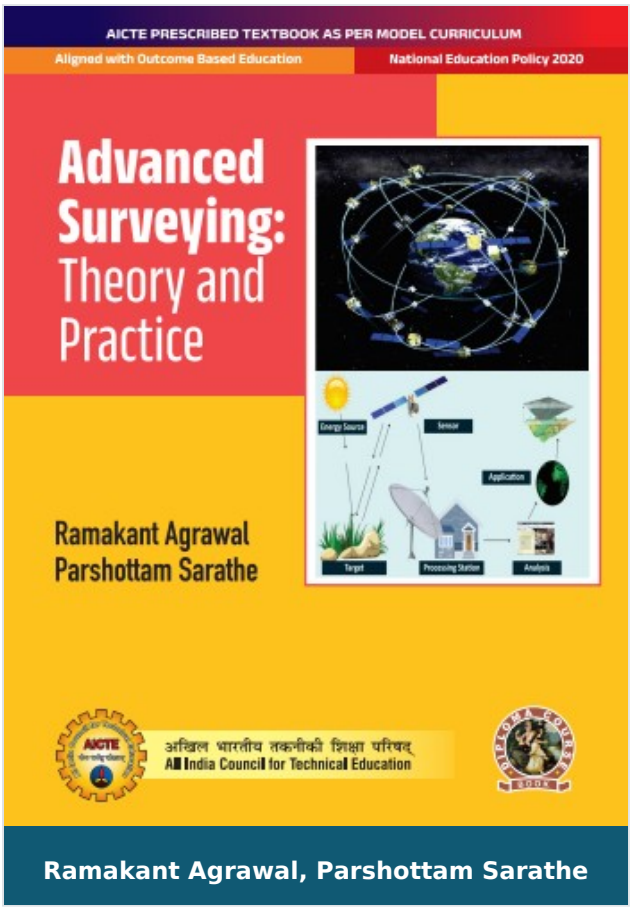

Advanced Surveying: Theory & Practice

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Product Description

Advanced Surveying: Theory & Practice

This book contains advanced topics of surveying for fourth semester students of diploma course strictly as per syllabus and model curriculum of AICTE and aligned with the theme of outcome-based education according to National Education Policy 2020. This book comprises of six chapters covering topics on plane table Surveying. Theodolite, tacheometry. Curves, total station, Electromagnetic measurement, Remote sensing and GPS & GIS.

Salient features:

- Content of the book aligned with the mapping course outcomes, programs and Units Outcomes.
- In the beginning of each unit learning outcomes are listed to make the student understand what is expected out of him/her after completing that unit.
- Book provides lots of recent information, interesting facts, QR code for E-resources, QR code for use of ICT, projects, group discussion etc.
- Student and teacher centric subject materials included in book with balanced and chronological manner.
- Figures, tables, and software screen shots are inserted to improve clarity of the topics.
- Apart from essential information a ‘know more’ section is also provided in each unit to extend the learning beyond syllabus.
- Short questions, objective questions and long answer exercises are given for practice of students after every chapter.

Solved and unsolved problems including numerical examples are solved with systematic steps

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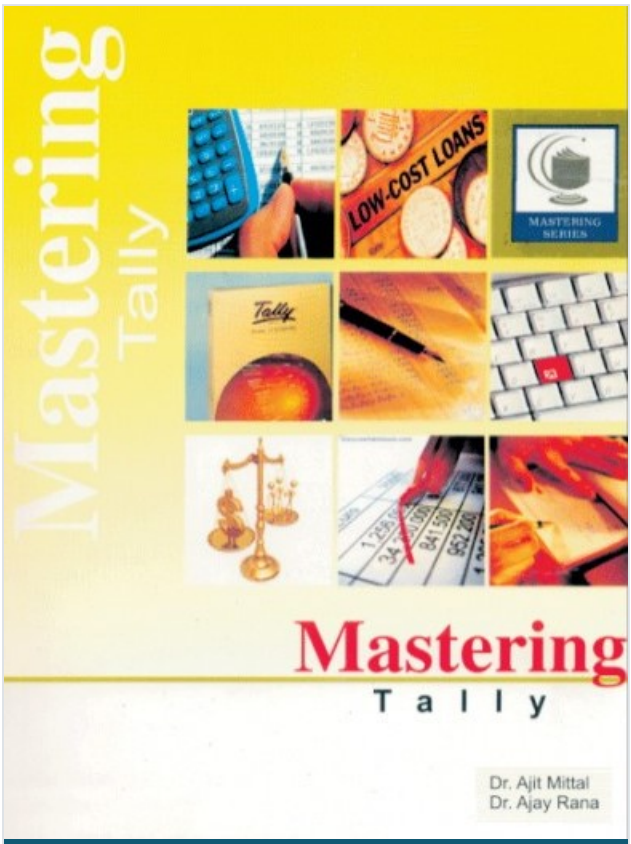

Ajit Mittal, Ajay Rana

Mastering Tally

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Product Description

Tally is an accounting software, very popular with the accountants and other computer users who need to do some accounting over the computer. It not only helps you in maintaining the accounts, but also helps you in taking care of your inventory, billing, invoicing, payroll, etc. No wonder it is the most popular one amongst its competitors. Various versions of the software are available in the market, with the latest being tally.ERP9. (version 2.1). This book, one of its kinds available in the market, is unique in nature since it covers all the versions in a single book. It traces back the various aspects of the software through the various options introduced in various versions. Obviously these options are there in the final version too, but it is important to know when and where they were introduced. So these topics are covered where they were introduced and not as part of the latest version, i.e., version 9.0. The versions covered here are from 7.2 to 9.0.

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Ajay Rana

Dr. Ajay Rana Professor, Department of Computer Science & Engineering Dean and Director, Amity University 30+ patents under his name in the field of IoT, Network & Sensors 279+ Research publications Co-authored 6 Books Completed 30 Sponsored Research Projects Senior member, Academic Council & Executive Council, Amity University Strong corporate connect

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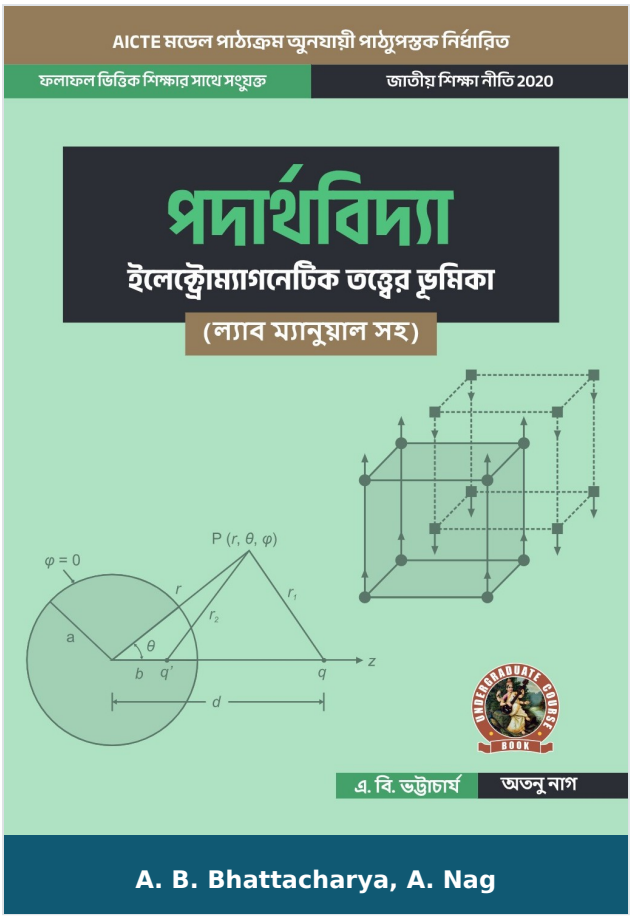

Physics (Introduction to Electromagnetic Theory) (with Lab Manual)

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Product Description

Engineering Physics: Introduction to Electromagnetic Theory has been written for the first year students of B. Tech Engineering Degree Courses of all Indian Universities following the guideline and syllabus as recommended by AICTE. The book, written in a very simple and lucid way, will be very much helpful to reinforce understanding of different aspects to meet the engineering student’s needs Writing a text-cum manual of this category poses several challenges providing enough content without sacrificing the essentials, highlighting the key features, presenting in a novel format and building informative assessment. This book on engineering physics will prepare students to apply the knowledge of Electromagnetic Theory to tackle 21st century and onward engineering challenges and address the related questions.

Some Salient Features of the Book:

· Expose basic science to the engineering students to the fundamentals of physics and to enable them to get an insight of the subject.

· To develop knowledge on critical questions, solved and supplementary problems covering all types of medium and advanced level problems in a very logical and systematic manner.

· Some essential information for the users under the heading “know More” for clarifying some basic

· Information as well as comprehensive synopsis of formulae for a quick revision of the basic principles.

· Constructive manner of presentation so that an Engineering degree students can prepare to work in different sector or in national laboratories at the very forefront of technology.

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Prof. A. B. Bhattacharya did his MSc and PhD degree from the University of Calcutta in Physics and Post-doc from the Massachusetts Institute of Technology (MIT), Cambridge, USA. He worked in close collaboration with the leading laboratories like Lincoln Laboratory; Milestone Hill Observatory; Earth, Atmospheric and Planetary Sciences division of MIT and many other well recognized laboratories in India and abroad. He served as Professor & Head of the Department of Physics, University of Kalyani; Dean of Research and Head of the ECE Department, Techno India University; Pro Vice Chancellor of JIS University and Director of Brainware University. He has published 32 text books for Science and Engineering students, two popular books for general readers and over 400 research articles in reputed International Journals. Under his supervision 24 scholars received their doctoral degree. He is a fellow of the Institute of Electronics and Telecommunication Engineers and member of many scientific organizations. India International Friendship Society awarded him the prestigious "Shiksha Ratna Award" and Certificate of Excellence for meritorious services, outstanding performance and significant contribution to education. The International Institute of Success Awareness hon0red him with their globally recognized "Glory of India Gold Medal" for his outstanding contribution to the national stature of India. A few words from the certificate issued by Prof. Williams of MIT may be quoted "Our collaborative effort was directed at the wavelength dependence of radar echoes observations with the Millstone Hill UHF radar in Westford. He made use of the Charles River Data System computer in the Weather Radar Laboratory for these calculations. His results help to make a convincing case that the volume reflectivity associated with lighting is a diminishing function of radar wavelength, contrary to contemporary thinking". Dr.

A. Nag

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5. Micro projects, points/issue for the creative inquisitiveness & curiosity, know more, video links, case study and summary points are integral part of each unit to facilitate the students to develop the attitude of scientific inquiry, investigate the cause and effect relationship, systematic, scientific & logical thinking , ability to observe, analyse and interpret.

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7. Sample QR codes have been provided in each units on some topics/sub topics for supplementary reading and reinforcing the learning.

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