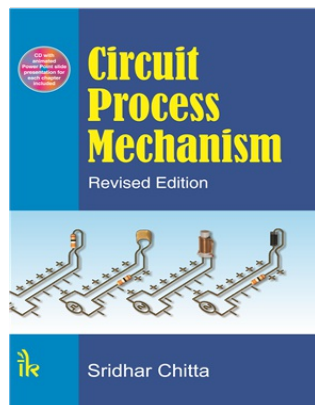


Circuit Process Mechanism, Revised Edition, 1/e

Sridhar Chitta



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About the Book

This book deals exhaustively with electrical and electronic circuit processes. Most textbooks neither describe accurately nor precisely the mechanism of the processes in the operation of electrical and electronic circuits. Common misconceptions that are dispelled in the book.

The contents provide an accurate and correct viewpoint of these very fundamental electric and magnetic processes. Every case has been dealt so that a present-day electrical and electronic engineer understands these physical and applied aspects at the first level before he/she studies topics of electromagnetic field theory and electrical circuits or networks. Electrostatics and electric circuits belong to one science and the contents of the book are vital to bridge the gap that present curricula have created between them. Based on latest research findings that unify the two concepts, using vivid diagrams depicting circuit processes with states evolving in time, the student is guided smoothly through the topics on the mechanism of conduction, operation of capacitive and inductive circuits subject to steady and alternating voltages; operation of motors, generators, microphones and loudspeakers and p-n junctions.

The revised (2013) edition includes a section describing the function, fabrication and operation of non-rectifying contacts in the chapter on p-n junctions along with animated power point slides depicting their operation in the accompanying CD.

The chapters combine text with several illustrative figures and derivations of formulae. The animated power point slides (included in the accompanying CD) for all chapters cover every pertinent principle that will aid readers in visualizing circuit processes. The CD accompanying the revised (2013) edition includes results of simulation runs of circuits that superimpose ac signals on dc voltages and of CR phase-shifting networks typically used in RC Phase shift oscillators. Procedures to obtain these using TINA simulation software are also provided in the CD.

The contents of the chapters are aimed to develop a strong sense of feel of the mechanism of electric and electromagnetic phenomenon, the important role of electric fields in circuit processes and the transport of energy in circuits. They enhance analytical ability and reasoning skills in solving electric and electronic circuit problems. With critical inputs and encouragement from renowned Professors Hermann Haertel, Bruce A. Sherwood, David J. Griffiths, Norris W. Preyer, Satyabrata Jit and Dipankar and several other experts in this important field, the book is strongly recommended for basic electrical and electronics courses as a text to give students a conceptual and physical basis of electric and magnetic fields.

Salient Features

- ▶ The electric field inside a metal is always zero (even when the system is not in static equilibrium);
- ▶ Drifting electrons push each other through a wire just as water molecules push each other through a pipe (despite charge neutrality inside the metal);
- ▶ There cannot be any potential difference across an open switch because $V = IR$, and there is no I ;
- ▶ Electrons travel at the speed of light in wires; a circuit requires two separate wires for operation.

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- ▶ Surface Charges and Conduction Processes
- ▶ Capacitors in Circuits
- ▶ Superposition of ac Signals on dc Voltages; Coupling of ac Signal Sources to Amplifier Inputs
- ▶ Electrical Energy, Electromagnetic Energy and Power
- ▶ Magnetic Field and Faraday's Law; Coulomb and Non-Coulomb Electric Fields; Self-Induction; Seeing Atoms
- ▶ Magnetic Forces; Magnetic Forces Do No Work!; How a Wire Moves
- ▶ Faraday's Law; Motional emf; How Generators and Microphones Operate

- ▶ Magnetic Forces; Magnetic Moment; Magnetic Forces on Magnetic Moment; Torque Production in Motors; Motor and Load Torque; Back emf; How Motors and Loudspeakers Operate; Magnetic Fields in Matter
 - ▶ The Role of Surface Charges in Diodes; Formation of a p-n Junction; a Diode in Forward and Reverse Bias; Why V can Never be Made Zero; Rectification
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About the Author

Sridhar Chitta :- Associate Professor, Electronics and Communication Engineering, Matrusri Engineering College, Hyderabad, obtained B.E. in Electronics and Communication Engineering from Regional Engineering College (now NIT), Tiruchirapalli (Madras University) in 1976 and M.E. in Control Systems from Victoria Jubilee Technical Institute (Bombay University) in 1980. His current research interests are in the area of Large Scale Control Systems. He has over 20 years of experience as a practicing engineer in industry in India, the Middle East and Canada. As an active life member of I.S.T.E, he has delivered scintillating lectures on unified Electric theory and Circuit Process Mechanisms using animated power point presentations to various engineering college faculty members and students.