

# Electrical Power Systems

P.S.R. Murty



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# Electrical Power Systems

By P.S.R. Murty, ME, PhD

With the growing importance of grid integration of renewables and the interest in smart grid technologies, it is more important than ever to understand the fundamentals that underpin electrical power systems. *Electrical Power Systems* provides comprehensive, foundational content for a wide range of topics in power system operation and control. The book includes a large number of worked examples and questions with answers and emphasizes design aspects of some key electrical components like cables and breakers. The book is designed to be used as reference, review, or self-study for practitioners and consultants and for students from related engineering disciplines who need to learn more about electrical power systems.

## Key Features

- Comprehensive coverage of all areas of the electrical power system, useful as a one-stop resource
- Large number of worked examples and objective questions (with answers) to help apply the material discussed in the book
- Foundational content that provides background and review for further study and analysis of more specialized areas of electric power engineering

## About the Author

**P.S.R. Murty** holds an ME and PhD in Power Systems, and is a recipient of a German academic exchange service fellowship for higher studies and training at Technical University, Berlin. He has five decades of experience in teaching and research. He worked at Regional Engineering College (now National Institute of Technology) in Warangal for over 13 years. He worked as Professor of Electrical Engineering, at Osmania University College of Engineering for 21 years, holding several academic and administrative positions such as Principal and Dean, Faculty of Engineering. He has published a large number of research papers, authored three textbooks in electrical engineering, continues to guide several research projects.

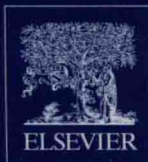
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*Dedicated to my late Grand Mother  
Marella Ranganayakamma garu*





# Preface

I had been in teaching for the last 50 years—teaching undergraduate and postgraduate students mainly in Electrical Power Engineering. At the end of the day, it was felt by me that my experience in teaching Power System subjects should be incorporated in a book form, so that it is shared by teachers and students of power engineering alike.

This book is intended to serve as a textbook for undergraduate students pursuing studies in Electrical and Electronics Engineering specialization at various universities and their affiliated institutions.

Chapters 2–4 deal with basics associated with transmission lines and their electrical parameters. Chapters 5 and 6, Corona and Interference, and Performance of Transmission Lines, explain the performance of transmission lines. Various aspects of underground cables are covered in Chapter 7, Cables. Substation layout and their components and functions along with earthing practices are included in Chapter 9, Substations and Neutral Grounding. Direct current and alternating current distribution engineering principles are explained in Chapter 10, Distribution System.

Overvoltage phenomenon and protection against overvoltages are elaborated in Chapters 11 and 12, Overvoltages and Protection Against Overvoltages. For systematic analysis of Power System under faulted conditions, graph theory and network matrix formation methodology is required, and this information is provided in Chapter 13, Graph Theory and Network Matrices.

Symmetrical and unsymmetrical fault analysis is explained with appropriate phasor diagrams in Chapters 15 and 16, Balanced Fault Analysis and Unbalanced Fault Analysis.

Protection of Power System under fault conditions and under certain contingencies using circuit breakers and relaying practices are explained in Chapter 17, Relaying and Protection.

Stability of Power System and various aspects of steady state, transient state, and dynamic condition are discussed to create clarity to the student in Chapter 18, Power System Stability.

Load flow analysis, economic scheduling without and with losses are covered in Chapters 19 and 20, Load Flow Analysis and Economic Operation of Power Systems.

Voltage and reactive power control are explained in Chapter 21, Load Frequency Control.

A large number of problems are solved for the benefit of the student.

More problems for practice to student are given at the end of each chapter. Questions on each topic are given.

**P.S.R. Murty**



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**P.S.R. Murty**



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