Numerical Distance Protection Principles And Applications

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Electric relays pervade the electronics that dominate our world. They exist in
many forms, fulfill many roles, and each have their own behavioral nuances and
peculiarities. To date, there exists no comprehensive reference surveying the
broad spectrum of electric relays, save one-Electric Relays: Principles and
Applications. This ambitious work is not only unique in its scope, but also in its
practical approach that focuses on the operational and functional aspects rather
than on theory and mathematics. Accomplished engineer Dr. Vladimir Gurevich
builds the presentation from first principles, unfolding the concepts and
constructions via discussion of their historical development from the earliest
ideas to modern technologies. He uses a show-not-tell approach that employs
nearly 1300 illustrations and reveals valuable insight based on his extensive
experience in the field. The book begins with the basic principles of relay
construction and the major functional parts, such as contact and magnetic
systems. Then, it devotes individual chapters to the various types of relays. The
author describes the principles of function and construction for each type as well
as features of several relays belonging to a type that operate on different
principles. Remarkably thorough and uniquely practical, Electric Relays:
Principles and Applications serves as the perfect introduction to the plethora of
electric relays and offers a quick-reference guide for the experienced engineer.
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This book presents the state-of-the-art approach for transmission line protection
schemes for smart power grid. It provides a comprehensive solution for real-time
development of numerical relaying schemes for future power grids which can minimize
cascade tripping and widespread blackout problems prevailing all around the world.
The book also includes the traditional approach for transmission line protection along
with issues and challenges in protection philosophy. It highlights the issues for
sheltering power grid from unwanted hazards with very fundamental approach. The
book follows a step-by-step approach for resolving critical issues like high impedance
faults, power swing detection and auto-reclosing schemes with adaptive protection
process. The book also covers the topic of hardware solution for real-time
implementation of auto-reclosing scheme for transmission line protection schemes
along with comparative analysis with the recently developed analytical approach such
as Artificial Neural Network (ANN), Support Vector Machine (SVM) and other machine
learning algorithms. It will be useful to researchers and industry professionals and
students in the fields of power system protection.

Differential protection is a fast and selective method of protection against short-circuits.
It is applied in many variants for electrical machines, trans-formers, busbars, and

electric lines. Initially this book covers the theory and fundamentals of analog and numerical differential protection. Current transformers are treated in detail including transient behaviour, impact on protection performance, and practical dimensioning. An extended chapter is dedicated to signal transmission for line protection, in particular, modern digital communication and GPS timing. The emphasis is then placed on the different variants of differential protection and their practical application illustrated by concrete examples. This is completed by recommendations for commissioning, testing and maintenance. Finally the design and management of modern differential protection is explained by means of the latest Siemens SIPROTEC relay series. As a textbook and standard work in one, this book covers all topics, which have to be paid attention to for planning, designing, configuring and applying differential protection systems. The book is aimed at students and engineers who wish to familiarise themselves with the subject of differential protection, as well as the experienced user entering the area of numerical differential protection. Furthermore, it serves as a reference guide for solving application problems. For the new edition all contents have been revised, extended and updated to the latest state-of-the-art of protective relaying.

This book develops novel digital distance relaying schemes to eliminate the errors produced by the conventional digital distance relays while protecting power transmission lines against different types of faults. These include high resistance ground faults on single infeed transmission lines; high resistance ground faults on double infeed transmission lines; simultaneous open conductor and ground fault on double infeed transmission lines; inter-circuit faults on parallel transmission lines; simultaneous open conductor and ground fault on series compensated parallel transmission lines; inter-circuit faults on series compensated parallel transmission lines; and phase faults on series compensated double infeed transmission lines. This monograph also details suggestions for further work in the area of digital protection of transmission lines. The contents will be useful to academic as well as professional researchers working in transmission line protection.

The death of Professor Arthur Wright in the summer of 1996 deprived me of a friend and a colleague whose judgement and experience shaped this book. I pay tribute to his contributions to protection and electrical engineering education. In the five years since the first edition appeared, many developments have taken place and it is now necessary to update the book. The use of digital communications and advanced signal processing techniques is now widespread and several fully numeric relays are available from manu facturers. Two new Chapters 13 and 14 have been added to introduce readers to these concepts and associated techniques. Artificial intelligence is making its impact in all engineering applications and power system protection is no exception. Expert systems, fuzzy logic, artificial neural networks, adaptive and integrated protection, synchronized measurements using the global positioning system, genetic algorithms, flexible a.c. transmission systems, are some of the techniques considered in connection with protection. Although many of these techniques have not yet found major application in protection, it is nevertheless essential for the educated protection engineer to have a basic understanding of the underlying principles and methodology so that he, or she, can evaluate their suitability for new relaying problems and applications. Chapter 15 was therefore added to guide readers through this developing area. I have also added some new material in other chapters to reflect changes over

the past years.

When planning an industrial power supply plant, the specific requirements of the individual production process are decisive for the design and mode of operation of the network and for the selection and design and ratings of the operational equipment. Since the actual technical risks are often hidden in the profound and complex planning task, planning decisions should be taken after responsible and careful consideration because of their deep effects on supply quality and energy efficiency. This book is intended for engineers and technicians of the energy industry, industrial companies and planning departments. It provides basic technical network and plant knowledge on planning, installation and operation of reliable and economic industrial networks. In addition, it facilitates training for students and graduates in this field. In an easy and comprehensible way, this book informs about solution competency gained in many years of experience. Moreover, it also offers planning recommendations and knowledge on standards and specifications, the use of which ensures that technical risks are avoided and that production and industrial processes can be carried out efficiently, reliably and with the highest quality.

Distance protection provides the basis for network protection in transmission systems and meshed distribution systems. This book covers the fundamentals of distance protection and the special features of numerical technology. The emphasis is placed on the application of numerical distance relays in distribution and transmission systems. This book is aimed at students and engineers who wish to familiarise themselves with the subject of power system protection, as well as the experienced user, entering the area of numerical distance protection. Furthermore it serves as a reference guide for solving application problems. For this fourth edition all contents, especially the descriptions of numerical protection devices and the very useful appendix have been revised and updated.

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This book is a timely compilation of the different aspects of wind energy power systems. It combines several scientific disciplines to cover the multi-dimensional aspects of this yet young emerging research field. It brings together findings from natural and social science and especially from the extensive field of numerical modelling.

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The protective relay industry has kept pace with the technological advancements in the field. Currently, the industry is introducing digital/numerical relays as they provide sub-station protection, control and communication, and the recording of disturbances and faults. Digital/Numerical Relays addresses the urgent based need of manufacturers and users adopting this latest technology. Besides covering the current developments, the book also covers current research as well as commercial application of digital/numerical relays.
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This book is a long awaited comprehensive introduction to the protection of electrical power systems using computer-based methods (i.e. digital relays). The treatment is logically structured, taking the reader through the mathematics and principles underlying the development and implementation of the major algorithms underlying different protection techniques. They can be applied to protection of generator transformers, lines, switchgear and cable circuits: the main components of transmission and distribution systems. The book deals with the research and development activity in the field of digital protection during the last 15 years. The reader will become familiarised with the fast developing field of power system protection using computers and microcomputers. "This book provides a full introduction for senior undergraduates and graduates, and acts as a sound reference for engineers already practising in this area."
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