An Introduction to Thyristors and Their Applications

To my wife
Lakshmi

An Introduction to Thyristors and Their Applications

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Preface

The rapid development of semiconductor technology has revolutionised the art of power modulation. "Thyristor" has become a byword for control in many industrial applications and the subject of several books. Some of these books emphasise its physics and characteristics, and some discuss one or the other of its applications in detail. Few qualify as texts for the undergraduate who needs not the details, which are available in handbooks and journals and/or in the teacher's lectures, but rather the basics.

In an attempt to fill in the lacuna, this text concentrates on the fundamentals of the operation of the thyristor and on its applications. No effort is made to go into the details of system design as a whole. The control circuits described for various applications using thyristors are not meant to be commercially feasible, but provide the basic understanding necessary for synthesising more sophisticated controllers.

The book, as its title indicates, serves as an introductory course on the thyristor and its applications to power control. It is, in fact, based on the lectures of such a course which the author has offered several times over the past few years. The volume is intended primarily for those undergraduates specialising in power control and industrial drives. Such readers have usually had a basic grounding in electronics, electric circuits and machines, and control theory.

The entire content can be covered in a two-semester course. The physics and characteristics of the thyristor, the methods of turning on and off, protection, general applications, phase control, and some fundamental aspects of line-commutated converters and inverters may be allotted to the first semester. The second semester may be devoted to Chapters 7 to 10 which focus attention on industrial controls involving all classes of forced-commutated circuits, and include a brief treatment of some important types of drives and their characteristics and the performance of controllers.

The illustrative problems at the end of the study are intended more to help the student gain an insight into the applications than to test his mathematical skill. A large number of examples are worked out in each chapter to facilitate a grasp of the subject. The list of important references, which identifies the source of material covered, proves useful when additional data is required.