

Preface

It is a well known fact that results from Functional Analysis and Theory of Operators are applied to many problems in the theory of ordinary and partial differential equations. During the last two decades, the area of Functional Analysis has provided significant contribution to a better understanding of equations of Evolution.

The works of a number of renowned mathematicians, including, H. Brezis, V. Barbu, J. L. Lions, A. Pazy, G. Morosanu, and others, have greatly contributed to the theory of the semi-groups of operators, initiated by E. Hille and K. Yosida. Due to such developments in the area of semi-groups of operators, the authors devote the entire second chapter to the presentation of the main results of this domain of Mathematics. To make this book as self-contained as possible, the first chapter is mainly devoted to the presentations of a series of elements of functional analysis and convex analysis; these will be used in the subsequent chapters.

The third chapter, which, alone, could be the subject of an entire book, contains the qualitative results regarding the evolution equations, such as: existence and uniqueness theorems, stability theorems, the strong convergence, the weak convergence, and other related topics. The authors decided that it is necessary to illustrate the abstract results of the theory; therefore, with this in mind, some applications are also included.

The methods used in the book permit the analyses of both continuous and discrete cases, which lead to the fact that the results presented are of interest to both the “theoretical and analysis” researchers, in general, and to researchers interested in a branch of “mathematical optimization algorithms”, in particular. In fact, Prof. Arabnia (Co-author of this book) is currently exploring the possibility of applying some of the ideas presented in this book to discrete wave signals with applications in brain wave processing.

The authors are aware that there are many more results in this important area of mathematic. Their inclusions in this book would have forced the composition of a multi-volume book series.

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