Lecture Notes in Mathematics

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Almost Periodic Differential Equations

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Preface

These lecture notes are written with the hope that the recent advances in the subject of almost periodic differential equations can become more accessible if the basic facts are collected in one place. It is well known that in Celestial Mechanics, almost periodic solutions and stable solutions are intimately related. In the same way, stable electronic circuits exhibit almost periodic behavior. A vast amount of research has been directed toward studying these phenomena. A great portion of the roughly five hundred items in our bibliography are dated after 1955.

These lecture notes are about almost periodic solution to ordinary differential equations. I spend the first four chapters on the theory of almost periodic functions. Included in those chapters is the skeleton of almost periodic theory. I have taken the tack of presenting only that material which is germane to the later chapters on differential equations. I include essentially no fact about almost periodic functions which is not used to prove something else. This is no virtue. It illustrates the depth of the thoery that is developed here.

These notes are self-contained except for the usual preliminary facts about existence and uniqueness of solutions of differential equations. It should therefore be accessible to a wide audience. I have taken the periodic case as motivation for much of the material, so an acquaintance with the fourier series theory of periodic functions is helpful.

Much of the material in the first four chapters appears in other books. Some of the material, however, is only available in research papers. This is primarily the case because the theory of almost periodic differential equations has been a rich source for new developments in almost periodic functions that are not well-known.

I have tried to give references to specific results. The reader will find an extensive bibliography of the subject. In addition, the notes at the end of each chapter are helpful in identifying sources of results as well as sources for a study of the literature.

The table of contents and the index are reasonably extensive and should be useful to the casual reader.

It is obvious that these lecture notes can only be an introduction to the subject. The number of items in the bibliography attests to that. Much interesting material is not mentioned. Topological dynamics is not included. It would require a book in itself, see Jacobs [546]. A specialist in the subject may easily find some favorite idea that is missing. I only hope that many readers can find something to tickle their imagination.

These notes have been used in various forms, for seminars at the University of Nebraska, the University of Colorado, and Iowa State University. The participants in those seminars have materially aided the exposition given here. In particular, my colleague, George Seifert, has read these notes and his comments, when followed, have improved the exposition. I thank him for his efforts.

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