

**Liu, James H.; N'Guérékata, Gaston M.; Minh, Nguyen Van**

**Topics on stability and periodicity in abstract differential equations.** (English) Zbl 1158.34002  
*Series on Concrete and Applicable Mathematics* 6. Hackensack, NJ: World Scientific (ISBN 978-981-281-823-2/hbk). ix, 208 p. (2008).

The authors have collected under a single cover a number of recent results on asymptotic behavior of solutions to evolution equations in Banach spaces. Fundamental definitions and theorems regarding Banach spaces, linear operators, semigroups of operators and spectral theory of operators are reviewed in Chapter 1. Chapter 2 is concerned with the stability and exponential dichotomy of linear homogeneous equations in Banach spaces. Existence of almost periodic solutions is addressed in Chapter 3, whereas existence of almost automorphic solutions to some classes of linear and semilinear abstract differential equations is discussed in Chapter 4. Chapter 5 deals with the existence of periodic solutions to nonlinear abstract differential equations and equations with finite and infinite delay. In addition to the review of results from functional analysis in Chapter 1, one finds additional information on Lipschitz operators, fixed point theorems, invariant subspaces and semilinear evolution equations in four appendices. Each chapter concludes with bibliographic comments and suggestions for further reading, and a number of exercises are inserted in the text.

Some criticism: The reader has to be patient. Since most results have been extracted from a number of different research papers, the notation is not always consistent (for instance, Banach space may be denoted as  $X$ ,  $\mathbf{X}$ , or  $\mathbb{X}$ ), some facts are repeated in different sections, and the clarity and manner of exposition vary from chapter to chapter. The format for references is a bit unusual, say (p. 44 in [Pazy (90)]) rather than traditional Pazy [90, p. 44]. The index is not very helpful, and it would be more convenient for the reader if the authors referred to theorems using their numbering and not by the names. Nevertheless, the selection of results included in the book reflects many important recent trends in the theory of abstract differential equations. Therefore, the monograph will be useful for graduate students and researchers working on asymptotic behavior of solutions to abstract differential equations.

Reviewer: [Svitlana P. Rogovchenko \(Kalmar\)](#)

**MSC:**

- [34-02](#) Research exposition (monographs, survey articles) pertaining to ordinary differential equations
- [34G20](#) Nonlinear differential equations in abstract spaces
- [34C25](#) Periodic solutions to ordinary differential equations
- [34C27](#) Almost and pseudo-almost periodic solutions to ordinary differential equations
- [34G10](#) Linear differential equations in abstract spaces

Cited in **13** Documents

**Keywords:**

[abstract differential equations](#); [periodic solutions](#); [almost periodic solutions](#); [automorphic solutions](#)