
Zbl 1068.34002**Agarwal, Ravi P. ; Bohner, Martin; Li, Wan-Tong****Nonoscillation and oscillation. Theory for functional differential equations.**
(English)

Monographs and Textbooks in Pure and Applied Mathematics 267. New York, NY: Marcel Dekker. vii, 376 p. (2004).

The theory of functional-differential equations (FDE's) is a rapidly developing branch of the qualitative theory of differential equations. FDEs cover as a special case (among others) differential equations with deviated argument which model many phenomena in natural sciences.

The reviewed book presents in a consistent form some results of the recent investigations in the oscillation theory of FDEs. It is written by the distinguished authors who achieved significant results in this area. The book consists of eight chapters. After the preliminary material collected in Chapter 1 (devoted mainly to the basic concepts of the oscillation theory and to general mathematical background like fixed-point theory), Chapter 2 deals with first-order delay differential equations and Chapter 3 with neutral first-order differential equations. The attention is devoted to various aspects of the oscillation theory of first-order equations, e.g., to the differences between the effect of a constant delay and of (one or several) variable delays. The similarities and differences between equations with constant and variable coefficients are treated as well.

The next two chapters concentrate on second-order differential equations. Chapter 4 is devoted to nonlinear ordinary differential equations (i.e., equations without delay), and mainly the influence of nonlinearities (sub/super linear) on the (non)oscillation of the investigated equations is studied. Chapter 5 is devoted to the classification schemes and to the existence of positive solutions of delay differential equations with or without neutral terms.

Chapter 6 deals with various aspects of the oscillation theory of higher-order FDEs. The attention is focused both on oscillatory and nonoscillatory equations. In particular, the classification of nonoscillatory solutions and the so-called trichotomy of positive solutions is studied in details. Chapter 7 features oscillation and nonoscillation for two-dimensional systems of nonlinear differential equations, and the last chapter is devoted to elements of the oscillation theory of the so-called dynamic equations on time scales. The time scale calculus is a natural unification of the differential and difference calculus, and the theory of dynamic equations on time scales unifies the theory of differential and difference equations. The results presented in the book are well understandable and the readers find there a unified presentation of recent results which are scattered in various scientific journals. The book will be very useful to mathematicians working in the area of the qualitative theory of differential equations as well as to physicists, engineers and biologists. It can also be used as a textbook at the graduate level and as a reference book for several disciplines.

*Ondřej Došlý (Brno)**Keywords* : functional differential equation; neutral differential equation; half-linear differential equation; time scale; dynamic equation on time scales

Zentralblatt MATH Database 1931 – 2007

© 2007 European Mathematical Society, FIZ Karlsruhe & Springer-Verlag

Classification :

- ***34-02** Research monographs (ordinary differential equations)
- 34K11** Oscillation theory of functional-differential equations
- 34C10** Qualitative theory of oscillations of ODE: Zeros, etc.
- 34K40** Neutral equations