# MONOGRAPHS

## Professor
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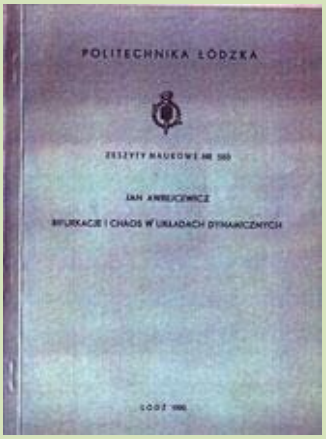
## Bifurcations and Chaos in Dynamical Systems

**TU Press, Lodz, 1990**
**monograph, 121 pages, in Polish**

**SUMMARY**




Preface & Contents

**Book Review**

This monograph is focused on analysis of bifurcation and chaos in the deterministic non-linear dynamical systems and includes three parts.
Chapter 1 is devoted to a general background of the further analysis. In the second part analytical local methods devoted to a study of the Hopf bifurcation occurred in three different autonomous systems, and also the analysis of the Hopf-like bifurcations in the systems externally and parametrically excited is outlined. First, a general introduction devoted to bifurcations is given. One parameter and two parameters Hopf bifurcations as well as Neimark-Sacker bifurcations are illustrated and analysed. In the next step, the Hopf bifurcation externally driven is studied. Among others, the non-resonance as well as main and n-th order resonances are analysed. Furthermore, a bifurcation in the system parametrically driven with and without external excitation is investigated.
The third part of the monograph focuses on the systematic global numerical analysis of both autonomous and non-autonomous nonlinear systems. Both problems of equilibria and periodic orbits are reduced to considerations of a boundary value problem. The eigenvalues of the Jacobi and Floquet matrices are traced. The chaotic dynamics is analysed via classical approaches, i.e. time histories, Poincaré maps and frequency spectra. A sudden and gradual transition to chaos via period doubling bifurcation, a transition of a multiplier through +1 as well as a simultaneous transition of two coupled conjugated multipliers are illustrated and discussed. The examples included are either theoretical or application-oriented (vocal chords dynamics or self-excited two degrees-of freedom system).
The fourth part includes the methodology yielding the chaotic orbits detection on a basis of approximate analytical methods (three examples of simple oscillators are considered). First, Van der Pol-Duffing oscillator with friction is analysed, then the oscillator statically loaded, and finally the oscillator with time delay is investigated.