

# Literature

## Scientific Computing

- [1] W. Böhm et al.. **Methoden der numerischen Mathematik**. Vieweg, Braunschweig, 1985 — *This general introduction to numerical mathematics contains a chapter on the numerical treatment of ODEs (in German).*
- [2] K. Burrage. **Parallel and Sequential Methods for Ordinary Differential Equations**. Clarendon Press, 1995 — *This is one of the few books which address the parallel solution of ODEs. In addition to that the usual sequential methods and the numerics of ODEs are explained.*
- [3] J. C. Butcher. **The Numerical Analysis of Ordinary Differential Equations**. J. Wiley & Sons, Chichester, 1987 — *This book contains an in-depth treatment of Runge–Kutta methods.*
- [4] G. Dahlquist and A. Björck. **Numerical Methods**. Prentice Hall, New Jersey, 1991 — *Basics of numerical mathematics, the presentation is clear and comprehensible.*
- [5] J. E. Dennis, Jr. and R. B. Schnabel. **Numerical Methods for Unconstrained Optimization and Nonlinear Equations**. SIAM, Philadelphia, PA, 1996 — *Applied introduction to solving nonlinear equations and to minimising nonlinear functions. A good introductory book to this subject.*
- [6] I. S. Duff, A. M. Erisman, and J. K. Reid. **Direct Methods for Sparse Matrices**. Oxford University Press, Oxford, 1997 — *Covers direct solvers for sparse matrices in considerable detail. The first half of our lecture on sparse linear solvers is based on this book.*
- [7] S. N. Elaydi. **An Introduction to Difference Equations**. Springer, Berlin, Heidelberg, New York, 1995 — *This book treats difference equations in high detail and the matter presented here is more comprehensive than in our lecture. Therefore, this book is a good supplement to the lecture.*
- [8] G. Engeln-Müllges and F. Reutter. **Numerische Mathematik für Ingenieure**. Bibliographisches Institut, Mannheim, 1987 — *The basics of numerical schemes (in German).*

- [9] G. Engeln-Müllges and F. Reutter. **Formelsammlung zur numerischen Mathematik mit \* - Programmen (\* = F77, Basic, C, Pascal, Modula 2, APL, PL/1)**. Bibliographisches Institut, Mannheim, 1988 — *Shows exemplary implementations of the algorithms from [8] (in German). Cf. [26] for a book with similar intentions.*
- [10] J. D. Faires and R. L. Burden. **Numerische Methoden**. Spektrum Akademischer Verlag, Heidelberg, Berlin, Oxford, 1995
- [11] L. V. Fausett. **Applied Numerical Analysis using Matlab**. Prentice Hall, New Jersey, 1999
- [12] G. Fulford, P. Forrester, and A. Jones. **Modelling with Differential and Difference Equations**. Cambridge University Press, Cambridge, 1997 — *Starting from simple examples (mostly from mechanics), the modelling by difference and differential equations is practiced. The book is clear and comprehensible and contains many examples from different areas of application.*
- [13] R. D. Grigorieff. **Numerik gewöhnlicher Differentialgleichungen 1 und 2**. Teubner, Stuttgart, 1977 — *These two older books have been the standard textbooks on ODEs for a long time (in German).*
- [14] E. Hairer, S. P. Norsett, and G. Wanner. **Solving Ordinary Differential Equations I**. Springer, Berlin, Heidelberg, New York, 1993 — *This book and the next are two detailed books on the numerics of ODEs.*
- [15] E. Hairer and G. Wanner. **Solving Ordinary Differential Equations II**. Springer, Berlin, Heidelberg, New York, 1996
- [16] G. Hämmerlin and K.-H. Hoffmann. **Numerische Mathematik**. Springer, Berlin, Heidelberg, New York, 1994 — *Treats the fundamentals of numerical mathematics but does not address the numerical treatment of ODEs (in German).*
- [17] M.T. Heath. **Scientific Computing – an introductory survey**. McGraw-Hill, Boston, 1997 — *Presents a broad overview of numerical methods and software for students and professionals in computationally oriented disciplines who need to solve mathematical problems.*
- [18] H. Heuser. **Gewöhnliche Differentialgleichungen**. Teubner, Stuttgart, 1989 — *Textbook on the mathematical theory of ODEs, contains many examples and applications, the style of the book is verbose and comprehensible (in German).*

- [19] C. T. Kelley. **Iterative Methods for Linear and Nonlinear Equations**. SIAM, Philadelphia, PA, 1995 — *Practically oriented introduction to this subject. Comes with a set of Matlab programs demonstrating the methods.*
- [20] H. Kocak. **Differential and Difference Equations through Computer Experiments : With Supplementary Diskettes Containing PHASER: An Animator/Simulator for Dynamical Systems for IBM Personal Computers**. Springer, Berlin, Heidelberg, New York, 1989 — *User's Manual for the program PHASER which can be used to simulate difference and differential equations numerically.*
- [21] N. Köckler. **Numerische Algorithmen in Softwaresystemen**. Teubner, Stuttgart, 1990 — *Describes the numerical algorithms which have been implemented in the software systems NAG and IMSL. Additionally, many examples for using NAG and IMSL are given.*
- [22] N. Köckler. **Numerical methods and scientific computing: using software libraries for problem solving**. Clarendon Press, Oxford, 1994 — *Describes the numerical algorithms which have been implemented in the software systems NAG and IMSL. Additionally, many examples for using NAG and IMSL are given.*
- [23] P. Kosmol. **Methoden zur numerischen Behandlung nicht-linearer Gleichungen und Optimierungsaufgaben**. Teubner, Stuttgart, 2. ed., 1989
- [24] J.D. Lambert. **Numerical Methods for Ordinary Differential Systems**. J. Wiley & Sons, Chicester, 1991 — *A comprehensible textbook on ODEs. It is well suited as a supplementary text for the lecture.*
- [25] H. E. Nusse and J. A. Yorke. **Dynamics: Numerical Explorations**. Springer, Berlin, Heidelberg, New York, 1994 — *User's manual for the program "Dynamics", which is a simulator for dynamical systems.*
- [26] W. H. Press. **Numerical Recipes in C (Fortran)**. Cambridge University Press, New York, 2. ed., 1992 — *This is a combination of theory and practice. Presents both selected numerical algorithms and their implementation in a programming language. Available for C, C++, Fortran, Fortran 90, older versions available for Pascal, Basic, IDL, Mathcad.*
- [27] Youcef Saad. **Numerical Methods for Large Eigenvalue Problems**. Manchester University Press, 1992 — *A well-written introduction*

to eigenvalue problems. Contains an exposition of the Jordan-canonic form.

- [28] H. R. Schwarz. **Numerische Mathematik**. Teubner, Stuttgart, 4. ed., 1997 — *Extensive introduction to numerical mathematics. This is one of the standard textbooks and it is covering almost all areas of numerics. (in German).*
- [29] L. F. Shampine. **Numerical Solution of Ordinary Differential Equations**. Chapman & Hall, 1993 — *This book covers multistep methods and step size control in detail.*
- [30] J. Stoer and R. Bulirsch. **Numerische Mathematik 1 und 2**. Springer, Berlin, Heidelberg, New York, 3. ed., 1990 — *Standard textbook about numerical mathematics. The first volume includes chapters on the solution of nonlinear equations and eigenvalue problems while the second volume covers the numerics of ODEs. (in German).*
- [31] G. Strang. **Introduction to Applied Mathematics**. Wellesley-Cambridge Press, Wellesley, 1986 — *An excellent introduction into applied mathematics containing many examples. It includes an introduction to numerical solvers for ODEs and their mathematical foundations.*
- [32] K. Strehmel and R. Weiner. **Numerik gewöhnlicher Differentialgleichungen**. Teubner, Stuttgart, 1995 — *Treats solvers for ODEs in more detail than this lecture. It contains a detailed chapter on differential algebraic equations (in German).*
- [33] F. Stummel and K. Hainer. **Praktische Mathematik**. Teubner, Stuttgart, 1982
- [34] C. Überhuber. **Computer Numerik 1 & 2**. Springer, Berlin, 1995
- [35] W. Walter. **Gewöhnliche Differentialgleichungen**. Springer, Berlin, Heidelberg, New York, 4. ed., 1989 — *Covers the mathematical foundations of ODEs and is an alternative to [18]. (in German).*