

Numerische Mathematik II

Wintersemester 2014/15

1 Course Policy

As the lecture notes by Dr. Gregory Von Winckel

<http://math.uni-graz.at/keeling/numIIscriptum.pdf>

are given in English, this course will be conducted in English with natural exceptions in German. The grade for the course will be based entirely on solutions to homework problems. Homework assignments will appear regularly at

<http://math.uni-graz.at/keeling/teaching.html>.

Solutions may be typeset or hand written and scanned, but they should be submitted in pdf format by email to stephen.keeling@uni-graz.at before the exercise unit. For discussion purposes these solutions will be projected during the exercise unit and then returned with a grade. The exercise unit will be held in the computer room SR11.35. The grades for the lecture and the exercises are determined by the solutions to the homework problems marked with PS or VO, respectively.

2 Topics

1. Numerical ordinary differential equations
 - (a) Review of ODE theory and methods of exact solutions
 - (b) Eulers method
 - (c) The Taylor series method
 - (d) Linear difference equations
 - (e) Linear multistep methods
 - (f) RungeKutta Methods
 - (g) Geometric numerical integration
 - (h) The Magnus expansion and operator splitting
 - (i) Adaptive step sizes
 - (j) Stochastic differential equations
 - (k) Differential algebraic equations
 - (l) Delay Differential Equations
2. Introduction to numerical partial differential equations
 - (a) Finite difference methods
 - (b) Spectral methods
 - (c) Finite element methods