SYLLABUS

I. General setting and introduction

I./1. Computational mathematics and numerical linear algebra
I./2. Eigenvalues
I./3. Linear models
I./4. General methodology

II. Model reduction and SVD, bidiagonalization

II./1. SVD and what does it reveal
II./2. TSVD solution of the deblurring problem
II./3. Computation of SVD – bidiagonalization
II./4. Application to solving $Ax \approx b$

III. Principles of Krylov subspace methods

III./1. Power method and finding the dominance
III./2. The essence of Krylov subspace methods
III./3. A symmetric positive definite example

IV. Gauß quadrature

IV./1. Interpolatory quadrature on n points
IV./2. Gauß-Christoffel quadrature
IV./3. Relationship with the SPD example in III./3.

V. Lanczos algorithm and the conjugate gradient method

V./1. Lanczos, CG and Gauß quadrature
V./2. Characterization of convergence
V./3. Measuring convergence

VI. GMRES behaviour and eigenvalues

VI./1. A counterintuitive theory
VI./2. Convection – diffusion model problem

VII. Numerical behaviour of Krylov subspace methods

VII./1. Delay of convergence
VII./2. Maximal attainable accuracy

VIII. Roundoff error analysis a mathematical discipline?

VIII./1. Tedious bounds
VIII./2. Mathematical rigor and beauty