AMSC/CMSC 660, Fall 2021: *Computational Methods* (Aug. 30, 2021)

Covid-19 By University policy a **mask covering mouth and nose** is required in class at all times without exceptions. Lectures and the exam will be given in-person in the classroom according to Math Department policy. If this policy should change this syllabus may be modified — I will discuss this in class and publish it on ELMS.

Time & Place MWF 1:00–1:50pm in MTH0104

Instructor Dr. T. von Petersdorff, e-mail tvp@math.umd.edu, office hours by appointment using Zoom

Course Web Page www.math.umd.edu/~tvp/660 gives additional information about the course, e.g., hints for using Matlab and for the homework problems. Please check this web page regularly.

No required textbook I will provide free PDF texts about the main topics on the course web page. I recommend that you take additional handwritten notes during the lectures.

Syllabus I will post PDF notes about the main results as we cover them in class.

- Linear algebra problems: linear systems, LU and Cholesky factorization, condition number, eigenvalues, linear least squares problems, QR factorization, singular value decomposition
- Nonlinear systems of equations: Newton method and modifications, continuation method
- Optimization: line search methods (steepest descent, Newton, BFGS), trust region
- Ordinary Differential Equations: basic theory, Runge-Kutta methods, multistep methods
- Monte-Carlo methods: introduction to statistics and CLT, MC integration, variance reduction, importance sampling

Grading Policy The grade will be obtained from a weighted average of exams, homeworks, and final exam (see below). With a total percentage $\geq 90\%, 80\%, 70\%, 60\%$ you are guaranteed an A, B, C, D, respectively. These cutoffs may be lowered slightly.

1 Exam (Total 15%) In the case of *legitimate* and *documented* excuses according to the University Attendance Policy (ugst.umd.edu/courserelatedpolicies.html) I will give an oral examination.

Homeworks (Total 60%) There will be about 5 assignments, containing both theoretical problems and computer problems with Matlab. **Homeworks are handed in on ELMS as a single PDF file**. See the **instructions on the webpage** for homework. Homeworks must be done individually by each student. Sharing of material (in particular code) is considered academic dishonesty.

Final Exam (25%) The final exam will be a take-home exam.

Matlab This course will use Matlab. You can download Matlab for free from terpware.umd.edu