Math 352, Elementary Numerical Analysis II, Winter 2019

Class Time:	MWF 2-2:50p.m. in 195 Anstett Hall
Instructor:	Dr. Marcin Bownik
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Office Hours:	1-2pm Mon., 1-2pm Wed., and 12-1pm Fri., or by appointment
Textbook:	W. Cheney, D. Kincaid, *Numerical Mathematics and Computing*, 6th ed.

1. **Background and Goals.** This course introduces students to the subject of numerical analysis. Numerical analysis is the study of methods and algorithms for mathematical computation, with an emphasis on techniques for approximating solutions to numerical problems and managing the error. Topics include: Gauss elimination method, matrix factorization, interpolation and approximation by spline functions, numerical methods for solving differential equations, and method of least squares. The course, which is the second of two in the sequence, covers most of chapters 7–12 of the textbook.

2. **Learning Outcomes.** Students should be able to solve systems of linear equations using gaussian elimination with scaled pivoting, compute error and residual vectors, solve tridiagonal and banded systems, identify strictly diagonal matrices, compute matrix LU factorization and Cholesky factorization, compute the condition number, identify ill-conditioned systems of linear equations, solve systems of linear equations using iterative methods such as Jacobi and Gauss-Siedel iterations and identify when these methods converge. They should be able to identify and compute first and second degree splines, estimate accuracy of spline approximation, identify and compute natural cubic splines, and perform interpolation and approximation using B splines. Students should be able to derive solutions of ordinary differential equations using Taylor series and Runge-Kutta methods and estimate their errors. They should be able to approximate given data using the method of least squares both for polynomial and non-polynomial basis functions.

3. **Mathematica.** For the in-class computer demonstrations we will use Mathematica, a powerful computer program for symbolic and numerical mathematical computations. You may also want to use it for your homework and project. Mathematica is available to students for instructional/academic research purposes only. It can be installed from Information Technology site at `https://it.uoregon.edu/software/mathematica`.

4. **Exams.** There will be an in-class midterm exam on Wed. Feb. 13 and a final exam on Thu. Mar. 21, 2:45-4:45p.m.

5. **Homework.** Homework problems will be assigned every week and be due in class on Wednesday on the material of the previous week. No late homework will be accepted.

6. **Project.** Part of your grade will be based on a programming or research project due on the last day of class. Possible projects include implementing the algorithms discussed in class in your favorite programming language, or researching a numerical analysis topic.

7. **Grading.** The grading distribution will be as follows:

Homework:	20%
Midterm Exam:	20%
Project:	20%
Final Exam:	40%