Lectures: Tuesday/Thursday 12:30–1:45PM, Derring 3076
Web Site: http://www.math.vt.edu/people/embree/cmda3606
Instructor: Mark Embree (embree@vt.edu), McBryde 575, (540) 231-9592
Office Hours: Monday 1–2:30PM, Wednesday 2:30–4PM, or by appointment.
You are encouraged to join me for lunch on Wednesdays, 11:45AM-12:45PM, at Owens.
Teaching Assistant: Andrew Glaws (glaws@vt.edu), McBryde 465D
Office Hours: Monday 3–4PM and Friday 1–2PM
Piazza: We will use Piazza as a forum for posting questions and extending class discussion. This tool allows you to post using clean mathematical notation, with your preferred degree of anonymity. Students are encouraged to use this forum vigorously.

Prerequisites: You should know basic matrix operations (matrix multiplication, Gaussian elimination, etc.), and multivariable calculus. MATLAB fluency will be helpful but is not required.

Grade Policy: 50% exams, 50% problem sets
Scores of at least 90, 80, 70, and 60 guarantee grades of at least A−, B−, C−, and D−, respectively. Class participation and engagement in active learning activities will influence borderline grades. Improving performance over the course of the semester will also be considered. Homework and exam grades will be posted on the class Scholar site.

Text: Lecture notes will be provided by the instructor throughout the course. They will be posted to the course website (or Scholar).

Exams: Two closed-book exams will each account for 25% of the final grade.
The first exam will be held on Thursday March 6 in class.
The second exam will be held on Saturday 10 May, 1:05–3:05PM.

Problem Sets: Problem sets will be assigned roughly once every 10 days, due in class on the specified date. Mathematically rigorous solutions are expected; strive for clarity and elegance.

Late Policy: You may turn in two problem sets one class period late without penalty; further late assignments will be penalized 20% each. Work will not be accepted more than one class late.

Re-Grade Policy: If your work has been graded incorrectly, you may submit a re-grade request. Clearly explain the perceived error on a separate sheet of paper, staple it to the front of your graded paper, and give it to the instructor within one week of the paper’s return.

Honor Code: Virginia Tech’s Honor Code applies to all work in this course. You are encouraged to discuss the problem sets with others, but your write-ups must be your own individual work. Transcribed solutions and copied MATLAB code are both unacceptable. The exams must be your own independent effort.

Programming: Most problem sets will require a modest amount of MATLAB programming, often based on codes provided by the instructor for class demonstrations. A crash course in MATLAB will be offered in a supplemental lecture on Wednesday, 22 January from 7:30-9PM in McBryde 219. Your programs should adhere to good programming standards, and must not be copied from another student. Consult the course website site for pointers to MATLAB resources.

Any student with special needs or circumstances requiring accommodation in this course is encouraged to contact the instructor during the first week of class, as well as the Dean of Students. We will ensure that these needs are appropriately addressed.
CMDA 3606 is a key component of the new curriculum in Computational Modeling and Data Analytics. This course introduces students to mathematical modeling alongside modern algorithms in numerical linear algebra and optimization. It will emphasize useful, modern computational tools used throughout research and industry, and explain why they work. Through meaningful applications students will learn to use these techniques in action.

This course counts like an upper division Math course for meeting Math minor requirements, and it counts as a math-related course for Math majors.

Outcomes: Upon completing this course, students should be able to:
- 1) develop matrix-based models of simple discrete and continuous time linear systems;
- 2) skillfully use the eigenvalue and singular value decompositions;
- 3) solve large linear algebraic equations, least squares problems, and eigenvalue problems;
- 4) solve basic linear inverse problems and optimize nonlinear systems.

Supplemental Reading:
- Carl Meyer, *Applied Matrix Analysis and Linear Algebra*
- Steven J. Cox, *Matrix Analysis in Situ*, Rice University
- Gilbert Strang, *Introduction to Applied Mathematics*
- Per Christian Hansen, *Discrete Inverse Problems: Insight and Algorithms*
- Jorge Nocedal and Steven Wright, *Nonlinear Optimization*

Links to these books will be provided on the class website, along with more specific references associated with each lecture.