Math. 309, Sec. 502 Fall, 2018

Linear Algebra for Differential Equations

Course description: Systems of linear equations, matrices, determinants, vector spaces, linear transformations, eigenvalues and eigenvectors, diagonalization, inner product spaces, orthogonal functions, separation of variables, Fourier series, Bessel functions.

Learning Outcomes:

1. Students will gain working knowledge of matrix algebra, the solution of systems of algebraic linear equations, determinants, and eigenvectors.
2. Students will learn to recognize and exploit vector spaces, linear transformations, subspaces, bases, and orthogonality in practical problems.
3. Students will learn to solve separable partial differential equations by Fourier series and Bessel functions.

Prerequisites: multivariable calculus (M. 251 or equivalent); differential equations (M. 308 or equivalent) at least concurrently; junior or senior classification or permission of instructor.

This course should not be taken in addition to M. 304, 311, or 323. Furthermore, if you plan to take M. 401 or 412 (PDEs and Fourier series), you should take one of those three linear algebra courses instead of this one.

Classes: TR 3:55–5:10, BLOC 163

Web page: `http://calclab.math.tamu.edu/~fulling/m309/`

Instructor: S. A. Fulling
Blocker 620H
`fulling@math.tamu.edu`

If I am not in my office, you can leave a note in my mailbox (in Blocker 226) or under my office door.

Tentative office hours: M 3:10-3:50, W 2:00-2:50, R 2:00-2:50. Permanent office hours (probably the same as these) will be announced later.

Textbooks:

1. S. J. Leon, *Linear Algebra with Applications*, 9th ed., Pearson, 2015 (for the first 2/3 of the course).
2. T. I. Vogel, *Lecture Notes for Math 309 (Fourier Series and Bessel Functions)*, 2013 (for the last third of the course). **This will be available from our class web page.**

Recommended supplementary textbooks:

1. For the first part: S. A. Fulling, Math 311 lecture notes (published as *Linearity*, World Scientific, 2000). **This will be available from our class web page.**
2. For the second part: Any of the dozens of books on Fourier series and PDEs, of which two useful short ones are
   i. M. R. Spiegel, *Fourier Analysis with Applications to Boundary Value Problems* (Schaum's Outline Series).
   ii. C. Constanda, *Solutions Techniques for Elementary Partial Differential Equations*, Chapman & Hall, 3rd ed., 2016 (used in M. 401).

Grading system:		
Hour tests:	$100 \times 2 =$	200
Final exam:		200
Homework and class participation:		200
Total		600

The "curve" will be at least as generous as the "standard" scale [i.e., 90% (= 540 pts) will guarantee an **A**, etc.].

Dates of hour tests: Thursday, Oct. 4; Thursday, Nov. 8
Final Exam: Tuesday, Dec. 11, 1:00–3:00

Homework will usually be collected on Thursdays. Assignments will be on the Web page.

Class participation: We will sometimes discuss homework problems and other examples at the blackboard (or projector) in class. Sometimes I'll assign problems for you to work on in class in groups. At other times volunteers and random draftees will simply be called on. (You may also be called to the board to help me introduce a new concept or technique "Socratically". In such cases a good participation score is attained merely by being alert and cooperative.) Attendance records may influence class participation scores slightly.

Make-up tests: Make-up tests are very hard to grade fairly, and they absorb a large amount of my time which would be better spent for the benefit of the whole class. Please cooperate in making these incidents as rare as possible. If you miss (or foresee that you will miss) a test, it is *your* responsibility to contact me as soon as possible to request, justify, and schedule a make-up test. (If you can't reach me directly, you can leave a message at the Math Department office, (979) 845–3261.) If the absence is not clearly excused under the Attendance section of *Student Rules*, the request may be denied.

An Aggie does not lie, cheat, or steal or tolerate those who do. See Honor Council Rules and Procedures, `http://www.tamu.edu/aggiehonor` .

Plagiarism: Finding information in books or on the Internet is praiseworthy; *lying* (even by silence) about where it came from is academic dishonesty. Whenever you copy from, or "find the answer" in, some other source, *give a footnote or reference*. Otherwise, you are certifying that it is your own work.

Joint work: On a homework assignment (*not* a take-home test!) discussion with other students is permitted, even encouraged. However, the grader will not give homework credit for "work" that is parasitical (and your test scores will suffer, too!). To forestall problems, please follow these policies: (1) When two or more students work together on an assignment, they should all indicate so on their papers. (2) If the cooperation is of the divide-and-conquer variety, you are certifying that you *have studied and understand* every problem solution on your paper. Mindless copying is dishonest and academically worthless.

Calculators in exams: Calculators are to be used only to perform *elementary operations* such as addition, multiplication, and (optionally — see remark below) evaluation of simple functions such as square roots, sines, and logarithms. Advanced facilities such as storing formulas in memory, inverting matrices, and graphing functions on the calculator display

are prohibited. Violations of this rule may lead to total prohibition of calculators in exams (probably at the insistence of other students).

Copyright: Course materials (on paper or the Web) should be assumed to be copyrighted by the instructor who wrote them or by the University.

Disabilities: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information visit `http://disability.tamu.edu/` .