**Professor:** David McClendon (2046 ASC, phone x2574 (231-591-2574 off campus), hours 1-2 MW, 12-1 TR or by appointment, email: mcclend2@ferris.edu)

**Lectures:** MWF 11:00-11:50 AM in Starr 212.

**Materials:** You need my lecture notes, which can be obtained in either of two ways:

- as a course pack, available at the bookstore; or
- online, at my web page (see below for URL) as a pdf file

**Technology:** No software or calculators are required, but a TI-83/84 graphics calculator or the computer software package *Mathematica* may save you significant time and/or give you a way to check your work. Directions on how to perform linear algebra procedures on these instruments is in the lecture notes.

**Web:** I maintain a personal web page at http://mcclendonmath.com/322.html; this page contains handouts, old quizzes and exams, and lecture notes.

**Prerequisite:** Math 220 with a grade of C- or better, or the equivalent. That said, this course uses very little calculus (only the occasional derivative or integral of easy functions). For the most part, the only math one actually has to know is how to add, subtract, multiply and divide (there is a little trig).

**Course material:** Vector spaces, subspaces, vector geometry, linear transformations, systems of equations, change of coordinates, determinants and eigentheory.

**Learning outcomes:** After completing Math 322, it is my hope and expectation that students will be able to:

1. determine whether or not a given subset of a vector space is a subspace and/or affine subspace; find the dimension of, and a basis or bases for, a given subspace (especially the fundamental subspaces of a linear transformation); determine whether or not a set of vectors is linearly independent or spans a particular subspace.
2. compute and interpret dot products; determine whether or not vectors are orthogonal; find an orthonormal basis of a vector space; compute projections and determine equations of lines, planes and hyperplanes;
3. perform basic matrix operations including inversion, multiplication, determinants, eigenvalues and eigenvectors, diagonalization, powers, exponentiation, and row reductions;
4. determine whether or not a given function is a linear transformation; find the kernel and image of a linear transformation; and
5. solve systems of linear equations (including least-squares methods).

**Grading policy:** Mathematical correctness of homework: $15\%$. Aesthetics of homework: $5\%$. Quiz average: $5\%$. Class participation: $5\%$. Midterm exams (three of them): $15\%$ each. Final exam: $25\%$. Grades will be curved at the end of the semester, but an average of $90\%$ guarantees you at least an A-, an average of $80\%$ guarantees you at least a B-, etc.

**Attendance policy:** I have no formal attendance policy. That said, **nothing** is more correlated with strong performance in my classes than attendance in lectures.

**Homework:** There will be weekly homework assignments, found at the end of each chapter in the lecture notes, each due whenever I go home on the dates listed on the attached course calendar. You can turn in homework in class or by putting it in the slot next to my office door marked "Math 322". I will grade a subset of the homework problems and each of your homeworks will receive two grades: one for mathematical correctness, and one for "aesthetics" (i.e. neatness, grammar, correct use of notation, etc.).

**Many of the homework questions are meant to be challenging!** In advanced math classes, you learn not only from lectures but by thinking about difficult homework problems. If you get stuck, come to office hours and ask questions, or work with a more able classmate, or go to the math club's tutoring hours.

**Quizzes:** There will be occasional unnanounced quizzes in class which cover your ability to perform very standard computations and check whether or not you are reviewing your notes regularly. For every four quizzes we have, you may drop one of your worst quiz grades.

**Midterms:** There are three midterms, all of which are to be done at home and returned in class on the dates listed on the attached calendar. You may use a calculator and you may use *Mathematica* on the midterms, and you may use your notes and graded homeworks, but you may not get help from books, the internet, or other sources, and you must work by yourself on the exams. Late exams will be severely penalized.

While none of the midterms are directly cumulative, mathematics is by its nature cumulative.

**Final exam:** The final exam is cumulative and will be done in class. It will be comprised of 60% "standard" problems (exactly what problems are "standard" will be discussed near the end of the semester), 20% questions on course vocabulary, and 20% questions on theory. There are no proofs on the final exam.

**Getting help:** The best place to receive help is my office. In class, I will not have time to take many homework questions, and I will not be able to present all perspectives on a topic. In office hours, I am able to discuss the material at a much more friendly pace and offer some alternate viewpoints that may help you understand the material better.

If you cannot make my scheduled office hours, you can come talk to me anytime my office door is open. Also, I am more than happy to make an appointment to discuss the material with you. Send me an email.

**Students with disabilities** who require reasonable accommodations to fully participate in course activities or meet course requirements should register with the Educational Counseling and Disability Services office (x3057, `ecds@ferris.edu`). While ECDS will send me a letter outlining the accomodations to make for you, I would appreciate it if you could contact me immediately for assistance with any necessary classroom accomodations.

**Academic dishonesty:** Papers will be monitored for "magic answers". Issues with academic dishonesty are taken very seriously, will almost always result in an F for the class, and will be referred to the Office of Student Conduct.

**How to succeed in this class:** Start by mastering vocabulary. Linear algebra is filled with new words and new concepts you've never seen before: for every new word or phrase you learn, you should

1. know the precise mathematical definition of the word/phrase
2. have a heuristic understanding of what the phrase means beyond its rigorous definition;
3. have a working list of examples and nonexamples which illustrate the phrase; and
4. think about how the concept relates to other ideas from the course.

Start by learning the item's part of speech... if it is a verb, what do you do the verb to? If it is an adjective, what kinds of nouns does it describe? If it is a noun, is it a specific type of some other noun? A more general type of some other noun? Etc.

If at any point there is terminology you don't think you understand, come to office hours.