MATH 2700.003. Linear Algebra and Vector Geometry.

Spring 2010 MW 2:00 to 3:20. LANG 319.

Textbook as required by the department. David C. Lay, Linear algebra and its applications. 3rd edition, Addison-Wesley, Boston, 2006. ISBN 0-321-28713-4. We should do all the chapters in the book but in a different way. See syllabus before buying the book.

Estimated cost of taking this course, in addition to UNT tuition and course fees. The list price of the textbook is around $140. You may be able to avoid buying the book. You will find it extremely helpful to have a scientific graphing calculator.

Final and test dates. There are two tests during the semester, tentatively on Wednesday, September 29 and Wednesday, November 10. According to the UNT website (accessed August 24), the final is on Monday, December 13, 1:30 to 3:30 pm in the usual class room.

Grades and exams. Your final grade is determined by two tests given during the semester (30% each) and the final (40%). I will hand out review sheets before each test and the final. The letter grade will be given strictly according to the recommended university standards: D = at least 60%, C = at least 70%, B = at least 80%, and A = at least 90%. Acceptable excuses for missing a test or the final are: illness or injury requiring professional medical attention, deaths of an immediate family member, or injury accidents. You may be asked to furnish documentary proof. Alternate tests will be different from the regular test and may be graded using a different procedure. Requests for alternate tests must be made *in person* during class or office hours *no later than one week after the regular test day.*

Your tests (but not the final) will be returned to you, usually the first class day following the test. You should be in class to pick up your test. No responsibility will be taken for tests which are not picked up within two weeks.

Homework. Homework will be assigned, once a week, almost always due on Wednesday. Homeworks are required. See the individual schedules.

Attendance. You are expected to attend all scheduled classes for the full class period, inclduing the first day! Attendance will be checked by discreet electronic means at a random time during the class period. This time is picked randomly according the the normal distribution, with mean at the middle of the class period (2:40pm) and with a variance which is a classificed secret. Attendance is a necessary condition for a passing grade. If you miss six or more class periods (and the electronic evidence will be irrefutable), then you

may receive a failing grade independently of how you are doing on the tests and final.

Prerequisites and code of conduct. The prerequisite course is MATH 1720, Second semester calculus. If in doubt, talk to me.

You may be dropped administratively at any time if you do not have the prerequisites. It is your responsibility to check that you have taken the prerequisite course. Having a prerequisite course means that you have *current* knowledge of the material covered in that course as stated in the official syllabus regardless of what your instructor for that course actually covered.

I expect you to behave in accordance with the student code of conduct. There will be **zero** tolerance of violations of this code: this particularly applies to cheating during tests and the final.

I also expect you to behave with courtesy and consideration towards your fellow students (and to me), particularly during class period. This is a large section and if you indulge in actions which disturb other students, you will be removed from the room at my discretion.

Other matters. All university policies will apply to this course. Any requests arising from university policy *(including but not limited to a request for accomodation for certified disabilities or religious observances* **at any time during the semester***)* must be submitted to me in writing before 5 pm on Friday, September 3, or five business days after you have enrolled for this course, whichever is later. Your request must be delivered to me in person during one of the scheduled class periods and a signed receipt must be obtained from me for any request to be valid.

Important note about schedules, review sheets, and other handouts.

Schedules are given out every week. The schedules are intended to give you useful information. Handouts, such as review sheets, will also be given out. Information on schedules or handouts might be changed and errors will be corrected; these amendments will be announced during class. You are responsible for keeping track of these amendments, as well as making sure you get all the schedules and other handouts.

Fine print. There are **no** verbal agreements in this course. If you think that I promise you something, be sure to get it from me in writing! This handout is intended as an general guide to the policies pertaining to the administration of this course. This handout does not replace or supercede any official university document.

Instructor. Joseph Kung. GAB 471C. Office hours: Mondays 12:00 to 2:00 pm, Wednesdays

9:55 to 10:55 am, 12:55 to 1:55 pm, other times by appointment.

e-mail: kung@unt.edu [Expect some delay and possible computer problems when using email. Be sure to put MATH 2700 in the subject line. Email without this may be put into a SPAM file and unread.]

Phone 940-565-4084.

Syllabus.

This is an introductory course on linear algebra. There are at least three approaches to linear algebra: the theoretical or axiomatic approach, involving proofs, the functional analysis approach, involving real functions and linear operators, and the matrix or numerical approach, involving actual explicit computations. Because this course serves a divesity of students, ALL THREE approaches need to be covered. It is impossible to follow the department textbook rigidly and achieve these aims. We will focus on the ideas and algorithms rather than any explciit material. If you want a course that follows the textbook rigidly, there are other sections of this course. I teach to the serious and committed student and go at the pace of the top 25%.

The textbook may or may not be useful. A useful free resource can be found on the website MIT OpenCourseware 18.06 Linear Algebra. Just google MIT 18.06 opencourseware. 18.06 is a freshman linear algebra course taught at MIT by Gil Strang. This course covers linear algebra (in all its aspects) in a fast-paced but accessible way. We will do much the same stuff, in more or less the same order, with somewhat less detail and omitting some applications. Mathematics is mathematics: there are not "easier" versions. What is done at MIT is universal. The MIT website contains videos of lectures, transcripts of lectures, etc. These may replace the textbook.

Attendance is necessary and required. See the attendance policy stated earlier. The subject is much easier to "get" if you have someone show you the ideas and calculations informally and you can ask questions. Be aware that certain topics may seem deceptively simple.

The university starts the fall semester on August 26. This means we lose the first week. The syllabus starts with week 2. With Labor Day and Thanksgiving, we will effectively have 13 weeks plus pre-finals week. For this reason, we can only have two tests during the semester rather than the usual three. I would much rather have three, but the university schedule makes this impossible.

Typographical errors, especially on dates, may occur in the syllabus. They will be corrected in class. Topics for each week may change depending on how the material comes across to you.

Week 1. Void

Week 2 (August 30, September 1) Solving linear equations, matrices, matrix multiplication, LU-decomposition

Week 3 (September 8) Real n-dimensional space, column and null space of a matrix

Week 4 (September 13, 15) More on subspaces, solving $Ax = 0$, pivoting, row and column reduction, inverse matrices.

Week 5 (September 20, 22) More on solving $Ax = 0$ and $Ax = b$. Application to Markov chains

Week 6 (September 27, 29) Review. First test. The test will be on Wednesday, September 29.

Week 7 (October 4,6) Independence, basis, dimension. The three fundamental subspaces (there's a fourth, but we won't emphasize the fourth subspace.)

Week 8 (October 11, 13) Spaces of polnomials, linear operators, differential operators on subspaces of polynomials, subspaces of polynomials, inner products, projecting onto subspaces.

Week 9 (October 18, 20) Determinants, signed volumes, Cramer's rule, inverse matrices revisited

Week 10 (October 25,27) Eigenvalues and eigenvectors

Week 11 (November 1,3) Diagonalizing a matrix, symmetric matrices

Week 12 (November 8, 10) Review and second hour test. The second test is on Wednesday, November 10.

Week 13 (November 15, 17) Powers of matrices, Markov chains again, complex matrices and rotations

Week 14 (November 22, 24?) Complex matrices continued. Fast Fourier transforms?

Week 15 (November 29, December 1) Orthogonality, Gram-Schmidt process

Prefinals week (December 6, 8) More on Gram-Schmidt. Fun topics: calculating page rank in search engines, image compression. Review for final

Final. Monday, December 13, 1:30 to 3:30 pm in the usual classroom. Please confirm room and time against the UNT final exam schedule.