Math 221: Applied Linear Algebra Spring 2024 Liberty University

	Topic	My Notes	Text	Due
M: 1-15	systems of linear equations: notation and setting up the matrix			
W: 1-17	systems of linear equations: row reduction technique			
F: 1-19	solution sets and classification of solutions, application example			
M: 1-22	matrix arithmetic (how to add, subtract and multiply matrices)			
W: 1-24	matrix arithmetic (transposition, column and row multiplication)			Mission 1
F: 1-26	systems of linear equations as vector equations			
M: 1-29	elementary matrices and the CCP, span and LI introduced			
W: 1-31	elementary matrices and the CCP, span and LI introduced			
F: 2-2	invertible matrices, application example			Mission 2
M: 2-5	partitioned matrices, matrix factorization			
W: 2-7	basis for column space or null space of matrix, rank nullity theorem			
F: 2-9	examples and applications			
M: 2-12	questions for Test 1			Mission 3
W: 2-14	Test 1			
F: 2-16	determinants, formulas and calculation			
M: 2-19	determinants, Cramer's Rule, formula for inverse			
W: 2-21	determinants, application examples			
F: 2-23	nonstandard coordinates for Euclidean space			Mission 4
M: 2-26	linear transformations on Euclidean space and their standard matrix			
W: 2-28	properties of linear transformations, onto vs. one-to-one maps			
F: 3-1	coordinate change for linear transformations on Euclidean space			
M: 3-4	calculus of matrices, systems of DEqns, motivation for eigenvector			
W: 3-6	eigenvalues and eigenvectors, properties and examples			Mission 5
F: 3-8	eigenvalues and eigenvectors, diagonalization, application			
	SPRING BREAK (a.k.a. "the holidays", 3-11 to 3-15)			
M: 3-18	complex eigenvalues and eigenvectors			
W: 3-20	complex eigenvalues and eigenvectors			
F: 3-22	examples and applications			
M: 3-25	questions for Test 2			Mission 6
W: 3-27	Assessment Day			
F: 3-29	Test 2			
M: 4-1	Easter Monday			
W: 4-3	orthogonality in Rn, orthogonal matrices, real spectral thm			
F: 4-5	conic sections and quadratic surfaces			
M: 4-8	application to multivariate extremal analysis			
W: 4-10	projections, orthogonal complements, perpendicularity of subspaces			Computer Project
F: 4-12	Gram Schmidt process, QR-decomposition			
M: 4-15	closest vector problem and least squares analysis			
W: 4-17	eigenvalues and eigenvectors, nondiagonalizable case			Mission 7
F: 4-19	complex eigenvalues and eigenvectors, nondiagonalizable case			
M: 4-22	the matrix exponential			
W: 4-24	singular value decomposition			
F: 4-26	on abstract vector spaces, Hilbert Space, quantum mechanics…			Mission 8
M: 4-29	on Takehome Test 3 (due at start of class), word about Final Exam			
W: 5-1	Reading Day			
TH: 5-2	Final Exam Thursday May 2, from 8-10am			

- Test 1=140pts, Test 2=140pts, Test 3=140pts
  Missions (240pts) / Final = 240pts / Computer Project 100pts

- The required homework is given as "Missions" there are ten of these which are shared as pdfs in Canvas.

- The Computer Project is due 4-10, there will be about 6 teams who work together to present a Matlab-based solution to a challenging applied problem. Probably there will be 3 challenges issued and each challenge will be faced by a pair of competing teams. Your goal is to solve the problem and outmatch the approach of your competitor.

- If you do not turn in Mission when it is due then you can earn half credit by submitting it later, however, only until the Test which covers the material. For example, Missions 1,2,3 can be turned in late before Test 1, but not after Test 1. Likewise, Missions 4,5,6 can be turned in late, but not after Test 2. Lastly, Missions 7 and 8 are only accepted late as late as 4-29. I have been more generous in past terms, but I want to be clear that such grace is not my intention this term. You need to do the homework when it is assigned. Not doing the homework means you're not really in the class to be entirely honest. Coming to class is a good first step, but you have to work out the homework. There is no substitute for working out the missions.

- I have a vast collection of problems solved for Math 321 and Math 221 in the course website which is linked at my personal website of www.supermath.info. Of course, Math 321 is different from this course, it has a heavy proof emphasis and much material outside of Euclidean space (Rn). I am working to make the distinction between these courses more pronounced in future years. My apologies for the instances where Math 321 material has found its way into both the required textbook and my notes. You must come to class and pay close attention to have the best representation of what constitutes this course. As you're studying the notes this term, if you make a collection of places in the notes which seemed out of place relative to the discussion in lecture then I would be interested in the list for my future editorial purposes.

- You are allowed one page of notes with writing only on two sides for Test 1, 2 and the Final.

- No cell phones or similar devices may be out during tests or final exam

- You can work together on the homework. However, remember, the purpose of the homework is actually not for you to earn points. The real purpose for homework is for you to learn the material.

- I am here to help. I have office hours where you can ask me about problems you have **already attempted.** Please do not plan to work problems in my office, you are welcome to ask questions, but, it is better if you study somewhere else. To summarize: office hours are for questions… or for playing pool or ping pong.
- Final Exam Period, I am giving Final Exams at the following times:
  - Thursday, May 2, 8:00-10:00am, DH 4166, officially for Math 221-001
  - Monday, May 6, 1:00-3:00pm, DH 4424, officially for Math 131-002
  - Friday, May 3, 3:30-5:30pm, DH4424, officially for Physics 231-001