

## WEEKLY SCHEDULE, (THE LETTERS GS REFER TO THE BOOK BY GIL STRANG)

**Note: Not all of the assigned problems will be graded, Nevertheless, please do them as well**

**Week 1:** August 21, 23: Reading: All of Chapter 1 and Section 2.1-2.5 in GS. This material should be very easy for you because it is a review. Do problems 2, 9, 25, 27 in Section 1.1 Problems 16, 17, 21, 27, 33, in Section 1.2, Problems 3, 4, 5, 6 in Section 1.3. These problems should be easy for you and will not be graded. Do problems 12, 13 in Section 2.2 of GS, problems 3, 9, 17 in Section 2.3 in GS, problems 6, , 21, 31, 32 in Section 2.4. Please turn the solutions in on Thursday August 30, they will be graded.

**Week 2:** August 28, 30: The topic will be ***LU factorization, subspaces, nullspace as well as range of a matrix*** Reading: Section 2.5, 2.6, 2.7, Section 3.1 and Section 3.2 in GS. Please do problems 27, 31, 33, in Section 2.5, problems 5, 6, 9, 10 in Section 2.6. of GS and problems 1, 3, 7, 16. Please do problems 11, 17-20 in Section 3.1 of GS, problems 24, 29, 34, and 43 in Section 3.2 of GS. Turn in problems 31 in Section 2.5, problems 9, 10 in Section 2.6, problems 16 in Section 2.7, problems 19, 20 in Section 3.1 and problems 24 and 29 in Section 3.2. for grading on Thursday September 6.

**Week 3:** September 4, 6: The topics are basis and dimension as well as the four subspaces related to a matrix and are **very important**. Reading: Sections 3.3-3.5 and 4.1 in GS. Please do problems 10, 11, 19, 21 in Section 3.3 of GS, problems 12, 15, 16, 21 in Section 3.4 of GS and problems 4, 6, 16 and 18 in Section 3.5 of GS. Do problems 14, 16, 22, 24, 28 in Section 4.1. Please turn in problems 10, 21 of Section 3.3, problems 16, 21 of Section 3.4, problems 4, 18 in Section 3.5 and problems 22, 24 of Section 4.1 for grading on September 13.

**Week 4:** September 11, 13: The topic is projections and least squares. These topics are easily understood using the four subspaces related to a matrix. Reading: Section Chapter 4.2, 4.3 in GS. These sections are important for the understanding as well as for the applications. Please do problems 14, 16, 17, 24, 27, 30 in Section 4.2 of GS, problems 2, 11, 16, 20, 22, 25 in Section 4.3 of GS. Please turn in the problems 14, 16, 17, 27 of Section 4.2, problems 11, 16, 20, 22 of Section 4.3 for grading on September 20..

**Week 5:** September 18, 20: The topics are orthonormal bases and the Gram Schmidt procedure. We then start a new topic about determinants. Please read Section 4.4, 5.1 and 5.2. No exercises have to be turned in on Thursday September 27, because we will have a test that

day. Instead I suggest that you work out the practice test posted on the course page. The actual test will be shorter, but the practice test hits all the main points.

**Week 6:** September 25, 27: Test 1 on September 27 that covers everything we talked about up to September 20. This week's topic is about determinants. Please read section 5.2 and 5.3. Please do problems 7, 10, 13, in Section 5.1, problem 1, 6, 11, 23 in Section 5.2, problems 17, 20, 23 in Section 5.3 in GS. Please turn them in for grading on October 4.

**Week 7:** October 2, 4: Please read sections Section 6.1 and 6.2 in GS. There will be no homework to be turned in on October 11. I expect you to be fluent in diagonalizing matrices as well as be fluent in the use of complex numbers. For your own study, I recommend doing the problems 21, 24, 33, 34, 37 in Section 6.1., and problems 8, 21, 26, 29, 34 in Section 6.2 in GS. Over the weekend I'll post some notes about what I talked on Tuesday.

**Week 8:** October 9, 11 (October 8 and 9 Fall recess): Please read section 6.3. In this section you encounter a first application of linear algebra to differential equations. Please work on the following problems: 10, 11, 12, 13, 22, 23, 26, 31 in Section 6.3 and turn them in for grading on Thursday October 18.

**Week 9:** October 16, 18: Please read Section 6.3, 6.4, 9.2 and 6.5 in GS. Diagonalization of symmetric matrices and Hermitean matrices is especially important. Please work the following problems: 3, 6, 13, 16 in Section 6.4, problems 2, 8, 11, 14, 20 in Section 9.2 and turn them in for grading on October 25 in class.

**Week 10:** October 23, 25: (October 27, grade mode, withdrawal and grade substitution deadline) Please read Section 6.5, 7.1-7.3 in GS. One of the topics will be the singular value decomposition, one of the most important factorizations of matrices. Please work the following problems: Problems 22, 23, 25, 29 in Section 6.5, Problems 1, 3, 6 in Section 7.1 and Problem 1 in Section 7.2. (I forgot to mention this: Please turn them in for grading on Thursday November 1)

**Week 11:** October 30, November 1 Please continue reading Sections 7.2-7.4 in GS. Please do problems 15, 16, 17 in Section 7.2, problems 1, 3 in Section 7.3 and problems 1, 10, 15 a) in Section 7.4. and turn them in for grading on November 8.

**Week 12:** November 6, 8: Test 2 on November 8 Please read Section 7.4 in GS and all of Chapter 8. Section 7.4 gives you a geometric intuition for the SVD and introduces a number of interesting concepts such as the pseudo-inverse and matrix norms. Chapter 8 is about linear transformations. This is a rather different point of view of linear algebra in that we deal with coordinate independent concepts. E.g., we talk about linear transformations that are defined independent of any choice of basis. Once a basis is chosen one can represent this linear transformation as a matrix.

Please do problems 6, 13, 16 in Section 7.4, problems 11, 12, 17 in Section 8.1 problems 10, 13, 15 in Section 8.2 and turn them in for grading on November 20.

**Week 13:** November 13, 15: Please continue reading Section 8.1, 8.2 and 8.3 in GS. Read Section 10.1. Chapter 8 has been described in the above paragraph. An important consideration will be to see what happens when one describes the linear transformation in a different basis. In particular there is the question of a ‘good’ basis in which the matrix looks as simple as possible. Section 10.1 is a first application of linear algebra and deals with electrical networks. You will see that the four subspaces will be very useful in this context.

Please do problems 22, 28, 30, 34 in Section 8.2, problems 3, 6, 7, 8 in Section 8.3 in GS. Please turn this homework in on November 29. This will be the last graded homework.

**Week 14:** November 20, 22: (November 21, student recess, November 22-23 Thanksgiving break) In the lecture on Tuesday we shall talk about the Fourier transform, its uses to diagonalize matrices and in particular the Fast Fourier transform, one of the best algorithms there is.

**Week 15:** November 27, 29: Read Section 10.1 and 10.5 in GS.

**Week 16:** December 4, 6: (December 3 and 4 final instructional class days) Read Section 10.3 in GS.