

## MATH 107 SYLLABUS & HW - SPRING 2008

**Instructor:** Dr. Fernando Schwartz

**Office Hours:** Thursdays 4:30 - 5:30pm or by appointment. Room 225 Physics Bldg.

**E-mail:** [fernando@math.duke.edu](mailto:fernando@math.duke.edu)

**Course Webpage:** <http://www.math.duke.edu/~fernando>

**Course description:**

Systems of linear equations, matrix operations, vector spaces, linear transformations, orthogonality, determinants, eigenvalues and eigenvectors, diagonalization, linear differential equations and systems with constant coefficients and applications, computer simulations. Intended primarily for engineering and science students.

**Textbook:**

Linear algebra and differential equations, by Gary L. Peterson and James Sochacki. Published by Addison Wesley, ISBN 0-201-66212-4.

### 1. DAILY COVERAGE AND HOMEWORK

Lesson	Topic(s)	Section(s)	Page / Homework
1	systems of linear equations	1.1	15 / 2,8,15,18,19,22,23,26,28 16 / 30 (intro to Matlab) <i>Additional Problem 1</i>
2	matrices and matrix operations	1.2	26 / 5,9,11,12,14,18,20,21,23,28-30,37
3	inverses of matrices	1.3	36 / 1,6,7,10,11(b),13,14,16,26
4	special matrices; determinants	1.4 & 1.5	41 / 4,12,17,20,22(c),24(d),26,32,33 50 / 5,8,12,15,16
5	proofs and applications	1.6	57 / 4,6,10,11,13,15(c),16,17
6	proofs and applications	1.7	64 / 5-7
7	linear independence in $\mathbb{R}^n$	2.3	93 / 1-3,6
8	<b>Exam 1 - Tuesday 2/4</b>		
9	vector spaces; subspaces	2.1 & 2.2	73 / 2,3,9 81 / 1(c,d),2(b,d),3(c),5,11-13,21,22
10	linear independence; dimension	2.3 & 2.4	93 / 7,10,14,17,21,24,25,27,28,32 104 / 2,3(a,b),4(c,d),7,10,14,18,21,26
11	Wronskians	2.5	110 / 5-8,12,14,16
12	intro differential eqns	4.1	188 / 2,3,6,10,11,15,17,24 119 / 1,4,7
13	homogeneous CCLDE (i)	4.2	201 / 2,5,23 <i>Additional Problems 2 and 3</i>
14	CCLDE (ii); undeterm coeff	4.2 & 4.3	201 / 7,10-13,20,22,24,29,30,37,40-42 211 / 1,4,9,11,18,36
15	applications (i)	4.5	228 / 5-8,11,13
16	applications (ii)	4.5	228 / 1,3,15,16,18
17	<b>Exam 2 - Thursday 3/6</b>		

**Spring Break 3/8-16**

18	linear transformations	5.1	243 / 3,4,7,12,13,18,20,33,35,36
19	algebra of LT	5.2	252 / 6,11,14,18,20,23
20	matrices; eigenvalues	5.3 & 5.4	267 / 1,5,7,9,17 277 / 5,8,9,16,17,20,26,32
21	similar matrices, Jordan	5.5	277 / 32 (is A diagonalizable?) 286 / 5,8,9,16,17,21,24,30,31,36,40
22	systems of LDE	6.1	301 / 1,4,5,9,17,27,28
23	constant coeffs diag; nondiag	6.2 & 6.3	311 / 3,5,11,15,22,25,28,30 314 / 3,17
24	nonhomogeneous systems	6.4	318 / 1,5,11,13,15
25	converting eqns	6.5 & 6.6	322 / 4,5,13 331 / 2,4,11,15
26	<b>Exam 3 - Tuesday 4/15</b>		
27	inner product spaces	9.1	419 / 6-8,12,16,18,20-22
28	orthonormal bases	9.2	429 / 2,6,9,13

**Block Final: Friday May 2, 2:00–5:00pm**

## 2. ADDITIONAL PROBLEMS

1. In parts (a) and (b) assume that the given system is consistent. For each system determine all possibilities for the numbers  $r$  and  $n - r$  where  $r$  is the number of nonzero rows of the (reduced) row echelon form of the augmented matrix and  $n$  is the number of the unknowns of the given system.

(a).  $Ax = b$  where  $A = [a_{ij}]_{3 \times 2}$ .

(b).  $Ax = b$  where  $A = [a_{ij}]_{3 \times 4}$ .

2. In each of the following write the given expression in the form  $a + ib$ :

(a)  $\frac{3+i}{4-5i}$ , (b)  $\exp(2 - 3i)$ , (c)  $e^{i\pi}$ , (d)  $e^{2-i\pi/2}$ , (e)  $2^{1-i}$ , (f)  $\pi^{1+2i}$ .

3. Solve each of the following equations:

(a)  $x^4 + 2x^2 + 1 = 0$ , (b)  $x^5 + 1 = 0$ .

## 3. POLICY ON HOMEWORKS, EXAMS AND GRADES

Homeworks are collected on a daily basis. Late homeworks are not accepted.

There will be 3 tests, each worth up to 100 pts. Your homework score is the average of all but the worst assignment grade. It is worth up to 60 pts. The block final is worth up to 200 pts.

Your grade depends on the amount of points obtained throughout the semester. Nevertheless, letter grades will be assigned only at the end of the semester, once the block final has been graded and a curve has been defined.

**Test grade revision is accepted only in written and within 1 week of the day you got your test back.**

For more information visit the course website at

<http://www.math.duke.edu/~fernando>