DIFFERENTIAL EQUATIONS
SM212 / SM212P SPRING SEMESTER 2005-2006

Textbook: *Fundamentals of Differential equations, 6th ed.,* by R. K. Nagle, E. B. Saff, A. D. Snider, Addison-Wesley (Pearson), 2004.

Certain lessons in this syllabus are marked CP under the page heading. For these lessons, your instructor may ask you to use Maple or the TI Voyage 200 or another software package to solve and plot, by numerical means, the indicated problem. Many problems need to be solved and plotted by numerical means since these problems may not have an explicit solution written as elementary functions. These problems may help you understand the usefulness of the numerical approach.

LESSON	PAGES	TOPICS	PROBLEMS
1.	1-5	1.1 Definitions and terminology	p. 5: 1,4,8,11,15,16
2.	6-11	1.2 Solutions and IVPs	p.14: 3,6,10,11,20(a),22
3.	16-21	1.3 Direction Fields / Isoclines	p.22: 1,3,4,5,6
4.	24-27	1.4 Numerical solutions: Euler's method	p.28: 2,5CP,6CP,15CP
5.	127-129	3.6 Numerical solutions: Improved Euler	p.132: 7,8CP
6.	40-45	2.2 Separable DEs	p.46: 4,5,6,7,10,12,18,34
7.	49-54	2.3 Linear DEs	p.54: 2,3,7,9,10,19,21
8.		review	
9.	89-91(ex.1)	3.2 Applications (mixing)	p.98: 1
	& 101-103(ex.1)	3.3 Applications (heating/cooling)	p.107: 1,5
10.	108-113	3.4 Applications (Newtonian mechanics)	p.115: 1,2,7
11.	119-122	3.5 Applications (Electrical circuits)	p.122: 1,3,4
12.		review	
13.		TEST 1	
14.	160-165	4.2 2nd order linear homog. DEs	p.167: 1,4,7,13,20,22
15.	165-167&	4.2 Homogeneous w/const. coeffs	p.167: 9,11 &
	326-329	6.2 cont'd	p. 331: 1,3,8,11
16.	169-173	4.3 2nd order homog DEs, complex roots	p.177: 1,5,10,23,28CP
17.	328-329	6.2 Higher order DEs	p.177: 2,15; p331:6,15,16
18.	179-187	4.4 Undeter. Coeffs. w/Annihilators, Superposition	p.186: 1,5,9,11; p192: 2
19.	333-337	6.3 Undeter. Coeffs. w/Annihilators, Superposition	p.186: 16; p192: 9,25; p. 337: 5,31
20.	154-155, 210-213	4.1, 4.8 Springs (undamped)	p.219: 1,2,3
21.	213-219	4.8 Springs (damped)	p.219: 7,8,9
22.	220-222, 224-225	4.9 Springs (Forced)	p.227: 3,9
23.	286-288	5.6 Circuits (example 1)	p.291: 1,2,3
24.		review	
25.		TEST 2	
26.	351-355	7.2 Laplace Transform (LT)	p.359: 1,4,12,13,17,20
27.	360-364	7.3 Properties of LTs	p.365: 1,7,10,16,25
28.	366-370	7.4 Inverse LTs	p.374: 1,2,3,6,8,9,11,19
29.	370-374	7.4 Inverse LTs, partial fractions	p.374: 21,23,25,28
30.	376-380	7.5 IVPs by LTs	p.383: 1,4,7,23,25
31.	384-390	7.6 Unit step functions	p.395: 1,2,4,5,8
32.	384-390	7.6 Unit step functions (cont'd)	p.395: 11,19,29,30
33.	286-292, 414-416	5.6 & 7.9 Electrical networks using Laplace	p.416: 23, 24
34.	241-20	5.1 & 5.2 Mixing problems using Laplace	p.251: 31
35.	253-260	5.3 First order systems and Euler's method	p.261: 1,5,10CP,11CP
36.	279-284	5.5 Coupled Mass - Spring Systems by Laplace	p.284: 1,6
37.		review	
38.		review	

39.		review	
40.		TEST 3	
41.	503-507	9.1 Matrix form for systems	p.507: 1,4,8,11
42.	508-511	9.2 Linear algebraic equations / rref	p.512: 1,8,11,12b
43.	512-521	9.3 Matrix algebra/inverse matrices/determinants	p.521: 2,4,6,13,25
44.	524-530	9.4 Linear systems in normal form	p.532: 1,5,10,23
45.&46.	533-541	9.5 Linear systems with const coeffs	
		Eigenvalues & eigenvectors	p. 541: 11,13,31,45
47.	579-583	10.2 Separable PDEs	p.587: 3,9,15,23
48.	576-583	10.2 Heat Equation	p.587: 17,25,33
49.	589-596	10.3 Fourier series	
		define period, sine and cosine series	p.603 9,11,17,19
50.	596-602	10.3 Convergence, odd & even functions	p.603 2,5,7,10,16,24
51.	607-611	10.4 Sine & cosine series	p.611: 5,11
52.	580-583	10.5 Heat equation, zero ends	p.624: 1
53.	612-615.	10.5 Heat equation, insulated ends	p.624: 3
54.		review	
55.		review	
56.		TEST 4	
57-59.		review for final examination	

The following web pages, created by Prof David Joyner and others, contain useful information relating to the course material:

For hints on using the TI Voyage 200 see http://cadigweb.ew.usna.edu/~wdj/teach/sm212_ti92.html

The Maple code at http://cadigweb.ew.usna.edu/~wdj/teach/sm212/sm212_euler.htm helps with the CPs in sections 1.4 and 3.6.

The Maple code at http://cadigweb.ew.usna.edu/~wdj/teach/sm212/sm212_euler_2x2.html helps with the CPs in section 5.3.

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