

Differential Equations

SM222 Fall Semester 2007-2008

Textbook: *Differential equations with Boundary Value Problems, 8th edition*, (by W. Boyce and R. DiPrima), John Wiley, 2005.

Certain lessons in this syllabus are marked CP under the page heading. For these lessons, your instructor may ask you to use SAGE or Maple or the TI92 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.	Introduction to Diff. Eqs	p.7: 1,3,11,15-20
2.	Initial Value Problems	p.15: 1,5,9,17, p.24: 1-8, 15-18
3.	Review of separable and 1st order linear	p39, 1,7,16,21; p 47, 1,2,8,21,25
4.	App's (falling body/cooling/circuits)	p.64: 23,28
5.	Numerical Solutions	p 108, 1 (all parts)
6	Existence and uniqueness	p117, 1-3
7	Review	
8.	IVPs and BVPs.	p.142: 1,9,10,20 p151 1,3,5,7,8
9,10.	Homogeneous w/const. coeffs	p.164: 1,3,5,7,9,17,18 p.172: 1,3,11,12,17 p230, 1,3,5,7,8,12,29
11., 12.	Undeter. Coeffs. or Annihilators	p.184: 1,2,13,17
13.	Variation of Parameters	p.190: 1,3,5
14.	review	
15.	Test 1 (no calculator)	

LESSON/PAGES	TOPICS	PROBLEMS
16., 17.	Springs (Free)	p.203: 1,3,5,6
18.	Springs (Forced), Circuits	p.214: 5,11
20.	Circuits	p203, 8, 12
21.	Series solns, I	p 249, 1, 3, 9,17,18,19,21,22
22.	Series solns II	p259, 1, 2, 3
23.	Laplace Transform	p.312: 1,3,6-8
24	Inverse Laplace/Derivatives	p.322: 1-4,11,12,24,25
25.	First Translation Theorem	p.329: 1,3,7,13,14,24,25
26.	and Unit step functions	
27.	Review	
28. 328-333	7.3 Unit Step	p.337: 1,2,12
29. 305-313	Dirac delta fcn,	p344, 1,2,3,14
30.	Convolution thrm,	p351, 4,5,8,9,13
31.	Review	
32.	Test 2	
33.	Intro to systems of DEs Lanchester's eqns	p360, 1,2,5
34.	Intro to matrices	p372, 1,3,6,8,10,12,22,23
35.	row reduction	
36.	row reduction, inverses, determinants	
37.	Cramer's rule, eigenvalues, eigenvectors	p383, 1, 2, 6, 7, 15-17
37.	review	
38.	Systems of DEs	p.398: 1,2, 15
39.	Systems of DEs	p.410: 1,2,9
40	7.6 Non-homog systems of DEs (by Laplace transforms)	p. 439, 1, 2
42. 319-322	7.6 Electrical networks (using Laplace transforms)	p.411, 25, 26, p 439, 13; p360, 20, 21
43. 381-385	9.4 Euler's Method for higher order DEs and systems	p.481: 1(a), 8 (by Euler's method)
44.	review	
45.	Test 3	

LESSON/PAGES	TOPICS	PROBLEMS
46. 465-468	Separation of Variables Transport equation (optional)	p.575: 1,2, p610, 1, 2 class notes
47.	Orthogonality+FS	p. 585: 14,19, 20
48	Fourier Series	p.592, 1, 2, 9
49.	Fourier Sine and Cosine Series	p.600: 1,3,5,7,9,15,16
50.	Fourier Sine and Cosine Series	
51.	Heat Equation	p.610, 7, 8, 9
52. 475-477	12.3 Wave Equation	p.632. 1,4
53.	review	
54	Schrödinger's eqn	class notes
55.	Review	
56.	Test 4	
57.	final exam review	
58.	final exam review	

Class web page:

<http://cadigweb.ew.usna.edu/~wdj/teach/sm212/> You will find the policy statement, some lecture notes, and old hourly and final exams there.

For hints on using the TI92, see

http://cadigweb.ew.usna.edu/~wdj/teach/sm212_ti92.html

Some instructors may allow for extra credit computer projects using the free program SAGE (www.sagemath.org). Please ask your individual instructor about this.