

Ma 221. Syllabus. Spring 2011

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Textbook:

[1] Nagle, Saff, and Snider, "Fundamentals of Differential Equations and Boundary Value Problems," 5th edition, Addison Wesley. ISBN 032161321X

Syllabus:

Week 1 (January 18 – 22)

1.1-1.4 Direction Fields. Isoclines. Euler approximation. 1A. Taylor series method 1D Phase portrait. 2.2 Separable equations.	Recommended problems: 1.1: # 1-17. 1.2: # 1, 2, 9, 10, 20, 21, 23-28, 30, 31. 1.3: #3, 4, 5, 7, 9, 17, 18. 1A, 2.2.
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Hw1 due on Tuesday 2/1

1.2: # 2, 10, 20
1.3: # 5
1A Compute the Taylor polynomial of degree 6 for the solution to the equation
$$\frac{d^2 y}{dx^2} = 2xy, \text{ if } y(0) = 2, y'(0) = -1.$$

1D (d), (e), (f), (g) (bonus).
2.2: #7,8,13,15,16,18,20,26,34,38.
3.2: # 10, 11 (p. 105)

Weeks 2-3 (January 24 – 29 and February 31 – 5)

2.3 Linear Equations: Integrating factor, Variation of parameters. 2.4 Exact Equations 2.6 Homogeneous, Bernoulli, Riccati eqns. 2E – Clairaut equation	Recommended problems: 2.3: #7,8,14,15,18,20,21,22,30,32,33. 2.4: # 10, 11, 13, 14, 19, 22, 23, 25, 27, 28, 29, 30, 31, 33(a-d). 2.5: # 8, 9, 12 2.6: # 1-16, 21-28, 43. 2E (a-d)
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Hw2 due on Tuesday 2/8

2.3: # 8, 14, 18, 20, 22, 30

2.4: # 10, 14, 22, 28, 30

2.5 # 10(bonus), 14

2.6 # 10, 12, 14, 22, 24, 34, 36, 38, 45, 46.

p. 83 # 3

pp. 87 – 88: 2C, 2D(a-b)(bonus)

p. 88: 2E (e)(bonus)

p. 91: 2H (a)-(d)

Week 4 (February 7 – 12)

3.2 Population models. Logistic eqn.

3.3 Heating and Cooling.

3.5 Electrical circuits

Recommended problems:

Ch. 2. Review # 1, 2, 3, 4, 6, 7, 14, 16, 17, 19, 23, 26, 28, 30, 31, 32, 34, 35, 36, 38, 39, 40.**3.2:** #9, 13, 23, 25**3.3:** # 1, 3, 15**3.5** #1, 5**Hw3** due on Tuesday 2/15:**3.2** # 14, 15, 20, 24, 26a,b**3.3** # 2, 4, 15**3.5** # 2, 8(bonus)

3B (a) (bonus)

Wednesday 2/16: in-class quiz. Chapters 1 and 2.**Week 5 (February 14 – 19)**

4.1, 4.2, 4.3

Homogeneous second-order linear equations

Recommended problems:

4.1: # 4, 5, 7, 8

4.2: # 1 – 12, 13 – 20, 21 – 25, 27 – 33, 34, 35, 37 – 44, 46.

4.3: # 1 – 8, 9 – 20, 21 – 27, 28, 29, 31, 32, 33.

Hw4 due on Thursday 2/24 or Friday 2/25 (depending on your recitation classes):

4.1: # 8

4.2: # 2, 4, 12, 14, 16, 22, 28, 30, 32, 36, 46 (a,b)

4.3: # 2, 4, 10, 22, 24, 28, 32(a,b), 34(bonus)

Week 6 (February 21-26):

Sections 4.4, 4.5, 4.6

Inhomogeneous linear equations

Recommended problems:

4.4: # 9 – 26, 33 – 36.

4.5 # 17-22, 23-30

4.6: # 1-10, 11 – 18, 20.

Hw5 due on Tuesday 3/1:

4.4: # 10, 12, 14, 16, 18, 20, 22, 24, 26, 34
 4.5: # 18, 20, 22, 28, 30, 42, 44, 46
 4.6: # 2, 8, 10, 12, 14, 16, 20(bonus)

Week 7 (February 28 – March 5)

4.7 Cauchy-Euler equations. Reduction of Order for variable-coefficient equations Sections 6.1, 6.2, 6.3	Recommended problems: 4.7 # 9-18, 19-20, 21, 22, 37-40, 41-43, 44, 45-49 6.1: # 7 – 14, 15 – 18, 19 – 24, 6.2: # 1-6, 19-21 6.3: # 1 – 10.
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Hw6 due on Tuesday 3/8:

4.7 # 10, 12, 20, 22, 30, 32(bonus), 38, 40, 42, 44, 46, 48, 52.
 6.1: # 14, 16, 20, 22, 32
 6.2: # 4, 6, 20
 6.3: # 6

Week 8 (March 7 – 12)

Laplace transform: 7.1-7.6, 7.8	Recommended problems: 7.3 # 1, 20, 27, 31, 32 7.4 # 2, 3, 8, 12, 13, 21, 22, 31, 32, 33, 34, 36, 38, 39, 42, 43 7.5 # 2, 3, 7, 8, 11, 12, 17, 18, 19, 25-28, 33-38 7.6 # 6, 7, 11, 12, 14, 19, 20, 21, 22, 25, 26, 47, 48, 59, 60 7.8 # 1, 2, 7, 8, 13, 14, 21, 22, 25, 26, 29, 30, 31, 32
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Hw 7 due on Tuesday 3/22:

Pp. 250 – 251 # 2, 10, 12, 18, 24, 26, 32, 36.
 P. 251 # 2, 3 (Technical writing section)
 Pp. 369 – 370 # 2, 6, 10.
 7.4 # 2, 32, 42(bonus)
 7.5 # 2, 8, 10, 18
 7.8 # 8, 14, 24, 30 (bonus)

Week 9 (March 14 – 19) – Spring break

Monday, March 28: in-class Quiz 2. Chapters 4, 7

Week 10 (March 21 – 26)

Review. Pp. 248 – 250, 368 – 369	Recommended problems: Tuesday class: Pp. 250 – 251 # 1 – 39, # 1 – 4. Pp. 369 – 370 # 1 – 10, # 1- 3. Thursday class: 10.2 # 1 – 8, 9 – 14 11.2 # 1 – 12, 13 – 20 Solve equations: (1) $y''+y'-2y=0$, $y(0)=0$, $y(1)=1$ (2) $2y''+y'-3y=1$, $y(0)=1$, $y(1)=0$ (3) $y''+y'-2y=x$, $y(0)=2$, $y(1)=1$ Find λ for which the following equations have nonzero solutions: (4) $y''+\lambda y=0$, $y(0)=y(1)=0$. (5) $y''+\lambda y=0$, $y(0)=y(\pi)=0$. (6) $y''+\lambda y=0$, $y(0)=y(L)=0$. (7) $y''+\lambda y=0$, $y'(0)=y'(L)=0$. (8) $y''+\lambda y=0$, $y(0)=y'(L)=0$. (9) $y''+\lambda y=0$, $y'(0)=y'(L)=0$.
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Hw 8 due on Thursday 3/31:

10.2 # 2, 4, 10, 12

11.2 # 2, 4, 6, 8, 10, 12, 14, 16, 18, 20.

Week 11 (March 28 – April 2)

Eigenvalue problems and boundary value problems: 11.1 – 11.3	Recommended problems: 11.2 # 23-26, 27 – 29 11.3: # 1 – 6, 7 – 11
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Hw 9 due on Thursday 4/7:

11.2 # 24, 28(bonus)

11.3: # 4, 6, 8, 10

11.5: # 2, 4

Week 12 (April 4 – 9)

Sturm-Liouville problem 11.5, 11.6	11.5: # 1, 3, 5, 6, 7, 8 11.6: # 1 – 10, 11 – 20, 23 – 26
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Hw 10 due on Thursday 4/14:

11.6: # 2, 4, 10, 12, 14, 20, 24, 26

10.2: # 16, 18, 20, 22, 24

10.5: # 2, 4, 6

Week 13 (April 11 – 16)

Heat and Wave equations: 10.2, 10.1, 10.5, 10.6	10.2: #15-18, 19-22, 23, 24, 27-33 What boundary condition should be imposed for the heat transfer in a rod if the left end is insulated and the right end has convective heat transfer with the outer medium of temperature U ? 10.5: # 1 – 19 10.6: # 1-4, 5, 6, 7, 8, 9, 10, 11, 13 – 18, 20, 21
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Hw 11 due on Tuesday 4/19:

10.5: # 8, 10, 12, 14, 16

10.6: # 2, 8, 10, 14, 16, 18.

Week 14 (April 18 – 23)

Series solutions: 8.3 Laplace equation: 10.7	8.3 # 11-18, 19-24, 25 – 28, 32, 34, 35, 36 10.7: # 1-5, 6, 7 – 8, 9, 10 – 17, 18, 19, 20 – 24
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Hw 12 due on Tuesday 4/26:

8.3: # 16, 24, 34(bonus)

10.7: # 2, 4, 8, 10, 12, 14, 20, 24 (bonus).

Wednesday, April 27: in-class Quiz 3. Chapters 11, 10.**Week 15 (April 25 – 30)**

BVP and PDE review. Quiz 3.	Recommended problems: TBA
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Hw 13 due on Tuesday 5/3:

TBA

Week 16 (May 1 – 3)

Review	Recitation class: Solutions to Quiz 3.
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Grading:

Hws (due on Tuesdays): 20%

Three midterm quizzes: 40%

Final Exam (cumulative): 40%

Bonuses (class activity and bonus problems) – up to 5%