SM212 DIFFERENTIAL EQUATIONS SYLLABUS, FALL AY 2025-2026

TEXT: Differential Equations with Boundary Value Problems, 10th edition, by Dennis G. Zill

LESSON	MTWF	MWRF	SECTION	TOPIC	ASSIGNMENT
1	8/18	8/18	1.1	Introduction to differential equations	Set up WebAssign* 1.1 #1, 5, 13, 15, 25, 33, 35, 37, 39
2	8/19	8/20	1.2	Initial value problems	1.2 #1, 3, 5, 7
3	8/20	8/21	2.2	Separable equations	2.2 #1, 5, 7, 15, 17, 21, 23, 25
4	8/22	8/22	2.3	Linear equations	2.3 #3, 5, 7, 9, 25, 27, 29
5	8/25	8/25	2.1.1, 2.6	Direction fields, Euler's method	2.1.1 #1, 3, 7, 2.6 #1, 2, Chap. 2 Review #38
6	8/26	8/27	3.1	Applications	3.1 #1, 4, 5, 6, 7
7	8/27	8/28	3.1	Applications	3.1 #15, 16, 19
8	8/29	8/29	3.1	Applications	3.1 #23, 25, 27, 29
9	9/2	9/3	App. B1	Matrices	B1 #1, 3, 4, 7, 11, 13
10	9/3	9/4	App. B1	Matrices	B1 #15, 17, 18, 23, 26, 27
11	9/5	9/5	App. B2	Gaussian elimination	B2 #31, 33, 39
12	9/8	9/8		Cramer's Rule	Handout
13	9/9	9/10		**REVIEW**	
14	9/10	9/11		**TEST 1 – CHAP.S 1 – 3, B1, B2, CRAMER'S RULE**	
15	9/12	9/12	App. B3	Eigenvalues and eigenvectors	B3 #47, 48, 49, 50
16	9/15	9/15	App. B3	Eigenvalues and eigenvectors	B3 #55
17	9/16	9/17	4.1.2	Homogeneous equations	4.1.2 #15, 17, 19, 21, 23, 25, 27, 42
18	9/17	9/18	4.3	Homogeneous linear equations with constant coefficients	4.3 #3, 5, 9, 11, 15

* Your instructor will inform you whether you will use WebAssign. Access codes for WebAssign are bundled with your textbook. Class keys will be provided by your instructor.

19	9/19	9/19	4.3	Constant coefficients	4.3 #24, 32, 33, 39, 49, 51
20	9/22	9/22	4.1.3, 4.4	Nonhomogeneous equations, undetermined coefficients	4.1.3 #31, 36, 4.4 #1, 5, 9, 11, 13
21	9/23	9/24	4.4	Undetermined coefficients	4.4 #27, 29, 31, 33
22	9/24	9/25	5.1.1	Springs, free undamped motion	5.1.1 #1, 2, 3, 5
23	9/26	9/26	5.1.1	Springs (Hint: use form of Equation (6) for #12.)	5.1.1 #6, 8, 12
24	9/29	9/29	5.1.2	Springs, free damped motion	5.1.2 #25, 27, 29, 31
25	9/30	10/1	5.1.3	Springs, external forces	5.1.3 #34, 35, 37, 43 (resonance)
26	10/1	10/2	5.1.4	Electrical circuits	5.1.4 #53, 55
27	10/3	10/3	7.1	Introduction to Laplace transforms	7.1 #1, 7, 9, 11, 19, 25, 27
28	10/6	10/6	7.1 & 7.2	Laplace transforms, inverse transforms	7.1 #23, 30, 31, 7.2 #3, 5, 7, 9, 11, 13, 15
29	10/7	10/8		**REVIEW**	
30	10/8	10/9		**TEST 2 B3, CHAP.S 4, 5**	
31	10/10	10/10	7.2	Inverse Laplace transforms	7.2 #17, 19, 25, 27, 29
32	10/14	10/15	7.2	Solving DE's with Laplace transforms	7.2 #35, 37, 38, 39, 41
33	10/15	10/16	7.3.1	Translation on the s-axis	7.3.1 #1, 3, 7, 11, 13, 15, 25, 31
34	10/17	10/17	7.3.2	Unit step function	7.3.2 #43, 45, 47, 49, 59, 63, 71, 73
35	10/20	10/20	7.4.1	Derivatives of transforms	7.4 #1, 3, 8, 11
36	10/21	10/22	7.5	Dirac delta	7.5 #1, 3, 7, 9
37	10/22	10/23	7.6	Systems with Laplace transforms	7.6 #1, 3, 5
38	10/24	10/24	7.6	Systems with Laplace transforms	7.6 #7, 8, 15 (see networks in 3.3)
39	10/27	10/27	8.1	Linear systems	8.1 #1, 9, 17, 23, 24, 27
40	10/28	10/29	8.2.1	Systems with real eigenvalues	8.2.1 #1
41	10/29	10/30	8.2.1 & 8.2.3	Systems with real, complex eigenvalues	8.2.1 #5, 6, 13, 8.2.3 #35

42	10/31	10/31	8.2.3	Systems with complex eigenvalues	8.2.3 #39, 48
43	11/3	11/3		**REVIEW**	
44	11/4	11/5		**REVIEW**	
45	11/5	11/6		**TEST 3 CHAP.S 7, 8**	
46	11/7	11/7	9.4	Euler's method for higher order equations	9.4 #1, 2
47	11/10	11/10	11.2	Introduction to Fourier series	11.2 #1, 3
48	11/12	11/12	11.2	Introduction to Fourier series	11.2 #7, 11
49	11/14	11/13	11.3	Fourier cosine and sine series	11.3 #1, 2, 3, 5, 11
50	11/17	11/14	11.3	Fourier cosine and sine series	11.3 #13, 14, 25, 29
51	11/18	11/17	12.1	Separable partial differential equations	12.1 #1, 5
52	11/19	11/19	12.1	Separable partial differential equations	12.1 #2, 3, 6, 10, 15
53	11/21	11/20	12.3	Heat equation with zero ends	12.3 #1
54	11/24	11/21	12.3	Heat equation with zero ends & insulated ends	12.3 #2, Solve 12.3 #1 with insulated ends instead of zero ends
55	11/25	11/24		**REVIEW**	
56	12/1	12/1	12.3	Heat equation	12.3 #4
57	12/2	12/3		**REVIEW**	SOFs
58	12/3	12/4		**TEST 4 CHAP.S 9.4, 11, 12**	
59	12/5	12/5		**COURSE REVIEW**	
60	12/8	12/8		**COURSE REVIEW**	

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NOTES

1. Prerequisites: Calculus III: SM221, SM221P, SM221X, or SM223

2. COURSE OBJECTIVES: Upon successful completion of this course, students will be able to:
a. Classify and identify different types of differential equations.
b. Explicitly solve two important classes of ordinary differential equations: first order separable and first or higher order linear with constant coefficients.

c. Apply knowledge from linear algebra in order to solve systems of linear differential equations.
d. Use the Laplace transform to solve differential equations and systems of differential equations.
e. Use numerical methods to solve differential equations and systems of differential equations.
f. Use the method of separation of variables in order to solve some basic partial differential equations via Fourier series.
g. Model certain physical phenomena using differential equations and interpret their solutions.
h. Write well-organized, coherent solutions to problems.

3. Study Skills: The value you get out of this course is proportional to the effort you put into it. Keep in mind that the primary goal (and your responsibility) is not just doing the problems, but rather understanding the material. Exercises that ask for verbal explanations should be answered in complete sentences. Suggestions on how to study mathematics may be found on pp. 8 – 10 of the Academic Center's Academic Success Handbook at
https://www.usna.edu/CTL/Faculty_Resources/Recommended_Reads_Content/Academic_Success_Handbook_USNA.pdf

4. Schedule: Classes on Tuesday, 25 November 2025 will follow a normal class start with no midday break. The last day of classes is Monday, 08 December. There is a review and study day scheduled for Tuesday, 09 December. The final exam period is 10 – 18 December.

5. Homework: Your instructor will inform you whether you will use WebAssign. Access codes for WebAssign are bundled with your textbook. Class keys will be provided by your instructor.
https://www.webassign.net/login.html

6. Technology:

a. All students in this course are expected to have the TI36X-Pro calculator. Your instructor may prohibit its use in some cases.
b. On homework, www.desmos.com is available for graphing.

7. Extra Instruction: a. If you would like help in the course, contact your instructor for extra instruction.

b. Also try the Math Lab in CH130. It is staffed all six periods every class day with instructors who should be able to answer your questions.

c. The Midshipman Group Study Program (MGSP) will be available evenings from Sunday through Thursday. Upper-class midshipmen will help you work on mathematics problems in groups. More information will be available early in the semester.

d. The Academic Center offers non-credit voluntary Supplemental Instruction Classes. For more information, contact the Academic Center.

8. Supplementary material: The mathematics department web site has practice tests, old exams, and other useful material. (See SM212 on the web site below.)
https://www.usna.edu/MathDept/resources/coursematerials.php

9. Modifications of syllabus: Your instructor may modify the schedule and list of problems.

10. Generative AI policy statement: Use of generative Artificial Intelligence (AI) to complete any part of quizzes or exams in this course is prohibited. Your instructor will inform you of the class policy on the use of AI on assignments. Keep in mind that the primary goal for homework assignments (and your responsibility) is not just doing the problems, but rather understanding the material. If in doubt, ask your professor.

11. Non-Attribution of Communication (Chatham House Rule): PROVOSTINST 1531.82D: USNA follows the practice of non-attribution to protect all faculty, staff, midshipmen, and guests. To foster an environment where ideas are openly exchanged, this class follows the practice of non-attribution for all communications (in-person, written, and electronic). If you wish to refer to another person's ideas or comments outside of this class, you may refer to them as 'a fellow class member' or 'a speaker,' but you may not disclose the speaker's identity without their express permission.