

SYLLABUS

SM286 Differential Equations with Quantum Mechanics

Spring Semester 2011

Textbook: *Differential Equations*, 7th Ed., Dennis G. Zill and Michael R. Cullen, Thomson-Brooks/Cole, 2005.

Note: Hyperlinks on syllabus are not active. Click on "Notes & HW Solutions" for active links.

Module	Day/Date			Reading Assignment	PROBLEMS	NOTES
1 st Order DEs	1	Tue	1/11	1.1 Introduction to differential equations	(10) 1,2,13,19,27,29	
	2	Wed	1/12	1.2 Initial value problems 2.2 Separable variables	(17) 1,9,13,14,17,25,26 (50) 1,6,7,17,25;	
	3	Fri	1/14	2.3 Linear equations	(60) 3,5,10,23,27,28	
	H	Mon	1/17	Martin Luther King Day		
	4	Tue	1/18	2.1 Direction fields 2.6 Euler's method	(41) 1,3 (79) 1,2	2.1 Template
	5	Wed	1/19	3.1 Applications: Cooling and mixing	(89) 13,17,21,25	
2 nd Order Homogeneous DEs	6	Fri	1/21	4.1 Higher order DE's: Existence and uniqueness	(128) 3,5,7,9,10	
	7	Mon	1/24	4.1 Higher order DE's: Linear independence, non-homogeneous DE's	(128) 15,18,23,25,31	
	8	Tue	1/25	4.3a Linear homogeneous constant coefficient DE's: real roots	(139) 3,5,15,31,35	Add Deadline
	9	Wed	1/26	4.3b Linear homogeneous constant coefficient DE's: complex roots	(139) 9,11,25,29,43-48	
	10	Fri	1/28	5.1.1 Undamped mass-spring systems	(194) 1,2,3,5 (194) 9,11	
	11	Mon	1/31	5.1.2 Damped mass-spring systems	(194) 17,19,21,23,25	
	12	Tue	2/1	Test 1		Prereg 2,3/C
2 nd Order Non-homogenous DEs	13	Wed	2/2	4.5 Undetermined Coefficients	(156) 15-26	Prereg 2,3/C
	14	Fri	2/4	4.5 Non-homogeneous DE's by Undetermined Coef	(148) 1,4,12,19,28	Prereg 2,3/C
	15	Mon	2/7	5.1.3 Mass-spring system with external force	(194) 31,39	Prereg 2,3/C
	16	Tue	2/8	5.1.4 Series electrical circuits	(194) 45,47,53	
Intro to Matrix Algebra	17	Wed	2/9	Appendix II.1 Matrices	(A18) 1,3,4,7,11,15,25	
	18	Fri	2/11	Appendix II.2 Solving linear systems by row reduction	(A18) 31,35,39	
	19	Mon	2/14	Appendix II.3 Matrix inverse by row reduction	(A18) 41,43	Ac Res
	20	Tue	2/15	Solving Chemical Formulae using Matrices	Supplementary Notes A	Ac Res
21	Wed	2/16	Appendix II.4 Eigenvalues and eigenvectors	(A18) 47,49,53	Ac Res	
Systems of DEs	22	Fri	2/18	8.1 Systems of DEs	(310) 1,11,13,17,21,23	Ac Res
	H	Mon	2/21	Washington's Birthday		
	23	Tue	2/22	8.2.1 Linear systems with real, distinct eigenvalues	(324) 1,3,5,7	
	24	Wed	2/23	9.4 Euler's method for linear systems	(357) 8,9 (use Euler's method with $h = 0.1$)	6 Wk Grades
	25	Fri	2/25	9.4 Euler's method for higher order DEs	(357) 1,2 (don't do analytic solution for #2)	
	26	Mon	2/28	Test 2		

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Power Series	27	Tue	3/1	6.1.1a Review of Power Series	(230) 1.3,8,10,11,13	
	28	Wed	3/2	6.1.1b Review of Maclaurin Series	Supplementary Notes 1	
	29	Fri	3/4	6.1.1b Review of Taylor Series		
	30	Mon	3/7	6.1.1c Power Series Solutions	(230) 17,27	Declare Maj
	31	Tue	3/8	Power Series Continued		Declare Maj
	32	Wed	3/9	The 'Gaussian' DE	Supplementary Notes 5	Declare Maj
	33	Fri	3/11	Review		Early Sched
H	3/12-3/19			Spring Break		
Fourier Series	34	Mon	3/21	11.1 Orthogonal functions	(402) 1,10,12,17	
	35	Tue	3/22	11.2 Fourier series	(407) 1,3,5,9	Prereg 4/C
	36	Wed	3/23	11.2 Convergence of FS	(407) Graph FS(x) for 7.11; 17.19	Prereg 4/C
	37	Fri	3/25	11.3 Sine and cosine series	(414) 1,3,5,7,11,13	Prereg 4/C
	38	Mon	3/28	11.3 Half-range expansions	(414) 25,29	Prereg 4/C
Intro to PDEs	39	Tue	3/29	12.1 Separation of variables for PDEs	(436) 1,3,5,11	
	40	Wed	3/30	12.3.1 Heat equation, ends held at 0 degs	(445) 1,6	
	41	Fri	4/1	12.3.2 Heat equation, ends insulated	(445) 3,5	
	42	Mon	4/4	12.4 Wave Equation	(448) 1,2	Ac Res
	43	Tue	4/5	Review		Ac Res
	44	Wed	4/6	Test 3		Ac Res
Applications of DEs to Quantum Mechanics	45	Fri	4/8	A Brief Introduction to Quantum Mechanics	Supplementary Notes 2	Ac Res
	46	Mon	4/11	Time Dependent vs. Time Independent Schrödinger Equation	Supplementary Notes 3	
	47	Tue	4/12	Solution to Particle in a Box (1D)	Supplementary Notes 4	12 wk grade
	48	Wed	4/13	The Hermite DE	Supplementary Notes 6	
	49	Fri	4/15	The Hermite DE (cont)		Drop Course Deadline
	50	Mon	4/18	The Harmonic Oscillator	Supplementary Notes 7	
	51	Tue	4/19	Solution to the Harmonic Oscillator		
	52	Wed	4/20	Solution to the Harmonic Oscillator		
	53	Fri	4/22	Particle in a Box (2d)	Supplementary Notes 8	
	54	Mon	4/25	Particle in a Box (3d)	Team Project	
	55	Tue	4/26	4.3b DE Solutions in complex exponential forms	Supplementary Notes 9	
56	Wed	4/27	13.1 Laplacian in Polar Coordinates	Supplementary Notes 10		
57	Fri	4/29	Rotational Motion in 2 Dimensions	Supplementary Notes 11		
58	Mon	5/2	The Rigid Rotor (Separation of Variables)	Supplementary Notes 12		
Final	59	Tue	5/3	Review		
	R	Wed	5/4	Reading Day		
	E	Fri	5/6	Final Exam @ 1930 (Room TBD)		