Differential Equations for Engineers: the Essentials – Example Course Plan

Date	Class #	# of slides	Topics	Reading Assigned	Problems Assigned	Problems Reviewed
	1	36	Administrative matters, course objectives, importance of DEs to engineers, review of math foundations, classes of DEs	Chap 1 (14 pages)		_
	2	31	First order linear ODEs: RC circuit; general solution to homogeneous eqns; in-class homogeneous problems; water pipe temperature example; general solution nonhomogeneous; In-class nonhomogeneous problems	Chap 2 (11 pages)		_
	3	35	1st order linear ODEs: System viewpt First order nonlinear separable ODEs: General solution approach; In-class problems; Sounding rocket phases 1 & 2	Chap 3 thru Sec 3.1 (7 pages)		From Class #1
	4	21	First order nonlinear separable ODEs: Sounding rocket phase 3; Short quiz #1	Chap 3, Sec 3.2, 3.3 (5 pages)		From Class #2
	5	32	Review of short quiz #1 First order ODEs: successive approximations with example; in-class problems; existence and uniqueness	Chap 4, thru Sec 4.4 (9 pages)		From Class #3
	6A/B	30/36	Qualitative analysis Stability revisited Computing project phase 1	Chap 4, Sec 4.5, 4.6 (3 pages)	Computing project phase 1	From Class #4
	7	24	2nd order LTI homogeneous ODEs LRC circuit, characteristic equation, real and repeated roots; in-class problems	Chap 5 thru Sec 5.1.2 (6 pages)		From Class #5
	8		Test #1			_
	9	28	Review of Test #1 2nd order LTI homogeneous ODEs, LRC circuit, complex roots, fundamental solutions, In-class example problems	Chap 5, Sec 5.1.3, 5.1.4, 5.2 (5 pages)		From Class #7
	10	41	2nd order LTI Nonhomogeneous ODEs; Cruise control Undetermined coefficients method LRC circuit with sine source	Chap 5, Sec 5.3, 5.4 (15 pages)		From Class #6
	11	42	Process & example for kernel method Undetermined coefficients example Higher order ODEs	Chap 6 (10 pages)		From Class #9

			Satellite orbit decay			
	12		Review for Midterm			From Classes #10, 11
	13		Mid-term exam			_
	14A/B	42/44	Review of mid-term Laplace transforms: intro, homogeneous equations Computing project phase 2	Chap 7 thru Sec 7.5 (11 pages)	Computing project phase 2	
	15	46	Laplace transforms: Nonhomogeneous equations et al	Chap 7, Sec 7.6 (20 pages)		
	16	43	State space format: Numerical methods Review of matrix algebra Linear systems in state space format	Chap 8 thru Sec 8.4 (11 pages)		
	17	20	State space format: Heat transfer Short quiz #2	Chap 8, Sec 8.5.1.1 (8 pages)		From class #15
	18	35	Review of short quiz #2 State space format: Two-state electrical circuit; Aircraft dynamics	Chap 8, Sec 8.5.1.2, 8.5.1.3 (15 pages)		From classes #14,#16
	19	42	Three state electrical circuit Repeated eigenvalues; Coordinate systems: Vehicle suspension system	Chap 8, Sec 8.5.1.4 thru 8.5.1.7 (12 pages)		From classes #17,#18
	20		Test #2			_
	21	37	Review of Test #2 Coordinate systems; state transition matrix; nonhomogeneous equations, kernel method, 2-state electrical circuit example	Chap 8, Sec 8.5.1.5 thru 8.5.2.1 (15 pages)		From class #19
	22	35	Nonhomogeneous equations: Laplace transform method, trial and error method, PDEs: IV heat equation	Chap 8, Sec 8.5.2.2, 8.5.2.3 (6 pages)		
	23	24	PDEs: BV heat equation – Fourier series Short quiz #3	Chap 9 thru Sec 9.1 (11 pages)		From class #21
	24	35	Review of Short quiz #3 PDEs: wave equation; IV wave equation, BV problem: membrane – power series I	Chap 9, Sec 9.2 thru 9.2.3 (16 pages)		From class #22
	25	35	PDEs: higher order Bessell functions;	Chap 9,		From class

			power series II	Sec 9.2.4 thru 9.2.6 (8 pages)		#23
	26	34	PDEs: BV potential equation – Legendre's eq'n; cantilever beam	Chap 9, Sec 9.3, 9.4 (13 pages)		From class #24, #25
	27		Test #3			
	28		Review of Test #3 Review for final exam			
	29		Review for final exam			
			Final Exam			