**SYLLABUS - SM212 Differential Equations (Generic)**

Spring Semester 2013

Textbook: Differential Equations w/Boundary Value Problems, 8th ed., Dennis Zill

(Problems that are bold, italicized, and starred, i.e. ***25\****, are not in WebAssign and must be done by hand)

| **Module** | **Day/Date** | | | **Reading Assignment** | **Problems** | **Notes** |
| --- | --- | --- | --- | --- | --- | --- |
| **Intro**  **-----**  **1st Order DEs**  **-----**  **2nd Order**  **Homogeneous DEs** | 1 |  |  | 1.1 Definitions and Terminology | p.10: 1,3, 5,7,9,11,15,19,23,  27,33 |  |
| 2 |  |  | 1.2 IVPs | p.17: 1,3,7,9,11,15,17,21,25,33 |  |
| 3 |  |  | 2.1.1 Direction Fields, Isoclines  2.2 Separable DEs | p.43: 1,3,4  p.51: 1,3,5,7,15,17,25 |  |
| 4 |  |  | 2.3 1st Order Linear DEs | p.61: 3,5,7,9,25,27 |  |
| 5 |  |  | 2.6 Euler’s Method | p.79: 1,7 |  |
| 6 |  |  | 3.1a **APP**: Growth & Decay/Cooling | p.90: 3,5,13,15,19 |  |
| 7 |  |  | 3.1b **APP**: Electrical Circuits/Air Resistance | p.92: 29,31, 35 |  |
| 8 |  |  | 3.1c **APP**: Mixing | p.91: 21,23,***25*\***,26 |  |
| 9 |  |  | 4.1.1a IVPs/General Solutions/Basic Theory | p.127: 1,4,***5\****,9,13 |  |
| 10 |  |  | 4.1.1b Basic Theory Continued | p.128: 17,21,23,27,36,40 |  |
| 11 |  |  | 4.3a Homogeneous Lin Del, Aux Eqn w/Real Unique Roots & w/Repeated Roots | p.137: 3,7,15,17,21,31,37 |  |
| 12 |  |  | 4.3b Aux Eqn Complex Roots | p.137: 9,11,19,29,33,43,45,47 |  |
| 13 |  |  | 5.1.1a **APP**: Mass/Spring (Free Undamped Motion) | p.205: 1,3,5,8 |  |
| 14 |  |  | 5.1.2a **APP**: Mass/Spring (Free Damped Motion) | p.206: 21,23,25,27 |  |
| 15 |  |  | Review |  |  |
| **16** |  |  | **Test 1** |  |  |
| **2nd Order Non-Homogeneous DEs**  **-----**  **Introduction to**  **Laplace Transforms** | 17 |  |  | 4.4a Undetermined Coefficients | p.147: 1,5,11,15,21 |  |
| 18 |  |  | 4.4b Undetermined Coefficients | p.147: 27,29,33,37 |  |
| 19 |  |  | 5.1.1b **APP**: Springs (Driven Motion) | p.207: 29,30,31 |  |
| 20 |  |  | 5.1.2b **APP**: Electrical Circuits | p.209: 45,47,49; |  |
| 21 |  |  | 5.1.2c **APP**: Resonance | p.207: 33,37; |  |
| 22 |  |  | 7.1 Laplace Transforms | p.280: 3,9,11,23,25,31,37,39 |  |
| 23 |  |  | 7.2.1a Inverse Laplace Transforms | p.288: 1,3,5,7,9,11,15, |  |
| 24 |  |  | 7.2.1b Inverse LTs & Partial Fractions | p.289: 19,23,25,29 |  |
| 25 |  |  | 7.2.2 Laplace Transforms of Derivatives | p.289: 31,33,37,39 |  |
| 26 |  |  | 7.3.1a 1st Trans Theorem/Completing Square | p.297: 3,5,7,11,13,15,19 |  |
| 27 |  |  | 7.3.1b continued | p.298: 21,23,25,27,33(**APP**) |  |
| 28 |  |  | Review |  |  |
| **29** |  |  | **Test 2** |  |  |

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| **Module** | **Day/Date** | | | **Reading Assignment** | **Problems** | **Notes** |
| **More**  **Laplace Transforms**  **-----**  **Systems of DEs**  **-----**  **Matrix Theory** | 30 |  |  | 7.3.2a Unit Step Function/2nd Trans Theorem | p.298: 37,39,41,43,45,47 |  |
| 31 |  |  | 7.3.2b Unit Step Function | p.298: 49,53, 55,57,61,63,67 |  |
| 32 |  |  | 7.4.2c Derivatives/ Convolution | p.309: 1,3,11,19,21.31,33 |  |
| 33 |  |  | 7.5 Dirac Delta Function | p.315: 1,3,5,7,9 |  |
| 34 |  |  | 7.H1 Green’s Function (Impulse Response) - [Handout](file:///O:\SM212%20FA12\SM212Web\Lecture%20Notes\Module%203\Section%207.5H%20Impulse%20HO.pdf) | Assignment 7.H1 |  |
| 35 |  |  | AIIa Matrix Theory (no inverse) | App-18: 1,6,14 |  |
| 36 |  |  | AIIb Matrix Inverse/Cramer’s Rule. | App-18: 15,16,24,29 |  |
| 37 |  |  | AIIc Gaussian Elimination (rref/inv on calc) | App II: 32,36,39, 41 |  |
| 38 |  |  | 7.6a Systems by LTs | p.319: 1,5,7,11 |  |
| 39 |  |  | 7.6b **APP**: Coupled Springs | p.319: 13,**14\*** |  |
| 40 |  |  | 7.6c **APP**: Electrical Networks | p.319: 15, 17 |  |
| 41 |  |  | Review |  |  |
| **42** |  |  | **Test 3** |  |  |
| **Eigenvalues**  **&**  **Eigenvectors**  **-----**  **Fourier Series**  **-----**ꜛ  **Partial DEs**  **&**  **Heat Equation** | 43 |  |  | AIId Eigenvalues/Vectors (2x2 Matrices) | App-19: 47,48,49 |  |
| 44 |  |  | 8.1 Systems of DEs in Matrix Form | p.332: 1,5,7,9,11,21 |  |
| 45 |  |  | 8.2.1 Distinct Real Eigenvalues | p.332: 1,3,13 |  |
| 46 |  |  | 9.4 Euler’s Method for Systems | p.379: 1,***6\****(use Euler) |  |
| 47 |  |  | Review |  |  |
| 48 |  |  | 11.2a Fourier Series (FS) | p.430: 1,3,5,13 |  |
| 49 |  |  | 11.2b FS-Convergence/Periodic Extension  11.3a Odd/Even Functions | p.431: ***17***\*,18  p.437: 1,3,5,7 |  |
| 50 |  |  | 11.3b Fourier Sine/Cos Series (FSS/FCS) | p.437: 13,15,18,25,29 |  |
| 51 |  |  | 12.1a PDEs, Separation of Variables (1st Order) | p.459: 1,3,5 |  |
| 52 |  |  | 12.1b PDEs, Separation of Variables (2nd Order) | p.459: 7,9,12 |  |
| 53 |  |  | 12.3a **APP** Heat Equation (0 Temp Ends) | Handout |  |
| 54 |  |  | 12.3b **APP** Heat Equation (More Practice) | p.468: 1,2 |  |
| 55 |  |  | 12.3b **APP** Heat Equation (Insulated Ends) | p.468: ***3***\*,4 |  |
| 56 |  |  | Review |  |  |
| **57** |  |  | **Test 4** |  |  |
| **Final Exam** | 58 |  |  | Review for Final |  |  |
| 59 |  |  | Review for Final |  |  |
| 60 |  |  | Review for Final |  |  |
| R |  |  | Reading Day |  |  |