DIFFERENTIAL EQUATIONS

SM212 FIRST SEMESTER 2011-2012

Textbook: *Differential equations with Boundary Value Problems, 7th ed.,* by Dennis G. Zill and Michael R. Cullen.

At the start of the semester, your instructor will inform you of his/her policy regarding grading, tests, quizzes, and homework. The final will be a common exam for the course. The textbook has been chosen with you, the student, in mind. So you should try to read it. It is, however, your responsibility to study the assigned pages and do the assigned problems from the text. If you have questions about these, then you should ask your instructor. Certain problems in this syllabus are marked with CP. These are to be done with the Voyage 200, Sage, or some other software package designated by your instructor.

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| LESSON/PAGES | TOPICS | DATE | PROBLEMS |
|---|---|---|---|
| 1/ 1-9 | Definitons and Terminology | 08/22 | p.10: 1,3,7.9,10,11, 16,20CP,22,28,30,34 |
| 2/ 12-14; 35-37 | IVPs, Direction Fields, Isoclines | 08/24 | p.17: 1,8,11; p.41: 1 |
| 3/ 44-50 | Separable DEs | 08/25 | p.50: 5,6,7,13,16,25 |
| 4/ 53-60 | 1st order linear DEs | 08/26 | p.60: 5,7,9,26,27 |
| 5/ 75-79 | Numerical method: Euler (or Constant Slope) | 08/29 | p.79: 1,2,5CP |
| 6/ 342-343 | Numerical method: Improved Euler (or Average Slope) | 08/31 | p.344: 1 ($h = 0.5$), 2 ($h = 0.25$) (both by hand), then **redo** 1 as CP with $h = 0.1$, $h = 0.05$ |
| 7/ | REVIEW | 09/01 | |
| 8/ 20-21; 83-86 | Applications (Growth/Cooling) | 09/02 | p.89: 3,5,13.14.15 |
| | Labor Day (no class) | 09/05 | |
| 9/ 24-25, 87-88 | Applications (Mechanics/Electrical circuits) | 09/06 | p.89: 19, 29, 30, 35 |
| 10/ 118-128 | IVPs/General solutions, Basic theory | 9/07 | p.128: 1,3,5,11(a) |
| 11/ 118-128 | Basic theory cont'd. | 09/08 | p.128: 17,21,23,27,31,35 |
| 12/ 133-138 | Hom. Linear DEs, Auxiliary Eqn. | 09/09 | p.138: 3,5,7,15 |
| 13/ 133-138 | Auxiliary Eqn. with repeated & complex roots | 09/12 | p.138: 11,12,30,43,47 |
| 14/ 182-194 | Springs (use T15) | 09/14 | p.194: 1,2,9 |
| 15/ 182-194 | Springs | 09/15 | p.194: 11(k),19,21,23,25 |
| 16/ | REVIEW | 09/16 | |
| 17/ | TEST 1 | 09/19 | |
| 18/ 140-148 | Undet. Coefficients | 09/21 | p.148: 2,5,8,12,21 |
| 19/ 140-148 | Undet. Coeffs, superpos. | 09/22 | p.148: 6,10,14,17,27 |
| 20/ 140-148 | Undet. Coeffs, Springs (use T15) | 09/23 | p.148: 36; p.194: 8 |
| 21/ 182-194 | Springs | 09/26 | p.194: 29,36,38,39; p148: 24 |
| 22/ 204-206 | Electrical Circuits | 09/28 | p.194: 46,47,53; p148: 35 |
| 23/ | REVIEW | 09/29 | p148: 33, 34 |
| 24/ 255-261 | Laplace Transform (LT) | 09/30 | p.261: 3,10,17,26,38; p.156: 35 |
| 25/ 262-269 | Inverse LT (ILT) & Derivatives | 10/03 | p.138: 29,34; p.269: 3,4,15,33,34 |
| 26/ 262-269, | ILTs & Partial Fractions | 10/05 | p.157: 65,69; p.269: 18,23,26,35 p278: 19 |

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| 27/270-274<br>272: Example 2 | Properties of LTs:<br>1st Transl. Thrm (s-shifting),<br>Completing Square | 10/06 | p.278: 5,9,11,15,21,29 |
| 28/ | REVIEW | 10/07 | |
| | Columbus Day (no class) | 10/10 | |
| 29/ | TEST 2 | 10/12 | |
| 30/ 274-278 | Unit Step Fcn,<br>2nd Transl. Thrm (t-shifting)<br>(use L15 for LT,<br>use L16 for ILT) | 10/13 | p. 279: 37,39,42,43,<br>47,55,56 |
| 31/ 274-278 | Unit Step Fcn<br>(use L15 for LT,<br>use L16 for ILT) | 10/14 | p.279: 49,50,57,60,61,66,67 |
| 32/ 282-289<br>(7.4.1,7.4.2) | Derivatives, Convolution<br>(no periodic fcns) | 10/17 | p.289: 1,6,7,19,20,37 |
| 33/ 292-294 | Dirac Delta Fcn | 10/19 | p.295: 3,5 |
| 34/Handout | Convolution<br>impulse response eqn | 10/20 | (see handout) |
| 35/ | REVIEW | 10/21 | |
| 36/ 295-299 | Systems by LTs | 10/24 | p.299: 1,3,8 |
| 37/ 109-110,<br>295-299,<br>& Handout | Electrical Networks | 10/26 | p.110: 12,14; p.299: 15,16 |
| 38/ app3-10 | Matrix Theory (no inverse) | 10/27 | app18: 4,6,14 |
| 39/ app10-14 | Gaussian Elim. (rref on calc) | 10/28 | app18: 31,33 |
| 40/ app10-14 | matrix inverses, Cramer's rule | 10/31 | app18: 15,16,23,<br>36 (use Cramer's rule),<br>41,42 |
| 41/ | REVIEW | 11/02 | |
| 42/ | TEST 3 | 11/03 | |
| 43/ app14-15 | Evals & Evecs | 11/04 | app18: 47,48,51 |
| 44/ app14-15 | Evals & Evecs | 11/07 | app18: 49,53 |
| 45/304-310 | Systems of DEs in Matrix Form | 11/09 | p. 310: 1,5,7,14 |
| 46/ 311-324 | Distinct Real Evals | 11/10 | p.324: 1,3,7,13,14 |
| | Veterans Day (no class) | 11/11 | |
| 47/ 353-357 | Euler's method for systems | 11/14 | p.357: 1, 7(Euler only) |
| 48/ | REVIEW | 11/16 | |
| 49/ 433-436 | PDEs, Separation of Variables | 11/17 | p.436: 1 with<br>$u(x,0) = 5e^{2x}$,<br>and 1 with<br>$u(x,0) = 10e^{3x} - 2e^{-5x}$ |
| 50/ 437-442 | Heat Eqn.,<br>Fourier's Problem & need for FS | 11/18 | p.436: 3 with<br>$u(x,0) = 2e^{3x} - 2e^{-x}$,<br>10 with $u(0,t) = u(10,t) = 0$,<br>$u(x,0) = 2\sin(2\pi x/5)$;<br>p.442: 1 |
| 51/ 403-407 | Fourier Series (FS),<br>Define periodic Fcn | 11/21 | p.436: 10 with<br>$u(0,t) = u(10,t) = 0$,<br>$u(x,0) = 2\sin(2\pi x/5) - 3\sin(\pi x)$;<br>p.402: 21;<br>p.407: 1,3,4 |
| 52/ 403-413 | FS, Convergence,<br>Periodic Extension,<br>Even and Odd Fcn's | 11/23 | p.407: 7,19;<br>p.414:1,2,3,5,7 |
| | Thanksgiving (no classes) | 11/24-25 | |
| 53/ 408-414 | Fourier Sine Series (FSS),<br>Fourier Cosine Series (FCS) | 11/28 | p.414: 11,12,25,26 |
| 54/ 443-445 | Heat Eqn. Ends at Zero | 11/30 | p.445: 1 ($L = \pi$), 2 ($L = 2$) |
| 55/ 443-445 | Heat Eqn. Both Ends Insulated | 12/01 | p.445: 3,4 |
| 56/ | REVIEW | 12/02 | |
| 57/ | TEST 4 | 12/05 | |
| 58-60/ | REVIEW FOR FINAL | 12/07-09 | |