## Marshall University Syllabus Department of Mathematics MTH 335-202 Spring 2023

| Course Title: | Differential Equations |
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| Course Number: | MTH 335 -- Section 202 -- CRN 5263 -- Credit: 3 Hours |
| Textbook: | Differential Equations with Boundary Value Problems by Zill, 9E |
| Sections Covered: | 1.1-1.3, 2.1-2.6, 3.1-3.2, 4.1-4.9, 5.1-5.2, 6.1-6.4, 7.1-7.6, 8.1-8.2 |
| Course Description: | First, second, and higher-order ordinary differential equations, Applications including vibrations and electrical circuits, Series Solutions, Laplace transform, approximate solutions, System of first order linear equations |
| Calculator: | TI-83 or higher, (TI-89 highly recommended) |
| Prerequisites: | MTH 231 with "C" or higher |
| Meeting Time: | MWF: 12:00-12:50 PM |
| Classroom: | Smith Hall 514 |
| Instructor: | Dr. Basant Karna |
| Office: | Smith Hall 715 |
| Office Hours: | MW: 1:00-2:00 PM, TR: 12:00-2:00 PM (Others by appointment) |
| Phone/Email: | Phone: (304) 696-4332, Email: karna@ marshall.edu |
| Course Objectives: | The objectives of this course are to provide students with a clear understanding of First order DEs, Second and higher order linear DEs and different methods to solve them including series solutions and using the Laplace Transform. Students will also learn the applications including vibrations and electrical circuits. |
| Course Contents: | - Introduction <br> - First Order Differential Equations <br> - Modeling with First-Order Differential Equations <br> - Higher Order Linear Equations <br> - Modeling with Higher-Order Differential Equations <br> - Series Solutions of Linear Equations <br> - The Laplace Transform |
| Attendance Policy: | Attendance is required. Having more than $\mathbf{2 5 \%}$ absences may result in a course grade of $\mathbf{F}$ ! Absences which can be excused include COVID-19 related absences, illness, emergencies, or participation in another university activity. Excused absences must be approved by the office of the dean of students. |
| Grading Policy: | A. Exams: There will be 2 exams given in class. <br> B. Homework Problems: 10 Homework assignments will be given and collected. <br> You are responsible for reading the text, working the exercises, and being aware of the dates for the major exams. <br> C. Final Exam: There will be a two-hour final exam on April 28 at 10:15 AM. |
| Points <br> Distribution: | Attendance/Teaching Eval 30 Pts <br> Homework 100 Pts <br> Exams 200 Pts <br> Final Exam 100 Pts |
|  | Total Pts: 430 Pts |


| Grades | The semester grade will be based on the percentage of the 430 total possible points, using the following scale. <br> A: $90-100 \%$, B: $80-89 \%$, C: $70-79 \%$, D: 60-69 \%, F: 0-59 \% <br> Note: The class score will be posted on http://www.marshall.edu/muonline/ |
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| Make-ups: | A. Exams: Making up a missed exam is possible only if you receive prior permission from me and only for serious and unavoidable circumstances. <br> B. Final: If you don't take final exam, you will receive " $F$ " for the class. |
| Exam Dates: | Exam 1 - February 10, Exam 2 - March 24 (Fridays) <br> Final Exam: April 28 @ 10:15 AM (Friday) |
| Important Dates: | - January 16, Monday - MLK, Jr. Holiday <br> - January 17, Tuesday - "W" Withdrawal period begins <br> - March 13, Monday - March 17, Friday- Spring Break <br> - April 14, Monday - Last day to drop <br> - April 21, Friday - Last class day |
| Disruptive Actions: | If your actions become disruptive or distracting for me or another student, you will be asked to cease your behavior. Disruptive behavior may include but are not limited to the following: cell phone use in class, talking during class, and the use of iPods or MP3 players during class. These will count as unexcused absences. |
| University Policies: | By enrolling in this course, you agree to the University Policies. Please read the full text of each policy (listed below) by going to MU Academic Affairs: <br> University Policies. (URL: http://www.marshall.edu/academic-affairs/policies/) <br> - Academic Dishonesty Policy <br> - Academic Dismissal Policy <br> - Academic Forgiveness Policy <br> - Academic Probation and Suspension Policy <br> - Affirmative Action Policy <br> - Dead Week Policy <br> - D/F Repeat Rule <br> - Excused Absence Policy for Undergraduates <br> - Inclement Weather Policy <br> - Sexual Harassment Policy <br> - Students with Disabilities (Policies and Procedures) <br> - University Computing Services Acceptable Use Policy |
| Academic Calendar: | For beginning, ending, and add/drop dates, see the Marshall University Academic Calendar (URL: http://www.marshall.edu/academic-calendar/). |
| Coming Late: | Students should join on time and stay in the class for entire class. |

## Health and Safety Information

All members of the Marshall University community are expected to always observe health and safety protocols. This includes general health and safety protocols as well as specific protocols that might emerge in response to community and campus health conditions.

Note: Homework assignments are posted on the blackboard.

## Course Schedule

| Week | Sections | Topics |
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| $\mathbf{1}$ | $1.1-1.3$ | Definitions and terminology, IVP, DE as Mathematical Models |
| $\mathbf{2}$ | $2.1-2.2$ | Solutions curves without a solution, Separable variables |
| $\mathbf{3}$ | $2.3-2.4$ | Linear equations, Exact equations |
| $\mathbf{4}$ | $2.5-2.6$ | Solutions by substitution, A numerical method |
| $\mathbf{5}$ | 3.1, Review | Linear models, Exam 1 on February 10 |
| $\mathbf{6}$ | $3.2,4.1$ | Nonlinear models, Linear differential equations |
| $\mathbf{7}$ | $4.2,4.3$ | Reduction of order, Homogeneous linear equations with constant coefficients |
| $\mathbf{8}$ | $4.4,4.5$ | Undetermined coefficients (superposition approach, Annihilator approach) |
| $\mathbf{9}$ | $4.6,4.7$ | Variation of parameters, Cauchy-Euler equation |
| $\mathbf{1 0}$ | No Class | March 13, Monday- March 17, Friday - Spring Break |
| $\mathbf{1 1}$ | 4.8, Review | Solving system of linear equations by elimination, Exam 2 on March 24 |
| $\mathbf{1 2}$ | $4.9,5.1$ | Nonlinear differential equations, Linear models (higher order) |
| $\mathbf{1 3}$ | $6.1,6.2$ | Solutions about ordinary points, Solutions about singular points |
| $\mathbf{1 4}$ | $7.1-7.3$ | Laplace transform, Inverse Laplace transform, Operational properties I |
| $\mathbf{1 5}$ | $7.4-7.6$ | Operational properties II, Dirac Delta function, system of linear DEs |
| $\mathbf{1 6}$ | Final Exam | Final Exam on Friday, April 28, 10:15 - 12:15 AM |

## Recommended Problems (from 8E)

Section 1.1 - 1 (Odds), 9, 10, 11, 17, 20, 23, 27, 34, 39, 52
Section 1.2 2, 5, 7, 9, 13, 14, 15, 17, 19, 22, 30, 35 - 38
Section 2.1 1, 3, 5, 7, 9, 10, 16, 19, 20, 21, 23
Section 2.2 1, 2, 3, 4, 6, 8, 10, 12, 13, 17, 19, 21, 22, 23, 25, 28, 36, 43
Section 2.3 , 2, 3, 5, 7, 9, 12, 17, 20, 24, 28, 33, 37, 53
Section 2.4 1, 3, 4, 7, 9, 10, 13, 16, 21, 25, 29, 32, 35, 38, 45(a)
Section 2.5 (1, 4, 6, 7, 10, 11, 13, 16, 23, 26, 27, 29
Section 2.6 2, 4, 5, 7, 9, 11
Section 3.1 1, 2, 3, 4, 5, 6, 9, 11, 13, 14, 17, 21, 22, 23, 25, 29, 31, 32
Section 3.2 1, 2, 3, 5, 6, 9, 19(try), 24(try).
Section 4.1 1, 3, 4, 5, 7, 9, 12, 13, 15-30(Odds), 31-36(Odds)
Section 4.2 1, 2, 4, 8, 10, 11, 13, 16, 17, 18, 19
Section $4.3>1, \mathbf{3}, 6, \mathbf{9}, 13, \mathbf{1 6}, 18,20, \mathbf{2 3}, 25,28, \mathbf{3 3}, 35, \mathbf{3 7}, 40,43-48,49,51,59,61,65$
Section 4.4 3, 5, 6, 8, 12, 14, 17, 19, 22, 24, 27, 29, 31, 39
Section 4.5 1, 3, 7, 8, 12, 14, 15 - 26(Odds), 31, 33, 37, 40, 42, 46, 48, 53, 57, 60, 67, 70
Section 4.6 1, 2, 4, 5, 6, 7, 11, 12, 13, 20, 25
Section 4.7 1, 3, 5, 7, 9, 11, 16, 19, 21, 22, 24, 29, 31, 33
Section 4.8 1, 3, 5, 6, 8, 10, 16, 21
Section 4.9 1, 4, 6, $\mathbf{1 3}$
Section 5.1 1, 2, 3, 5(a, b), 6, 8, 11(a-c),(f),(g),(h), 17-20, 23, 26(a),(b), 29, 32, 45, 47, 49, 53
Section 6.1 3, 5, 7, 11 19, 23, 27, 28, 33
Section 6.2 1, 3, 7, 9, 13, 18, 21
Section 6.4 1, 3,5, 7, 9, 10, 27(a)
Section 7.1 1, 3, 5, 7, 9, 12, 14, 17, 20, 23, 28, 32, 33, 36, 37
Section 7.2 1, 4, 8, 10, 11, 13, 15, 19, 23, 26, 30, 33, 34, 35, 38
Section 7.3 3, 6, 7, 11, 15, 20, 21, 25, 37, 41, 43, 47, 48, 55, 57, 63, 65, 67
Section 7.4 1, 3, 7, 9, 11, 19, 21, 28, 31, 37, 39, 43

