Ordinary Differential Equations/ Differential Equations

COURSE CODE: MA: 218

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| **Lecture Schedule** | See on Moodle  | **Semester** | Spring 2021 |
| **Credit Hours** | 03 | **Pre-requisite** | MA 111, Applied CalculusMA 100, Calculus I, Calculus II |
| **Instructors** | Dr. Muhamad Bilal Riaz | **Contact** |  |
|  |  | **Contact** |  |
| **Offices** |  | **Office Hours** | See office door or Moodle. |
| **Course Description** | The aim of this introductory course is to familiarize students to the subject of differential equations and their applications in simple physical situations. The student is supposed to understand how DE’s arise in mathematics, physics and engineering and the importance of initial and boundary conditions in solving an equation. Standard methods for solving first order DE’s. In addition, student able to understand general method for solving second order DE’s with constant coefficients and its applications. Laplace and Fourier transform techniques will introducein this course and applied in simple cases. The method of solution in series will discuss and exemplify.  |
| **Expected Outcomes** | * The student should be able to understand the basic concepts and terms of differential equations and their applications in simple physical situations.
* The student is supposed to understand how DE’s arise in mathematics, physics and engineering.
* The student should appreciate the importance of initial and boundary conditions in solving an equation
* The student should be able to classify a given DE and be able to analyze which method to apply.
* He should be familiar with Laplace and Fourier transform techniques.
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| **Textbook:** | * D.G. Zill: *Differential Equations and their Applications,*Latest edition
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| **Reference:** | * Erwin Kreyzig, Advanced Engineering Mathematics, Latest edition.
* C.H. Edwards, David E. Penney, Elementary Differential Equations with applications, Latest edition.
* Michael Greenberg, Advanced Engineering Mathematics, Latest edition.
* Zill, Prindle Weber and Schmidt, A first Course in Differential Equations, Latest edition.
* Differential Equations by (Paul Dawkins)
* S. M. Yousaf: Mathematical Method

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| **Sessionalexams** | At least 4Quizzes&4 assignments and one Mid Term | **Final exam** | Will cover the whole course  |
| **Attendance Policy** | Students missing more than 25% of the lectures will receive an “SA” grade in the course. |
| **Evaluation criterion** | * Assignments: 10 %
* Quizzes: 15%
* Mid-Term: 30%
* Exam final : 40%
* Class Activity 5%
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 **Course Outline**

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| **Wk** | **1st Lecture** | **2nd Lecture** |
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| 1 | Introduction to the subject, how DE’s arise; classification of DE’s with particular reference to linearity and nonlinearity | Introduction to Ordinary Differential Equations, Solution of ODE’s |
| 2 | Differential equations as a Mathematical Model | Separable Equations |
| 3 | Equations Reducible to Separable form | Exact Differential Equations,  |
| 4 | Integrating Factors (Non-Exact Differential Equations) | Bernoulli, Ricatti’s Differential Equations |
| 5 | Linear first order Ordinary Linear DE | Homogeneous Linear DE of Second Order |
| 6 | Homogeneous Second Order Equations with constant Coefficients | Differential Operators |
| 7 | Cauchy Equations (with Variable Coefficients) | Variation of Parameters  |
| 8 | **Midterm exam** |  |
| 9 | Homogeneous Linear Equations of Arbitrary Order with constant coefficients |  Method of Reduction of Order |
| 10 | Undetermined Coefficients | Non homogeneous Linear Equations (Cont.) |
| 11 | Introduction to method of solution in series | Illustrative examples on the method of solution in series |
| 12 | Introduction to Laplace transform, Calculation of Laplace transforms in simple cases. | Inverse Laplace Transforms, Calculation of Inverse Laplace Transforms |
| 13 | Application of LT to solution of initial-value problems. | Further Application of LT to solution of initial-value problems |
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| 14 | Application of Differential equations to real life problems | Application of Differential equations to real life problems |
| 15 | Review and revision of material covered | Review and revision of material covered |