



# FORMAN CHRISTIAN COLLEGE, LAHORE

(A Chartered University)

## Department of Mathematics

Ordinary Differential Equations –MATH202 (A)

Spring 2023

### **Instructor Information:**

Dr Farheen Ibraheem

Assistant Professor

### **Office Hours:**

Monday & Friday: 11:00- 12:00 & 13:00-14:00

Tuesday: 14:00 – 16:00

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**Office No.** S113

### **Course Information:**

**Title:** Ordinary Differential Equation

**Course Code:** MATH 202

**Class Room:** S313

**Prerequisite:** MATH 102 (Calculus 1)

**Class Timings:** Tuesday & Thursday @ 11:00a.m.-12:15p.m.

### **Recommended Books**

1. Applied Differential Equations by Murray R. Spiegel, 2<sup>nd</sup> Edition, Prentice-Hall Mathematics Series, USA.

2. A First Course in Differential Equation with Modeling Applications by Dennis G. Zill, 10<sup>th</sup> Edition, Cengage Learning, USA.

### **Reference Books**

1. Elementary Differential Equations and Boundary Value Problems by William E Boyce and Richard C. DiPrima, 8<sup>th</sup> Edition, John Willy & Sons.

2. Ordinary Differential Equations for Engineers Problems with MATLAB Solution by Ali Umit Keskin, Springer.

## **Course Description:**

Differential equations serve as the language of the natural laws. Differential equation modelling, as well as how to solve the equations and analyse the results, are essential skills for scientists and engineers.

## **Course Goals:**

Upon successful completion of the course, students should be able to learn:

1. Identify and classify Ordinary Differential equations.
2. Think critically to determine appropriate technique to solve Differential Equation.
3. Integrate knowledge and ideas of differential equations in a meaningful way to solve real world problems.

## **Course Requirement:**

- Students must arrive at class on time, should remain in class for the entire class period and mobile phones should be switched off or on silent mode. Students whose
- attendance is less than 70% won't be allowed to take the final exam. Note that there are **05 marks for attendance and class participation**. If a student arrives more than 10 minutes late or leaves class during lecture or uses mobile phone in class, he/she will be marked absent.
- Course assessment will be through quizzes, attendance & class participation, assignments, midterm and final exam. **Absolute grading system** will be followed throughout the course. If needed, students may be asked to explain the submitted work. **Late submission of assignment will result in deduction of points for the assignment**. There is no make up for missed quizzes but **best 3 out of 4** will be counted. In extreme cases average marks for the missed quizzes might be given provided students should submit strong evidence **within 3 days** after missing the quiz. Make up for midterm and final exam is possible only under extremes cases if student provides strong documentary evidence within **3 days after missing the mid/final exam**. In case of make-up examination, there will be a 0-20% deduction in marks depending upon case to case.
- Academic dishonesty or cheating will result in zero points (grade F) and will be referred to AIC (Academic Integrity Committee) at FCC for necessary action.

## **Course Evaluation:**

Following assessment tools will be used to evaluate students' progress

1. Attendance and Class Behaviour (Regularity and Punctuality in completion and submission of home tasks. 5%
2. Assignment 5%
3. Quizzes  
(Best 5 out of 6 will be chosen) 20%
4. Midterm Exam 30%
5. Final Exam 40%

<b><u>Grades</u></b>	<b><u>Quality Points</u></b>	<b><u>Numerical Value</u></b>	<b><u>Meaning</u></b>
A	4.00	93-100	Superior
A-	3.70	90-92	
B+	3.30	87-89	
B	3.00	83-86	Good
B-	2.70	80-82	
C+	2.30	77-79	
C	2.00	73-76	Satisfactory
C-	1.70	70-72	
D+	1.30	67-69	
D	1.00	60-66	Passing
F	0.00	59 or below	Failing

## Course Outline:

<b>Weeks</b>	<b>Topics</b>	<b>Reading Material from Book</b> Murray R. Spiegel
(1)	1) Discussion of Course Plan 2) Definitions and Classification of Differential Equations 3) Formation of Differential Equations.	Pages: 4-6 Pages: 14-18
(2)	1) First Order Ordinary Differential Equation 2) Separable Equations <b>Quiz 1</b>	Page: 27 Pages: 36-38
(3)	1) Homogeneous Equations 2) Exact Equations	Pages: 46-49 Pages: 28-35
(4)	1) Inexact Equations and Integrating Factors 2) First Order Linear Equations 3) Bernoulli Equations <b>Quiz 2</b>	Pages: 39-42 Pages: 43-44 Page: 45
(5)	Clairaut's Equation	Pages: 58
(6)	Second Order Linear Equations <b>Quiz 4</b>	Pages: 139-14
(7)	Linear Homogeneous Equations: the Wronskian	Pages: 153-157

(8)	Non-homogeneous Equations <b>Midterm</b>	Page: 159
(9)	The Method of Undetermined Coefficients	Pages: 160-164
(10)	The Method of Undetermined Coefficients (Continued from Week 9)	Pages: 165-167
(11)	Method of Variations of Parameters <b>Quiz 5</b>	Pages: 168-170
(12)	Euler's Differential Equation	Pages: 180-183
(13)	Introducing the Laplace Transformation <b>Quiz 6</b>	Pages: 244-247
(14)	Properties of Laplace Transformation	Pages: 248-250
(15)	Inverse Laplace Transform and its Properties	Pages: 259-260
(16)	Solution of Ordinary Differential Equations using Laplace Transform <b>Assignment 1</b>	Pages: 261-264
	<b>FINAL EXAM (FROM THE WHOLE COURSE)</b>	