NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES
LAHORE CAMPUS

Differential Equations (Calculus-II)-MT 224 Outline according to OBE Spring-2020

Prepared By: Dr. Akhlaq Ahmad Bhatti

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Outline of Differential Equations (Calculus-II)

Dr. Mubashar Baig - Coordinator Math Courses in CS Department

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Signature for Final Approval

DEPARTMENT OF SCIENCES & HUMANITIES

Department	Department of Computer Science	**Dept. Code**	CS
Course Title	Differential Equations(Calculus-II)	**Course Code**	MT-224
Pre-requisite(s)	Calculus & Analytical Geometry	**Credit Hrs.**	3
Moderator	Dr. Saeeda Zia		
Course Instructor(s)	Dr. Akhlaq Ahmad Bhatti, Dr. M. Farasat Shamir, Dr. Saeeda Zia, Dr. Sumaira Hafeez, Ms. Hina Firdous,		
Note:	It is a tentative schedule of the course. It may vary (if required).		

Course Objective	The objective is to impart training to the students in this important branch of Mathematics. Students are expected to learn, Convergence/Divergence of Series, system of linear equations & Differential Equations arising from different Physical systems. Attempt will be made to introduce the students how to solve Linear systems, Ordinary & Partial Differential Equations using different techniques. Concept of Fourier Series will also be explained for PDE's solution.

No.	Assigned Program Learning Outcome (PLO)	Level	Tool
01	An ability to identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural science and engineering sciences.	R	

I = Introduction, R = Reinforcement, E = Evaluation.
A = Assignment, Q = Quiz, M = Midterm, F=Final, LA=Linear Algebra, DE=Differential Equation.

No.	Course Learning Outcome (CLO) Statements	Tools
01	• Solution of infinite sequences & series using different methods.	Q1, A1, M1, F
02	• Solution of different type of ODE's using different methods.	A2, M1, Q2, M2, F
03	• Solution of some basic ODE's like Linear, Exact, Bernouli etc.	A2, Q2, M2, F
04	• Existence/Independence of solutions of Initial/Boundary value problems for first & second order ODE's through different techniques.	Q2, M2, A2, Q3, F
05	• Solution of PDE's by Fourier series using orthogonal set of functions.	Q3, A3, M2, F

Text Book(s)	**Title**	Thomas Calculus / A first course in Differential Equations (DE) with modeling applications / Differential Equations with boundary-value problems.
	Authors	G. B. Thomas / Dennis G. Zill (DE) (Latest Editions).
Ref. Book(s)	**Title**	Elementary Differential Equations (DE) with applications.
	Author	C. H. Edwards. David, E.

Week	Course Contents	Chapter	CLO
01	**Infinite Sequences and Series** 10.1 Introduction to Sequences 10.2 Infinite series	10 (13th Edition)	01
02	10.3 The integral test 10.4 Comparison tests	10 (13th Edition)	01
03	10.5 Absolute convergence; The ratio and root test 10.6 Alternating series and conditional convergence **Quiz#1**	10 (13th Edition)	01
04	10.7 Power series 10.8 Taylor and Maclaurin series	10 (13th Edition)	01
05	**1st Order Differential Equations:** 2.1 Basic concepts, formation and solution of differential equations by direct integration and by separating the variables. Direction Fields. 2.2 Separable variables.	2 (9th Edition)	02
06 (Mon-Wed)	**MID TERM-I**		
07-09	2.3 Linear Equations. 2.4 Exact Equations. **Solution by Substitution** 2.5 Equations (Homogeneous & Bernoulli's DE) reducible to linear equations & Riccati. 3.1 01st order ODE's arising from Real life problems. 3.3 01st order ODE's arising from Real life problems.	02 (9th Edition) 03 (9th Edition)	03-05
10-12	**2nd & Higher Order Differential Equations** 4.1 Initial and Boundary value problem, Existence of a unique solution. Homogeneous DEs', Linear Dependence and Independence. Wronskian and non-homogeneous Linear Differential Equation. 4.2 Reduction of order. **Quiz#2** 4.3 Homogeneous Linear Equations with Constant Coefficients. 4.4 Undetermined coefficients-Superposition approach. 4.5 The operator D, Inverse operator 1/ D, Solution of	04 (9th Edition)	06, 07

	differential equations by operator D methods, Special cases. 4.5 Undetermined coefficients-Annihilator approach. 4.6 Variation of parameters. 4.7 Cauchy Euler equation.		
13	**Partial Differential Equations** 12.1 Basic concepts and formation of partial differential equations. Linear homogeneous partial differential equations and relations to ordinary differential equations. 12.2 Classical Equations & Boundary Value Problems. 12.3 Heat Equation 12.4 Wave Equation 12.5 Laplace Equation	12(3rd Edition)	08
14 (Thu-Sat)	**MID TERM II**		
15-16	**Orthogonal Functions and Fourier Series** 11.1 Orthogonal Functions 11.2 Fourier Series **Quiz#3** 11.3 Fourier Cosine & Sine Series (Periodic functions and expansion of periodic functions in Fourier series and Fourier coefficients.) 11.4 Sturm-Liouville Problem.	11 (3rd Edition)	09
	Series Solutions of Linear Equations: (If time permits**)** 6.2 Solution about ordinary point & Singular points.	09th edition	
	FINAL EXAM		

Evaluation Scheme & Marks Distribution: Relative grading scheme will be used for final assignment of grades. Marks distribution is given below.

Assessment Tools	Total No.	Weightage
Quizzes	3 (at least)	10%
Assignments	3(at least)	8%
Homework	As per instructors advice.	7%
Mid Term Exam	2	25%
Final Exam	1	50%

Note:

1. **Reaching 10 minutes late after the class starts will not be considered present.**
2. **Late submission of home works will not be rewarded.**
3. **Relative grading scheme will be followed in the course.**

Important links:

https://www.youtube.com/watch?v=8yEE2YURbAo&list=PLlXfTHzgMRUK56vbQgzCVM9vxjKxc8DCr&index=31