National University

Of Computer & Emerging Sciences
Karachi

Course Outlines of BS (CS) Degree Program

Course Instructor	Mr.Abdul Basit/Mr.Nadeem/Ms.Asma/Ms.Javeria/Ms.Urooj	**Semester**	Spring
Batch/Section(s)	2021/BS-CS A,B,C,D,E,F,G,H,J,K,L; BS-AI A,B ;BS-CY A,B	**Year**	2022
Course Title	Differential Equations (MT-1006)	**Credit Hours**	3
Prerequisite(s)	MT1003- Calculus and Analytical Geometry	**Course TA**	

Text Book (1)	A first course in Differential Equations (DE) with modeling applications/ Dennis G. Zill (Latest Editions).
Text Book (2)	Differential Equations with Boundary-Value Problems/ Dennis G. Zill
Ref. Book	Elementary Differential Equations (DE) with applications. / C. H. Edwards. David, E.

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	Tools
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, DE=Differential Equation.

No.	Course Learning Outcome (CLO) Statements	Tools
01	Solution of different type of ODE's using different methods.	Q1, A1, M1, F
02	Solution of some basic ODE's like Linear, Exact, Bernouli etc.	A2, M1, Q2, M2, F
03	Existence/Independence of solutions of Initial/Boundary value problems for first & second order ODE's through different techniques	A2, Q2, M2, F
04	Solution of 2nd and higher order differential equations	Q2, M2, A2, Q3, F
05	solution of PDE's by Fourier series using orthogonal set of functions	Q3, A3, M2, F

Week	Contents/Topics	Exercises	CLO
1	**1st Order DE** Basic concepts, formation and solution of differential equations Initial value problems	1.1,1.2	1
2,3	Separable variables Linear Equations. Exact Equations	2.2,2.3,2.4	2
4	**Solution by Substitution** Equations (Homogeneous & Bernoulli's DE) reducible to linear equations & Riccati.	2.5	2
5	1st Order DE arising from real life	3.1-3.3	3
6	**Midterm 1**		
7	**2nd and Higher Order DE** Initial and Boundary value problem, Existence of a unique solution. Homogeneous DEs', Linear Dependence and Independence. Wronskian and non-homogeneous Linear Differential Equation	4.1	3-4
8-10	Reduction of order. 4.2 Homogeneous Linear Equations with Constant Coefficients. 4.3 Undetermined coefficients-Superposition approach 4.4 The operator D, Inverse operator 1/ D, Solution of differential equations by operator D methods, Special cases. 4.5 Undetermined coefficients-Annihilator approach. 4.5 Variation of parameters. 4.6 Cauchy Euler equation. 4.7	4.2-4.7	4
11	**Midterm 2**		
12-13	**Orthogonal Functions and Fourier Series** Orthogonal Functions Fourier Series Fourier Cosine & Sine Series (Periodic functions and expansion of periodic functions in Fourier series and Fourier coefficients.)	11.1-11.3 (DE with BVP book)	5
14-15	**Partial Differential Equations** Basic concepts and formation of partial differential equations. Linear homogeneous partial differential equations and relations to ordinary differential equations. Classical Equations & Boundary Value Problems. Heat Equation. Wave Equation. Laplace Equation.	12.2-12.5 (DE with BVP book)	5
16	**Final Exam**		

Grading Criteria:

Marks Distribution:

Particulars	% Marks
1. Quizzes (at least 3)	10
2. Assignments (at least 3)	10
4. First Mid Exam	15
5. Second Mid Exam	15
6. Final Exam	50
Total:-	**100**

Important Instructions to be followed for this Course

- Be in classroom on time. Any student who arrives more than 5 min late in the class would be marked LATE. Anybody coming to class more than 15 minutes late will be marked ABSENT.
- Turn off your cell phones or any other electronic devices before entering the class.
- Maintain the decorum of the class room all the time.
- Avoid a conversation with your classmates while lecture is in progress.
- Use parliamentary language in the class room as well as in assignments. Refrain from using impolite, vulgar or abusive language in the class room as well as in class presentations and assignments.
- Submit your assignments on time, no assignment will be accepted after the deadline.
- There would be no re- take of any quiz.

Instructions / Suggestions for satisfactory progress in this course:

- On average, most students find at least three hours outside of class for each class hour necessary for satisfactory learning.
- Chapters should be read and homework should be attempted before class.
- Do not get behind. You are encouraged to work with other students. Plus, I am always available during office hours to help you.
- The homework assigned is a minimum. You may always work extra hours on your own.
- Use the few minutes you usually have before the start of each class to review the prior meetings' notes and homework. This will save us valuable in-class time to work on new material.
- Develop a learning habit rather than memorizing.
- Work in groups, whenever appropriate.
- Apply the learned principles and gained knowledge.
- Be creative in thinking, but stick to the topic assigned for discussions, assignments and presentations.
- Always bring your text Books with you in the class.

Note: Students are welcome all the time to get help from the Teacher.

Signature: _____ Date:31-01-2022