Course Number and Title:	NS-214 Differential Equations			
Credit Hours:	3+0			
Pre Requisite	Calculus and Analytical Geometry			
Instructor (s):	Mr. Zulqarnain Haider			
Lab Engineer:	N/A			
Compulsory/Elective:	Compulsory			
If Elective: Depth Core/ Breadth Core:				
Course Schedule:	Lecture:	3 Hours/Week		
	Lab:	N/A		
	Office hours:	4 Hours/Week		
Course Assessment:	Assignments/ Course project:	3		
	Quizzes:	4		
	Lab work:	N/A		
	Exams:	Mid-Semester and Final		
Grading Policy:	Quizzes:	10%		
	Assignments/ Course project:	10%		
	Lab work:	00%		
	Mid-Semester:	20%		
	End-Semester:	60%		
Text Book:	Advanced Engineering Mathematics by Erwin Kreyzig, John Wiley & Sons Inc. Latest Edition.			
Reference Book(s):	1. Differential Equations with Boundary Value Problems by Dennis G. Zill, Michael R. Cullen, 1996, Brooks/Cole Publishing. 2. Mathematical Methods by Dr. S.M Yousuf, Ilmi Kitab Khana, Latest Edition.			
Course Objective:	Develop fundamental skills of solving ordinary differential equations, and developing differential equations for real-world problems.			
Course Learning Outcome	CLO Statement		PLO	Bloom
CLO-1:	Knowledge about the differential equations and understanding of the fundamental methods, techniques and algorithms to solve them.		PLO-1	C1 C2
CLO-2:	Application and analysis of differential equations in Electrical Engineering.		PLO-2	C3 C4
Topics covered in the course and level of coverage:	❖ First order differential equations			12 Hours
	❖ Applications of first order differential equations in Electrical Engineering			6 Hours
	❖ Differential equations of higher order			12 Hours
	❖ Applications of higher order differential equations in Electrical Engineering			6 Hours
	❖ Partial differential equations			6 Hours
	❖ Applications of partial differential equations in Electrical Engineering			6 Hours
Program learning outcomes and how they are covered	Detailed Contents		CLO	PLO
	❖ Differential equations: Definitions, order, degree, ODE,		CLO-1	PLO-1

by specific course outcomes:	PDE, Linear Differential equations, Non-Linear Differential equations, Solutions of differential equations, General solutions, Particular solutions, Initial and boundary value problems.		
	❖ Separable equations, Homogeneous equations, Differential equations reducible to homogeneous form and related examples.	CLO-1	PLO-1
	❖ Exact equations, Integrating factors, Linear equations and related examples.	CLO-1	PLO-1
	❖ Bernoulli's equations, orthogonal trajectories, Equations solvable for p, Equations solvable for y, Equations solvable for x and related examples.	CLO-1	PLO-1
	❖ Cailraut's equation, Singular solutions, Ricatti equations and related examples.	CLO-1	PLO-1
	❖ Homogeneous linear equations, Differential operators, Non-homogeneous linear equations, Undetermined coefficients, Cauchy-Euler equations and related examples	CLO-1	PLO-1
	❖ Variation of parameters, exact linear equations, linear system of D.E. and related examples.	CLO-1	PLO-1
	❖ Power series solutions of first order D.E., Second order linear equations and related examples.	CLO-1	PLO-1
	❖ Applications of Ordinary differential equations in Electrical Engineering.	CLO-2	PLO-2
	❖ Partial Differential Equations: Method of Separation of variables and related examples	CLO-1	PLO-1
	❖ Wave, Heat & Laplace equations and their solutions by Fourier series method	CLO-1	PLO-1
	❖ Applications of partial differential equations in Electrical Engineering	CLO-2	PLO-2

Mapping of CLOs with PLOs and Bloom's Taxonomy Cognitive Levels:

PLO	1	2	3	4	5	6	7	8	9	10	11	12
CLO-1	C1 C2											
CLO-2		C3 C4										

Mapping of CLOs with Assessment Methods:

CLOs/Assessment	CLO-1	CLO-2
Assignments:	√	√
Quizzes:	√	√
Mid-Semester:	√	√
End-Semester:	√	√