Differential Equations (BH-211)

Pre-Requisite(S)

- Calculus and Analytical Geometry

Recommended Book(s)

- Advanced Engineering Mathematics by Erwin Kreyzig, John Wiley & Sons Inc. Latest Edition.
- Differential Equations with Boundary Value Problems by Dennis G. Zill, Michael R. Cullen, 1996, Brooks/Cole Publishing.
- Non Linear Ordinary Differential Equations by D.W Jordan, P. Smith, Fourth Edition.
- An introduction to Ordinary Differential Equations by James C. Robinson. Latest Edition.

Reference Book(s)

i. Mathematical Methods by Dr. S.M Yousuf, Ilmi Kitab Khana, Latest Edition.
ii. Calculus with Analytical Geometry by Dr. S. M. Yusuf.

Course Objectives

The course is an introduction to neural networks. We will first review the most important artificial neural network architectures and algorithms such as backpropagation, deep learning, reinforcement learning, and neuro-evolution. Information processing in biological neural networks will be reviewed and distributed representations will be introduced as a foundation for connectionist artificial intelligence. Understanding of this material will be tested in a closed-book exam. In addition, homework assignments will give students hands-on experience in building simple network models.

Course Learning Outcomes (CLO)

CLO-1:	Knowledge about the differential equations and understanding of the fundamental methods, techniques and algorithms to solve them.	C1
CLO-2:	Application and analysis of differential equations in Electrical Engineering.	C3

Course Contents

- Ordinary Differential Equations of the First Order:
- Geometrical Considerations, Isoclines, Separable Equations, Equations Reducible to Separable Form, Exact Differential Equations, Integrating Factors, Linear First-Order Differential Equations, Variation of Parameters. Ordinary Linear Differential Equations;
- Homogeneous Linear Equations of the Second Order, Homogeneous Second Order Equations with Constant Coefficients, General Solution, Real Roots, Complex Roots,
- Double Root of the Characteristic Equation, Differential Operators, Cauchy Equation, Homogeneous Linear Equations of Arbitrary Order
- Homogeneous Linear Equations of Arbitrary Order with Constant Coefficients
- Non-homogeneous Linear Equations
- Modeling of Electrical Circuits
- Systems of Differential Equations
- Series Solutions of Differential Equations.

Mapping of CLOs to Assessment Modules

CLOs/PLOs	**CLO1**	**CLO2**		
PLO1: Engineering Knowledge	√			
PLO2: Problem Analysis		√		
PLO3: Design and Development of Solution				
PLO4: Investigation				
PLO5: Modern Tool Usage				
PLO6: The Engineer and Society				
PLO7: Environment and Sustainability				
PLO8: Ethics				
PLO9: Individual and Team Work				

PLO10: Communication				
PLO11: Project Management				
PLO12: Life Long Learning				