**DS804 MODELING WITH STRUCTURAL AND DIFFERENTIAL EQUATIONS 3-0-0-3**

Unit-I: First-order differential equations

Direction fields, existence and uniqueness of solution, numerical methods for first-order differential equations, solution of linear equations with integrating factors, complex exponentials; sinusoidal functions, linear system response to exponential and sinusoidal input: gain, phase lag; autonomous equations.

Unit-II: Second-order linear differential equations

Modes and the characteristic polynomial, damping conditions, exponential response formula, complex gain, operators, undetermined coefficients, resonance, frequency response, LTI systems, superposition, RLC circuits.

Unit-III: Structural equation models

Factor analysis, path analysis, structural equations, causality and equivalent models, latent class regression, analysis of panel data with observed and latent variable models, item-response models, Rasch models.

**Text Books/ References:**


1. R. Kline, “Principles and Practice of Structural Equation Modeling”, Guilford Press, 2016.
2. W. Boyce and R. DiPrima, "Elementary Differential Equations and Boundary Value Problems", Wiley, 10th Edition, 2012.