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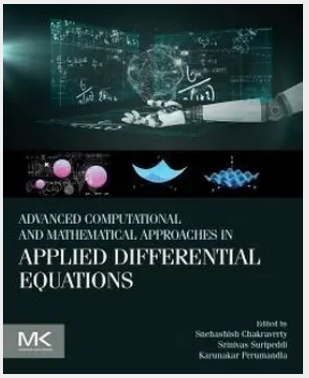
Advanced Computational and Mathematical Approaches in Applied Differential Equations



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Advanced Computational and Mathematical Approaches in Applied Differential Equations explores cutting-edge techniques and methodologies in solving complex differential equations, a cornerstone of mathematical modeling across science and engineering. The book bridges theory and application, offering advanced computational strategies and innovative mathematical insights to address real-world problems. Beginning with an overview that presents a unified framework that defines the types of differential equations covered (e.g. ordinary, partial, fractional, fuzzy), the book then progresses to foundations and methods such as Lie symmetries, homotropy, Adomian, FEM, FDM, spectral, machine learning, fuzzy, and fractional derivatives, addressing both computational and mathematical dimensions. Differential equations are fundamental to modeling complex systems, yet solving them often involves significant challenges due to their complexity and nonlinearity. The book equips readers with advanced tools and methodologies to overcome these challenges, providing innovative solutions that improve accuracy, efficiency, and applicability in real-world scenarios. Ideal for researchers, practitioners, and advanced students, it provides a comprehensive resource for tackling challenging applied differential equations with better precision and efficiency.

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