



mathematics



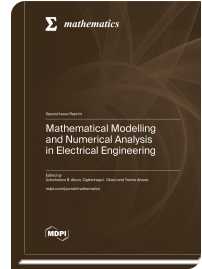
Special Issue Reprint

Mathematical Modelling and Numerical Analysis in Electrical Engineering

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This special issue focuses on the mathematical modelling and numerical analysis methods employed in electrical engineering applications. The 11 manuscripts included utilize various analytical and computational techniques such as parameter modelling methods and numerical analyses to solve engineering problems in domains such as electric motors, power systems. One of these papers investigates line-start permanent magnet synchronous motors and explores the starting performance when parameters such as the supply voltage and cable length are varied; in addition, simulation and experimental methods are employed to characterize the motor behavior. Another study employs the finite element modelling technique to study the electric field distributions for lightning rod design. Additionally, optimization techniques such as the Nelder–Mead algorithm are applied to optimize a synchronous homopolar motor. Mathematical and numerical analyses of the induction and flux-switching motors are also presented. Transient simulations of the starting and synchronization processes, which incorporate the lumped parameter motor models of a line-start permanent magnet synchronous motor, are also undertaken. Other studies employ accurate models that have been developed for adjustable permanent magnet couplers, external magnetic fields and switched reluctance motors. Validation using finite element analyses and experiments demonstrates the feasibility and superiority of the proposed modelling approaches. The broad range of topics addressed reflects the extensive application of analytical techniques in electrical engineering research.



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