With 90% of visible matter in the Universe existing in the plasma state, an understanding of magnetohydrodynamics is essential for anyone looking to understand solar and astrophysical processes, from stars to accretion discs and galaxies; as well as laboratory applications focused on harnessing controlled fusion energy.

This introduction to magnetohydrodynamics brings together the theory of plasma behavior with advanced topics including the applications of plasma physics to thermonuclear fusion and plasma-astrophysics. Topics covered include streaming and toroidal plasmas, nonlinear dynamics, modern computational techniques, incompressible plasma turbulence and extreme transonic and relativistic plasma flows. The numerical techniques needed to apply magnetohydrodynamics are explained, allowing the reader to move from theory to application and exploit the latest algorithmic advances. Bringing together two previous volumes: Principles of Magnetohydrodynamics and Advanced Magnetohydrodynamics, and completely updated with new examples, insights and applications, this volume constitutes a comprehensive reference for students and researchers interested in plasma physics, astrophysics and thermonuclear fusion.

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MAGNETOHYDRODYNAMICS
of Laboratory and Astrophysical Plasmas

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