UNITEXT for Physics

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Astrophysics of the Interstellar Medium

This book is based on a series of lectures for an Astrophysics of the Interstellar Medium (ISM) master's degree in Astrophysics and Cosmology at Padova University.

From the cold molecular phase in which stars and planetary systems form, to the very hot coronal gas that surrounds galaxies and galaxy clusters, the ISM is everywhere. Studying its properties is vital for the exploration of virtually any field in astronomy and cosmology. These notes give the student a coherent and accurate mathematical and physical approach, with continuous references to the real ISM in galaxies.

The book is divided into three parts. Part One introduces the equations of fluid dynamics for a system at rest and acoustic waves, and then explores the real ISM through the role of thermal conduction and viscosity, concluding with a discussion of shock waves and turbulence. In Part Two, the electromagnetic field is switched on and its role in modulating shock waves and contrasting gravity is studied. Part Three describes dust and its properties, followed by the main stellar sources of energy. The last two chapters respectively address the various components of the ISM and molecular clouds and star formation.

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