



EPFL



My name is Ambrogio Fasoli and I would like to introduce to you our new course on plasma physics and applications. I'm a professor of physics at the Swiss Federal Institute of Technology and I have the privilege of directing the Center for Research of Plasma Physics from where all instructors and assistants for this course come. This course will provide you with the basic knowledge of plasmas and lead you through the application to fusion energy, space and astrophysics. Most of the universe we know about is made of plasma, a state in which nuclei and electrons are set free. and in which electromagnetic forces are dominant. We are surrounded by plasma, starting from the ionosphere a hundred kilometers above us, which is connected to the sun via the plasma of the solar wind. The [inaudible] is a plasma and so are the largest objects that emit x-rays. Our life is energized by plasmas. All stars, in fact, including our sun are made of plasma and operate on the principle of nuclear fusion. Without plasmas and fusion, the Universe as we know it today would not exist. On Earth, natural plasmas are much less frequent but still present. For example, they appear in lightning and auroras.

Notes

Summary

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In addition, many plasmas are man-made. Most technology objects in a room are produced using plasmas. The market of plasma-aided manufacturing is gigantic, on the order of a hundred billion dollars per year. And plasmas are at the core of fusion, a possible solution to one of the most formidable challenges faced by mankind today, that of finding a source of energy that is safe, abundant, available to all, and compatible with sustainable development. Different parts of the course will be discussed by different specialists who will combine formal aspects of plasma physics with cutting-edge illustrations of research topics. In the first part, we will introduce the plasma state and the models to describe it, from single particles to fluid. In the second part, we will illustrate examples of plasma in space and astrophysics and discuss plasma applications in industry and medicine. The third part will be dedicated to fusion energy. We will go from the design of a fusion reactor to plasma confined in configurations of fusion. And finally, to confining, heating and extracting energy from a burning plasma.

Notes

Summary



