INSTITUTO DE FÍSICA
FACULTAD DE FÍSICA

COURSE	:	**ADVANCED TOPICS IN PLASMA PHYSICS**
TRASLATION	:	TÓPICOS AVANZADOS EN FÍSICA DE PLASMAS
NUMBER	:	FIM4013
CREDITS	:	15 UC / 9 SCT
MODULES	:	2 THEORETICAL
REQUISITES	:	FIZ2700
CONECTOR	:	AND
RESTRICTIONS	:	030401, 030501
CHARACTER	:	OPTATIVE
FORMAT	:	THEORICAL LECTURES
QUALIFICATION	:	STANDARD
FORMATIVE LEVEL	:	DOCTORATE
DISCIPLINE	:	PHYSICS

I. COURSE DESCRIPTION

The course presents advanced formal contents for the theoretical description of plasmas, both in the macroscopic framework characterized by the magnetohydrodynamic equations and in the statistical description given by the Kinetic Theory, as well as for the generation and characterization of different types of plasmas.

II. LEARNING OUTCOMES

- Provide the graduate student with advanced theoretical training in Plasma Physics.

III. CONTENT

1. Statistical treatment of a plasma: Vlasov Equation, Boltzmann Equation, Moments of Boltzmann Equation.
2. Macroscopic equations for the description of a plasma: MHD equations, Applicability of MHD equations, Generalized Ohm's law
3. Ideal magnetohydrodynamics: static equilibrium, MHD stability, energy principle, exchange instabilities, Rayleigh-Taylor instability
4. Resistive magnetohydrodynamics: magnetic relaxation and reconnection, resistive instabilities, magnetic field generation, MHD shocks.
5. Non-collisional kinetic theory: Vlasov equation, Landau damping, micro instabilities.
6. Collisional Kinetic Theory: transport coefficients, Fokker-Planck equation.
7. Plasma spectroscopy: equilibrium models (LTE, PLTE, MCE, CRM), Saha equation, ionization energy reduction, emission line profile, Doppler broadening, emission and absorption in lines and bremsstrahlung, Thomson scattering, Stark broaching
8. Laser-generated plasmas: laser gas breakdown, laser-target interaction plasma generation, dynamics of laser-generated plasmas

IV. METHODOLOGICAL STRATEGIES

- Lecture classes.
- Bibliographic research.

V. EVALUATIVE STRATEGIES

- Two interrogations70%.

- Exhibition work 30%.

VI. BIBLIOGRAPHY

Minimum

- Chen F., "Introduction to Plasma Physics and Controlled Fusion" (Third Ed., Springer, 2016).
- Boyd, T.J. and Sanderson, J.J., "The Physics of Plasmas", Cambridge University Press, 2005.
- Smirnov, B.M., "Physics of Ionized Gases", John Wiley & Sons, 2001.
- Gurnett D. A. and Bhattacharjee A., "Introduction to Plasma Physics: With Space, Laboratory and Astrophysical Applications", Cambridge University Press, 2017.
- Moisan M. and Pelletier J., "Physics of Collisional Plasmas", Springer, 2012.
- Miyamoto, K., "Fundamentals of Plasma Physics and Controlled Fusion", NIFS, 2000.
- Echkin V. N., "Spectroscopy of Low Temperature Plasa", Wiley-VHC, 2008.
- Eds. Hipper R., Hersten H., Schmidt M. and Schoembach, "Low Temperature Plasmas", Vols 1 &2, Wiley-VCH, 2008.
- Radziemski L. J. and Cremers D. A. (Eds.), "Lasers-Induced Plasmas and Applications", CRC Press, 1989

Complementary

- Smirnov, B.M., "Physics of Weakly Ionized Gases", Mir, 1981.
- Fridman, A and Kennedy, L.A., "Plasma Physics and Engineering", Taylor & Francis, 2004.
- . Dobrowolny, "Advanced Plasma Physics", e-book, Youcanprint, 2019.

research plasma laser physics physics-simulation plasma-physics vlasov vlasov-solver. Updated Aug 30, 2016.Â Add a description, image, and links to the plasma-physics topic page so that developers can more easily learn about it. Curate this topic. Add this topic to your repo. To associate your repository with the plasma-physics topic, visit your repo's landing page and select "manage topics." Learn more. Â© 2021 GitHub, Inc. This event aims to provide a platform for the exchange of recent results between plasma scientists working on different plasma-related research topics, to stimulate further breakthroughs in fundamental understanding and advances towards new applications in this fascinating field of research. In partnership with the leading publishing house Nature Research and the editors of high-profile journals Nature Physics, Nature Communications and Nature Reviews Physics we invited the most important researchers from different plasma-related topics to give their speeches at the conference. The participant...Â Share. AAPP 2019. Advances and Applications in Plasma Physics. 18-20 September 2019. Lecture Notes in Physics Introduction to Plasma Physics. Michael Gedalin. ii.Â Waves are the heart of plasma physics. There is nothing which plays a more important role in plasma life than waves, small or large amplitude ones. The rest of this chapter is devoted to the description of the wave properties of plasmas within the MHD approximation.Â This will be considered in an advanced section below. Let ei(k) be the unit vector corresponding to the wave with the wave vector k. It is called a polarization vector. The electric eld corresponding to this wave can be written as Ei = a(k)ei(k), where a is the amplitude. An Introduction to Plasma Physics and its Space Applications. Dr. L. Conde Department of Applied Physics. ETS Ingenieros AeronÃ¡uticos Universidad PolitÃ©cnica de Madrid.Â Only longitudes L > Î»D over the Debye length are usually considered in Plasma Physics because for distances below L < Î»D the electric elds are local, very variable and they are regarded as microscopic. By other hand, the damping of the charge uctuations takes place during a time scale Ï„pe which denes the electron plasma frequency fpe = 1/Ï„pe.