UNIVERSITATEA BABEŞ-BOLYAI
TRADIȚIE ȘI EXCELENȚĂ
FACULTATEA DE FIZICĂ
Str. M. Kogălniceanu nr. 1
Cluj-Napoca, RO-400084
Tel.: 0264-405300/ Fax: 0264-591906
secretariat.phys@phys.ubbcluj.ro
www.phys.ubbcluj.ro

Announcement ERASMUS+, Incoming teaching staff

Professor Istvan Ballay from University of Sheffield, School of Mathematics and Statistics UK, will be our ERASMUS+ visiting professor and will deliver lectures in the period 13.05 -23.05.2019.

Teaching Programme/ Schedule

Time: Place:	
15.05: 14-16 **5/II**	**1. Magnetohydrodynamic (MHD) waves and oscillations: Theory and Observations**
14.05: 16-18 **243**	**2. The theory of linear guided MHD waves**
15.05: 16-18 **5/II**	**3. Remote seismology of space plasmas**
18.05:10-12 **Cabinet Fizica Teoretica**	**4. Waves and instabilities in partially ionised plasmas**

Details:

1. Fundamental equations of Magnetohydrodynamics (MHD), waves and oscillations: Theory and Observations

Abstract: Recent satellite observations revealed that space plasmas are dynamic; waves and oscillations have been observed in almost all regions of the solar atmosphere and interplanetary space. Their presence has a very important implication for the dynamics, heating and stability of solar and space plasmas. Waves are also successfully used to diagnose magnetic fields and the plasma using seismological methods, similar to the methods used in Earth's seismology.

Plasmas can be considered as magnetic fluids that exhibit collective motion. In this lecture I will introduce the concept of a plasma and I will speak about the system of equations that describe the dynamical state of the plasma. Next, I will give an introduction into the theory of MHD waves highlighting the limitations and possibilities of the formalism, as well as an overview of the current state-of-the-art in observation of waves and oscillations in solar plasmas.

Str. M. Kogălniceanu nr. 1
Cluj-Napoca, RO-400084
Tel.: 0264-405300/ Fax: 0264-591906
secretariat.phys@phys.ubbcluj.ro
www.phys.ubbcluj.ro

2. The theory of linear guided MHD waves

Abstract: Magnetic fields are perfect channels for wave propagation. Observations show that magnetic fields lines can support a rich variety of waves. Once these waves are "forced" to propagate in such waveguides they become dispersive. In this lecture I will introduce the concept of guided waves within the context of plasma physics, and discuss the properties of waves at tangential and contact discontinuities. For particular relative values of characteristic speeds I will present dispersion curves of waves propagating in various solar plasma environments. In this lecture I will also tackle the problem of wave propagation in inhomogeneous plasmas, with special attention paid to the properties of waves propagating in the presence of longitudinal and transversal inhomogeneities.

3. Remote seismology of space plasmas

Abstract: Waves and oscillations observed in space plasmas are suitable for performing remote seismology (diagnostics) since they carry information about the medium in which they propagate. Combining observable parameters (amplitude, wavelength, damping times and lengths) to theoretical models allows us to determine physical quantities that cannot be measured (magnetic field, density and density structuring, sub-resolution structure of magnetic waveguides, etc.). In my presentation I will introduce fundamental concepts about seismology, data inversion and show –through a few realistic examples- how powerful this method is for remote diagnostics.

4. Waves and instabilities in partially ionised plasmas:

Abstract: This lecture will deal with the introduction of key ideas about partially ionised plasmas in continuous media, a topic that is rather challenging from both mathematical and physical point of view. I will speak about the properties of multi-fluid approaches as well about the role of collisions in such media. The theoretical model will be then applied to study the propagation of waves in plasmas where the temperatures are not high enough to ensure a full ionisation state. I will present a possible application of this topic in the theory of stability and discuss the role of ionisation degree on the stability of plasmas in single and two-fluid framework. Finally, I will focus on the effects of neutral atoms on the structure of shock waves propagating in partially ionised plasmas.

Erasmus Coordinator,

Assoc. prof. S. Cinta Pinzaru