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| <b>Study programmes:</b> PhD Studies - Astronomy and Astrophysics  |                    |                     |               |
| <b>Course name:</b> Magnetohydrodynamics   |                    |                     |               |
| <b>Lecturers:</b> Dejan Urošević   |                    |                     |               |
| <b>Status:</b> Optional  |                    |                     |               |
| <b>ECTS:</b> 9   |                    |                     |               |
| <b>Attendance prerequisites:</b> None  |                    |                     |               |
| <b>Course aims:</b> Attaining of advanced knowledge connected to theoretical studying of the magnetohydrodynamics (MHD).   |                    |                     |               |
| <b>Course outcome:</b> At the end of the course, student has skills to work on some research topics in propagation of disturbances through the neutral and ionized medium. The magnetohydrodynamics method has abroad applicability in theoretical description of stellar plasmas, interstellar and intergalactic matter.  |                    |                     |               |
| <b>Course content:</b><br>Integral forms of equations of motion. Electromagnetic equations. Equations of dynamics. Constitutive equations. General equations of fluid motion. Shock equations (jump conditions). Electromagnetic shock equations. Mechanical shock equations. Propagation of small disturbances. Analysis of Cauchy problem. Determination of wave propagation velocity. Propagation of weak shocks. General theory of simple waves. Riemann invariants. Simple waves in MHD. Geometrical properties of shock waves. Energy equation of shock waves. Thermodynamic properties.                                 |                    |                     |               |
| <b>Literature:</b><br>1. Cabbanes, H.: 1970, <i>Theoretical Magneto-fluid-dynamics</i> , Academic Press, New York and London<br>2. Jeffrey, A.: 1966, <i>Magnetohydrodynamics</i> , University Mathematical Texts, Oliver and Boyd LTD.<br>3. Lequeux, J., Falgarone, E. & Ryter, C.: 2004, <i>The Interstellar Medium</i> , Springer.<br>4. Shu, F.H.: 1992, <i>The Physics of Astrophysics, Vol. II, Gas Dynamics</i> , University Science Books, Mill Valley, California.<br><br>Exercises: Shu, F.H.: 1992, <i>The Physics of Astrophysics, Vol. II, Gas Dynamics</i> , University Science Books, Mill Valley, California. |                    |                     |               |
| <b>Number of hours: 10</b>   | <b>Lectures: 4</b> | <b>Tutorials: 6</b> |               |
| <b>Teaching and learning methods:</b><br>Ex cathedra, group work, student research   |                    |                     |               |
| <b>Assessment (maximal 100 points)</b>   |                    |                     |               |
| <b>Course assignments</b>  | <b>points</b>      | <b>Final exam</b>   | <b>points</b> |
| Lectures   | 20                 | Written exam        | -             |
| Exercises / Tutorials  | 20                 | Oral exam           | 60            |
| Colloquia  | -                  | Written-oral exam   | -             |
| Essay / Project  | -                  |                     |               |