Course: Hyperbolic partial differential equations

Course instructors: Marko Nedeljkov

Course type: elective

Credit points ECTS: 12

Prerequisites: Linear partial differential equations

Course objectives:
Dealing with different types of hyperbolic equations

Learning outcomes:
Students will have knowledge that enables research work with hyperbolic equations and systems, as well as the applications in other scientific fields.

Course description (outline):
Theoretical classes
Part A. Linear equations and systems: Notions of hyperbolicity, well-posedness of the Cauchy problem, distributional solutions, methods from semigroups of operators; examples from physics and geophysics. Part B. Nonlinear equations and conservation laws: Characteristics, weak solutions, entropy con- ditions, methods from nonlinear semigroups; examples from physics and geophysics.

References:

1. F. Treves, Basic linear partial differential equations, Academic Press 1975.
2. L. Hörmander, The analysis of linear partial differential operators, volume II, Springer 1983.
3. A. Pazy, Semigroups of linear operators and applications to partial differential equations, Springer 1983.
4. S. Benzoni-Gavage and D. Serre, Multi-Dimensional Hyperbolic Partial Differential Equations: First-Order Systems and Applications, Oxford Uni Press 2007.
5. L. C. Evans, Partial differential equations, Amer. Math. Soc., 2nd edition 2010.
6. V. Barbu, Nonlinear differential equations of monotone types in Banach spaces, Springer 2010.
7. C. M. Dafermos, Hyperbolic conservation laws in continuum physics, Springer, 4th edition 2016.

Active teaching hours: 5	Theoretical classes: 5	Practice classes:

Methods of teaching:
Lectures and independent work of students

Grading structure (100 points)
50 Colloquia, 50 Exam