

## COURSE DESCRIPTION

Course name	Conservation laws
Course type	reading course (wrd)
Supervisor	Tomasz Cieslak
ECTS credit allocation	4 – IM PAN Ph. D. program; 6 - recommended for MA programs
Duration	One semester
Number of hours	60
Language	English or Polish, if every participant speaks Polish
Prerequisites	Course on ODEs and Functional Analysis
Course content	<ol style="list-style-type: none"> <li>1. Burgers equation, gradient catastrophe</li> <li>2. Oleinik-Lax formula and uniqueness of weak solutions to one conservation law in space-dimension one.</li> <li>3. Entropy solutions, Kruzhkov's uniqueness theorem.</li> <li>4. Lax's theorem on unique solvability of the local Riemann problem</li> <li>5. Riemann invariants</li> <li>6. Numerical scheme's approximations of solutions</li> <li>7. Glimm's scheme</li> <li>8. Bressan's estimates and uniqueness of solutions to conservation laws in 1 space dimension</li> <li>9. Examples of non-uniqueness in higher-dimensional domains.</li> </ol>
Recommended reading	<p>H.Holden, N.H. Risebro, „Front tracking for hyperbolic conservation laws.”, 2002</p> <p>P.Lax, „Hyperbolic partial differential equations.”, 2006</p>
Learning outcomes	Knowledge of basic theory and recent developments in conservation laws. Ability to start research projects in this subject.
Assessment methods and criteria	Lists of exercises and exam
Remarks	