Introduction to Hyperbolic Conservation Laws

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Timetable: 16hrs. March-April 2019, Torre Archimede, Room 2BC/30.

Course requirements:

Examination and grading:

SSD: MAT/05

Aim:

Course contents:

The course aims at introducing the student to:

- Fundamental features of hyperbolic evolution equations in the form of conservation laws, mostly focusing on the one space variable setting. Examples date back to Euler (1755) for describing gas dynamics, and now arise in several other fields like relativity, traffic flow, blood flow, supply-chains.

- Topics in recent research on control, networks and vanishing viscosity techniques for this class of first order Partial Differential Equations.

The course shall be of particular interest for students in Mathematica Analysis, Mathematical Physics, Numerical Analysis, especially if interested in fluid models, control problems or network structures.

Part 1: Introduction to the general theory on systems of hyperbolic conservation laws.

Part 2: To be chosen among

1. Lyapunov-type functionals for stability and control of the Cauchy problem
2. Analysis of conservation laws on networks
3. Vanishing viscosity approximation
4. Relative entropy methods for hyperbolic and hyperbolic-parabolic systems

References:

- C.M.Dafermos, Hyperbolic Conservation Laws in Continuum Physics, Fourth ed. Springer Verlag.