Summer Semester 2020.

V4B2: Nonlinear Partial Differential Equations II

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Exercices: Richard Höfer and Tania Pernas Castaño.

Outline: The goal of this course is to study the theory of hyperbolic equations as well as some basic results of the theory of dispersive equations. The course will cover first the theory of nonlinear first order equations. In particular topics like the Hamilton-Jacobi equation and first order conservation laws will be covered, including the proof of existence and uniqueness results for these classes of equations. The theory of systems of conservation laws will be studied, including a detailed analysis of shock waves, rarefaction waves and the solution of the Riemann problem. The theory of local well posedness of strong solutions of wave equations will be also discussed. Finally topics like the well posedness of semilinear Schrödinger equations will be also studied.

Prerequisites: Analysis and the theory of basic linear partial differential equations (Laplace, heat and wave equations).

Bibliography:

L. C. Evans, Partial Differential Equations. American Mathematical Society, 1991.

J. Smoller, Shock waves and Reaction-Diffusion Equations. Springer-Verlag, 1982.

G. B. Whitham, Linear and Nonlinear Waves. John Wiley&Sons, 1974.