Ordinary Differential Equations 2 0366-2104-01

Tentative Syllabus

- Comparison theorems for the first-order differential equations.
- Comparison theorems for the second-order linear differential equations. Phase plane. Theorems by Sturm on zeros of the solutions.
- Abel-Liouville theorem and its application
- Solution of differential equations by means of power series. Local evaluation of the solutions.
- Euler differential equations. Singular points of linear differential equation. Regular singular points.
- Frobenius method of solving differential equations by means of power series in vicinity of a regular singular point. Bessel functions, their asymptotics and zeros.
- Boundary value problem. Its standard form.
- Green function for non-homogeneous regular boundary value problems
- Self-adjoint boundary-value problems. Sturm-Liouville problem. Systems of eugenfunctions , their eugenvalues. Ortogonality and completeness.
- Fourier series of eigenfunctions, solution of non-homogeneous boundary-value problems.
- Critical points of differential equations. Classification of critical points in $\mathbf{R}^2$ and $\mathbf{R}^3$.
- Lyapunov stability of a critical point. Asymptotic stability.
- Lyapunov function. Theorems on stability and instability.
- Construction of a Lyapunov function for linear autonomous systems. Solution evaluation of disturbed stable systems.
- Stability of a critical point according to the linear approximation of the equation. Linearization.
- Newton equation and its first integral (energy).
- Periodic solutions (cycles) in the plane.

The syllabus is subject to change without preliminary announcement.