Introduction to Linear Differential Equations
in the Complex Domain and Isomonodromic Deformations

about 30 hours
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The aim of the course is to provide basic notions about linear systems of
differential equations in the complex domain, monodromy data, isomon-
odromy deformations. These notions play an important role in modern
mathematical physics, for example in integrable systems.

– Existence and uniqueness theorems in the complex domain.
– Linear systems
– Singularities and monodromy
– Classification of isolated singularities of linear systems (first and second
  kind).
– Linear systems with singularities of first kind (Fuchsian systems). Re-
duction to Birkhoff normal form.
– Linear equations of order $n$. Riemann and Gauss equations.
– Review of Poincaré asymptotics.
– Linear Systems with singularities of the second kind.
Stokes phenomenon (some examples, such as the Bessel equation).
– Global description. Monodromy data.
– Linear systems depending on parameters.

Prerequisites: Complex analysis, theory of analytic functions in one
complex variable (see Reference 4. below).

Basic References
1. W. Wasow: Asymptotic Expansions for Ordinary Differential Equa-
tions.

3. E.L. Ince: *Ordinary Differential Equations*

4. V.I. Smirnov: *A course of higher mathematics. Vol. 3. Part 2: complex variables, special functions*


