

MATH2560J, Honors Linear Algebra & Differential Equation

Teaching Assistant in Fall 2021, Advisor: [Prof. Olga Danilkina](#)

Instructors:

OLGA DANILKINA;Jing Liu;Runze Cai

Credits: 4 credits. No credits are counted towards graduation for those who have completed Vv286

Pre-requisites: MATH2550J Obtained Credit||MATH2850J Obtained Credit

Description:

Topics include mathematical models and single first-order ODEs (separable, linear, homogeneous, Bernoulli, Riccati, exact), intervals of existence and autonomous equations; implicit first order ODEs and singular solutions; normed linear spaces and elements of linear algebra (systems of linear equations, eigenvalue problem, diagonalization); normal systems of ODEs, proof of the existence theorem, higher-order ODEs, linear homogeneous equations with constant coefficients, vibrations; linear systems of ODEs with constant coefficients; Bessel's equation and series solutions; the Laplace transform; inner product and orthogonality, real and exponential Fourier trigonometric series; boundary-value problems for PDEs, Sturm-Liouville eigenvalue problems; autonomous Systems of ODEs; phase portraits and stability

Course Topics:

- Mathematical models and single first-order ODEs (separable, linear, homogeneous, Bernoulli, Riccati, exact), intervals of existence and autonomous equations (8 hrs at 45 min each)
- Implicit first order ODEs and singular solutions. (4 hours)
- Normed linear spaces and elements of linear algebra (systems of linear equations, eigenvalue problem, diagonalization) (4 hours)
- Normal systems of ODEs, proof of the existence theorem, higher-order ODEs, linear homogeneous equations with constant coefficients, vibrations (10 hours)
- Linear systems of ODEs with constant coefficients (4 hours)
- Bessel's equation. Series solutions. (4 hours)
- The Laplace transform (4 hrs)
- Inner product and orthogonality, real and exponential Fourier trigonometric series. (4 hours)
- Boundary-value problems for PDEs, Sturm-Liouville eigenvalue problems. (6 hours)
- Autonomous Systems of ODEs. Phase portraits. Stability. (6 hours), Three exams (6 hrs)