



Master's program Entrance examination topics

Mathematics

1. Real numbers. Complex numbers. Sequences of numbers.
2. Functions of real variable. Derivative. Taylor's polynomial.
3. Riemann integral. Fundamental theorem of calculus. Newton-Leibniz's formula.
4. Linear differential equations. Linear systems.
5. Power series expansion. Taylor series. Fourier series.
6. Functions of more variables. Gradient and Hesse matrix. Local extremal values.
7. Multiple integrals. Change of variables in multiple integrals.
8. The Fourier integral. Inverse Fourier transform. Time- and frequency domain descriptions.
9. Vector spaces. Linearly Independent Sets, Bases. Coordinate Systems. Dimension
10. Vector algebra. 2d and 3d Vectors: Inner Product, Cross-Product, Mixed Product.
11. Matrix Operations: addition, multiplication, transpose. Inverse of a Matrix.
12. Vector Equations of a linear system of equations. The Matrix Equation $Ax = b$
13. Determinants. Applications: Area, Volume and Determinants.
14. Linear maps. Kernel, Image, Dimension formula. Eigenvalues, Eigenvectors.
15. Relations. Equivalence Relations, Partitions. Order Relations, Maximal/Minimal elements.
16. Representing Graphs, Graph Isomorphism. Euler and Hamilton Circles. Trees.
17. Propositional calculus. Basic and derived argument forms.

Recommended literature:

- R. Courant – F. John: *Introduction to Calculus and Analysis I-II*. Springer.
D. C. Lay: *Linear Algebra and Its Applications*. University of Maryland, Pearson.
K. H. Rosen: *Discrete Mathematics with Applications*. Mcgraw Hill.
J. Stewart: *Calculus*. ISBN-13: 978-1285740621
Vágó Zsuzsanna: *Matematikai Analízis 1., II.* (in Hungarian)