אוניברסיטת
בן-גוריון בנגב

The Department of Mathematics

2022—23—A term

Course Name Linear Algebra ME

Course Number 214.1.9321

Course web page
`https://www.math.bgu.ac.il//en/teaching/fall2023/courses/linear-algebra-me`

Lecturer Prof. Nadya Gurevich, <ngur@bgu.ac.il>, Office 110

Office Hours `https://www.math.bgu.ac.il/en/teaching/hours`

Abstract

Requirements and grading[1]

Course topics

.1 The real numbers, inequalities in real numbers, the complex numbers, the Cartesian representation, the polar representation, the exponential representation, the Theorem of de Moivre, root computations.

.2 Systems of linear equations over the real or complex numbers, the solution set and its parametric representation, echelon form and the reduced echelon form of a matrix, backwards substitution, forward substitution and their complexity, the Gauss elimination algorithm and its complexity, the reduction algorithm and its complexity.

.3 Vector spaces, sub-spaces of vector spaces, linear combinations of vectors, the span of a set of vectors, linear dependence and linear independence, the dimension of a vector space, row spaces and column spaces of matrices, the rank of a matrix.

.4 Linear mappings between vector spaces, invertible mappings and isomorphisms, the matrix representation of finite dimensional linear mappings, inversion of a square matrix, composition of mappings, multiplication of

[1] Information may change during the first two weeks of the term. Please consult the webpage for updates

matrices, the algebra of matrices, the kernel and the image of a linear mapping and the computation of bases, changing of a basis, the dimension theorem for linear mappings.

.5 Inner product spaces, orthogonality, the norm of a vector, orthonormal sets of vectors, the Cauchy-Schwarz inequality, the orthogonal complement of a sub-space, orthogonal sequences of vectors, the Gram-Schmidt algorithm, orthogonal transformations and orthogonal matrices.

.6 The determinant of a square matrix, minors and cofactors, Laplace expansions of the determinant, the adjoint matrix and Laplace theorem, conjugation of a square matrix, similarity transformations and their invariants (the determinant and the trace).

.7 Eigenvalues, eigenvectors, eigenspaces, diagonalization and similarity, the characteristic polynomial, the algebraic and the geometric multiplicities of an eigenvalue, the spectral theorem for Hermitian matrices.