

The Department of Mathematics

2017–18–B term

Course Name Algebra 2 for CS

Course Number 201.1.7021

Course web page

<https://math.bgu.ac.il/en/teaching/spring2018/courses/algebra-2>

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Office Hours <https://math.bgu.ac.il/en/teaching/hours>

Abstract

Requirements and grading¹

1. Polynomials, algebras and ideals, the algebra of polynomials and its ideal structure, Lagrange interpolation, the prime factorization of a polynomial.
2. Elementary canonical forms, characteristic values and vectors of linear transformations and matrices, characteristic polynomials and annihilating polynomials, invariant subspaces, direct sum decompositions, invariant direct sums, the primary decomposition theorem, diagonalization: necessary and sufficient conditions for diagonalization, computing diagonalizing matrices.
3. Inner product spaces, inner products, inner product spaces, linear functionals and adjoints, unitary operators, Hermitian operators, normal operators and the spectral decomposition theorem, singular value decomposition theorem and applications.
4. Jordan forms (optional), cyclic subspaces and annihilators, cyclic decomposition, the Jordan form and its computation.

Course topics

- Rings. Ring of polynomials and its ideal structure. The prime factorization of a polynomial. Lagrange interpolation.
- Eigenvalues and eigenvectors of linear operators. Characteristic polynomial and Cayley–Hamilton theorem. The primary decomposition theorem.

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



Diagonalization. Nilpotent operators. Jordan decomposition in small dimension. Jordan decomposition in general dimension- time permitting.

- Linear forms. Dual basis. Bilinear forms. Inner product spaces. Orthogonal bases. Projections. Adjoint linear transformation. Unitary and Hermitian operators. Normal operators and the spectral decomposition theorem. Singular value decomposition theorem and applications.

Optional topics:

- Quadratic forms.
- Sylvester theorem.
- Classification of quadrics in two-dimensional spaces.