

The Department of Mathematics

2017–18–B term

Course Name Algebra 2 for CS

Course Number 201.1.7021

Course web page

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

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

Abstract

Requirements and grading¹

1. Polynomialsalgebras and idealsthe algebra of polynomials and its ideal sturcture-Lagrange interpolationthe prime factorization of a polynomial.2. Elementary canonical forms characteristic values and vectors of linear transformations and matrices.characteristic polynomials and annihilating polynomialsinvariant subspaces.direct sum decompostions .invariant direct sums.the primary decomposition theorem.diagonalization:necessary and sufficient conditions for diagonilaztion, computing diagonalizing matrices.3. Inner product spacesinner productsinner product spaces linear functionals and adjointsunitary operatorsHermitian operatorsnormal operators and the spectral decomposition theoremsingular value decomposition theorem and applications4. Jordan forms (optional)cyclic subspaces and annihilatorscyclic decompostionsthe Jordan form and its computation

Course topics

- Rings. Ring of polynomials and its ideal structure. The prime factorization of a polynomial. Lagrange interpolation.

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



- Eigenvalues and eigenvectors of linear operators. Characteristic polynomial and Cayley–Hamilton theorem. The primary decomposition theorem. 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.