

Topics (Estimated Schedule)

1. *Week 1:*
 - Gauss-Jordan elimination;
 - Matrices (addition, product, scalar multiplication);
 - The inverse of a matrix;
 - Permutations;
 - Determinants (definition, properties, computations).
2. *Week 2:*
 - Computing the inverse of a matrix;
 - Cramer's theorem and rule (how to solve $Ax = b$, when $\det A \neq 0$);
 - The rank of a matrix (definition and computations);
 - Theorem about the existence of solutions for system $Ax = b$;
 - Linear spaces; linear subspaces;
 - Linear transformations; kernel and image.
3. *Week 3:*
 - Basis and dimension of a linear space;
 - The rank-nullity theorem;
 - The change of basis matrix;
 - The matrix associated to a linear transformation;
 - The dimension of the space of solutions of a linear homogeneous system of equations;
 - Computing Im and Ker.
4. *Week 4:*
 - Inner product spaces;
 - The Cauchy-Schwarz inequality;
 - Orthonormal basis;
 - The Gram-Schmidt Process;
5. *Week 5:*
 - Orthogonal matrices and orthogonal transformations;
 - The orthogonal complement and the projection map;
 - Eigenvalues, eigenvectors, eigenspaces;
 - Diagonalization;
6. *Week 6:*
 - Linear algebra over \mathbb{C} ;
 - Final review.