

# COM 5993 Mathematical Methods for Communications

## Syllabus

The aim of this course is to introduce useful and practical tools for the study of communication theory, error-correcting codes, and convex optimization. We will particularly focus on techniques in linear algebra. The basic topics we cover are listed as follows.

1. Positive-definite/semidefinite Matrices. Quadratic Forms
2. Eigendecomposition and its Applications (Karhunen-Loève Expansion)
3. Linear Systems and Decompositions (LU, LDM, Cholesky Factorization)
4. Least Squares, Orthogonal Projections, Singular Value Decomposition.
5. QR and Householder Decomposition
6. Kronecker Product
7. Matrix of Finite Field Elements. Cyclic Codes.

We may cover the above topics out of order depending on the topics. In addition to these topics, we may also include some important topics at the end of the semester such as (not limited to) the following topics.

- Dual Spaces
- Canonical Forms