Introduction to real vectors and matrices

- Definition of a vector, geometric representation of vectors
- Basic operations on vectors and concepts, e.g. addition, multiplication by a scalar, dot product, vector norm, etc.
- Definition of a matrix.
- Binary operations on matrices (addition, multiplication, multiplication by a scalar) and their properties. Applications.
- Unary operations on matrices such as finding transpose, trace, determinant, inverse. Applications.

Linear equations

- Nature of solutions to linear equations
- Systematic approaches of finding solutions to linear equations, e.g. row reduced echelon form method, Cramer’s rule, etc.
- Application of systems of linear equations.

Linear transformations and inverses

- Inverse of a linear transformation.
- Matrix representation of linear transformations.
- Geometric interpretation

Characteristic value problem

- Problem statement
- Finding eigenvalues and eigenvectors

Discrete dynamical systems

- Examples of discrete dynamical systems
- State space representation. Finding solution to the initial value problem
- Higher order difference equations.