Lecturer: Paschalis Karageorgis (pete@maths.tcd.ie).
Web page: http://www.maths.tcd.ie/~pete/ma1212
Homework: Assignments will be posted online each Thursday and they will be due a week later. No late homework will be accepted.
Tutorials: Starting with the second week of classes, we will be having a tutorial instead of a lecture every other Tuesday.
Reading: Brief lecture notes will be posted online. If you need some additional references, then you may always consult
- Algebra by Michael Artin,
- Matrix theory: a second course by James Ortega,
- Elementary linear algebra with applications by Anton and Rorres.
Marking policy: 80% annual exam and 20% homework. The exam problems will be similar to the homework and tutorial problems.
Module structure: We will be studying three main topics, namely diagonalisation, Jordan forms and bilinear forms.
The main concepts to be introduced in this module are the following.

1 **Diagonalisation**: recursive relations, diagonalisable, eigenvalues, eigenvectors, characteristic polynomial, null space, nullity.

2 **Jordan forms**: generalised eigenvectors, column space, rank, direct sum, invariant subspace, Jordan chain, Jordan block, Jordan form, Jordan basis, similar matrices, minimal polynomial.

3 **Bilinear forms**: bilinear form, matrix of a bilinear form, positive definite, symmetric, inner product, orthogonal/orthonormal basis, orthogonal matrix, quadratic form, signature, Sylvester’s criterion.
On successful completion of this module, students will be able to:

- find an explicit basis for the null space of a given matrix;
- solve linear recursive relations involving two or more terms;
- apply standard techniques to obtain the Jordan form and a Jordan basis for a given complex square matrix;
- compute the matrix of a bilinear form with respect to a given basis;
- apply various methods (completing the square, Sylvester’s criterion, eigenvalues) to find the signature of a symmetric bilinear form;
- combine various results established in the module to either prove or disprove statements involving concepts introduced in the module.