MA1111 – General information

- **Lecturer:** Paschalis Karageorgis (pete@maths.tcd.ie).
- **Web page:** http://www.maths.tcd.ie/∼pete/ma1111
- **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,
  - *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 four topics: basic concepts, square matrices, vector spaces and linear transformations.

MA1111 – Main concepts

The main concepts to be introduced in this module are the following.

1. **Basic concepts:** vectors, lines and planes, dot and cross product, linear systems, elementary row operations, pivots, row reduction, reduced row echelon form, matrix multiplication.
2. **Square matrices:** invertibility, elementary matrix, determinant, expansion by minors, cofactors, adjoint matrix, permutations.
3. **Vector spaces:** linear combinations, linear independence, span, completeness, basis and dimension, subspace, null space, column space, vector space, subspace, coordinate vectors.
4. **Linear transformations:** kernel and image, dimension formula, injective, surjective, matrix of a linear transformation, similarity.

MA1111 – Learning outcomes

On successful completion of this module, students will be able to:

- operate with vectors in $\mathbb{R}^n$ and solve basic geometric problems;
- apply standard techniques (row reduction and inverse matrices) to solve systems of linear equations in any number of variables;
- compute the sign of a given permutation and apply known results to compute the determinant of a square matrix;
- demonstrate that a given set of vectors forms a basis of a vector space, compute coordinate vectors in terms of a given basis and find the matrix of a linear transformation with respect to a given basis;
- combine various results established in the module to either prove or disprove statements involving concepts introduced in the module.