1203 (Algebra for Joint Honours Students)

Year:	2014–2015
Code:	MATH1203
Level:	First
Value:	Half unit (= 7.5 ECTS credits)
Term:	2
Structure:	3 hour lectures and 1 hour problem class per week. Weekly assessed coursework.
Assessment:	The final weighted mark for the module is given by: 90% examination, 10% coursework. In order to pass the module you must have at least 40% in both the examination and the final weighted mark.
Normal Pre-requisites:	A in A-level Mathematics
Lecturer:	Mr J Evans
Problem class teacher:	Mr R Sánchez Galán

Course Description and Objectives

The course introduces the two main foundations of modern algebra: group theory and linear algebra. Groups consist of a set and an operation which combines members of the set. The objects in the set may be numbers, transformations, functions, matrices, etc. Groups appear everywhere in mathematics, physics, and chemistry. Linear algebra deals with simultaneous linear equations, matrices, and (more generally) linear transformations. The properties of matrices and vector spaces will be examined in detail.

Recommended Texts

(i) *Guide to Linear Algebra*, by David Towers, published by MacMillan.

(ii) *A First Course in Abstract Algebra*, by John B. Fraleigh, published by Pearson Education.

Detailed Syllabus

- Sets and Functions
- Abstract Group Theory
- Modular Arithmetic, the Groups $(\mathbb{Z}_n, +)$, $(\mathbb{Z}_p, \cdot)$, Fermat's Little Theorem
- Groups of Permutations, Symmetry Groups, Dihedral groups
- Subgroups, Order of a Group, Cyclic Groups, Lagrange's Theorem
- Systems of Simultaneous Linear Equations
- Matrices, Elementary Matrices, Row Reduced Echelon Form
- Determinants
- Vector Spaces, Subspaces, Spanning Sets and Bases, Dimension
- Linear Transformations, Image, Kernel.
- Eigenvalues, Eigenvectors, Matrix Diagonalisation