# Algebra 2

1. **Course number and name:** 020AL2CI3 Algebra 2

2. **Credits and contact hours:** 6 ECTS credits, 3x1:15 contact hours

3. **Name(s) of instructor(s) or course coordinator(s):** Fares Maalouf

4. **Instructional materials**
   a. **Text book:** C. Cochet & X. OUDOT, Maths MP/MP* Vuibert 2022
   b. **Other supplemental materials:** Notes on certain topics from internet sites.

5. **Specific course information**
   a. **Catalog description:**
      This course, a continuation of Algebra 1, explores the advanced study of algebraic structures such as groups, rings, and fields. It includes a detailed examination of endomorphisms, matrix reduction, and special substructures of algebraic structures like ideals. Topics explored include classification of matrices, the computation of eigenvalues and equivalent matrices. With a mix of theoretical understanding and practical applications, students will gain a comprehensive understanding of these mathematical concepts.

   b. **Prerequisites:** 020AL1CI2 Algebra 1

   c. **Required/Selected Elective/Open Elective:** Required

6. **Educational objectives for the course**

   a. **Specific outcomes of instruction:**
      - Identify, manipulate algebraic structures.
      - Characterize substructures and special subsets (ideals, sets of generators, bases).
      - Study and manipulate linear applications.
      - Classify matrices.
      - Compute eigenvalues and eigenvectors.
      - Compute equivalent diagonal or triangular matrix to a given one.

   b. **PIs addressed by the course**:

      | PI | 1.1 |
      |----------|-----|
      | **Covered** | x |
      | **Assessed** | x |

7. **Brief list of topics to be covered**

- Generalities on algebraic structures (2 lectures)
- Group theory, subgroups order of a group finite groups, subgroups, morphisms cyclic groups (8 lectures)
- Rings, ideals, morphisms and applications to number theory and polynomials (8 lectures)
- Morphisms of fields and vector spaces (2 lectures)
- Invariant subspaces and equivalent matrices (6 lectures)
- Eigenvalues and eigenvectors spectrum of an endomorphism (6 lectures)
- Diagonalization and trigonalization applications (10 lectures)