

Discrete Mathematics

1. **Course number and name:** 020MADCI1 Discrete Mathematics
2. **Credits and contact hours:** 6 ECTS credits, 3x1:15 contact hours
3. **Name(s) of instructor(s) or course coordinator(s):** Guilnard Sadaka
4. **Instructional materials:**

Textbook :

- Mathématiques tout-en-un MPSI, R. Mansuy, Vuibert
- Maths, MPSI – MP2I, J-M. Monier, G. Haberer, Dunod
- Supplemental material : pdf course

5. **Specific course information**

- a. **Catalog description:**

Logic and reasoning, Set theory, Applications, Binary relations, Algebraic calculations, Complex numbers, Integer arithmetic, Polynomials.

- b. **Prerequisites:** None

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

6. **Educational objectives for the course**

- a. **Specific outcomes of instruction:**

- Analyze and solve logical problems.
- Understand, read, and write a mathematical proposition using quantifiers.
- Know common logical reasoning.
- Reason well and write clear proofs and problem solutions.
- Manipulate applications and recognize their properties: identify an injective, surjective, and bijective function, determine the inverse of a bijection, find the direct image and inverse image of a set under a function...
- Distinguish an equivalence relation as well as the quotient set.
- Recognize an ordered set and determine its remarkable elements.
- Calculate sums and products.
- Use the binomial theorem.
- Manipulate complex numbers and their algebraic and geometric properties.
- Solve algebraic equations of degree 2.
- Determine the n th roots of a complex number.
- Master the concept of divisibility and its resulting properties.
- Know how to characterize a prime number with respect to Bézout's theorem.
- Calculate a greatest common divisor (GCD) and a Bézout's relation.
- Use prime factorization.
- Manipulate congruence notation and solve congruence equations.

- Perform division of two polynomials.
- Calculate the GCD of polynomials.
- Understand the relationship between GCD and roots.
- Exploit the relations between the coefficients and roots of a polynomial.
- Factorize a polynomial into irreducible factors over the field of real numbers or the field of complex numbers.

b. PI addressed by the course:

PI	1.3
Covered	x
Assessed	x

7. Brief list of topics to be covered

- Logic
- Reasoning
- Set theory
- Applications
- Binary relations
- Algebraic calculations
- Complex numbers
- Integer arithmetic
- Polynomials