Discrete Mathematics

1. **Course number and name:** 020MADNI1 Discrete Mathematics

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

3. **Name(s) of instructor(s) or course coordinator(s):** Tony Nicolas

4. **Instructional materials:** Course handouts, PowerPoint slides

   References: Mathématiques tout-en-un MPSI, C. Deshamps, F. Moulin, A. Warusfel, Dunod 2013

5. **Specific course information**
   a. **Catalog description:**
      Propositional logic - Mathematical reasoning - Sets - Relations – Natural numbers, induction - Applications - Algebraic calculation - Binomial coefficient and Pascal triangle - Polynomials - Arithmetic

   b. **Prerequisites:** None

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

6. **Educational objectives for the course**
   a. **Specific outcomes of instruction:**
      − Analyze and resolve logical problems.
      − Determine a method to proof properties.
      − Recognize applications and their properties.
      − Manipulate and calculate algebraic expressions.
      − Determine the properties of the relationship.
      − Manipulate and make calculations on polynomials.
      − Studying the numbers and their properties.

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

PI	1.3
Covered	x
Assessed	x

7. **Brief list of topics to be covered**
   − Propositional logic: Proposition logic, basic logic, logical connectives, truth tables Notion of proof: proof by implication, converse, inverse, contrapositive, negation, and contradiction, direct proof, proof by using truth table direct reasoning, reasoning by recurrence (10 lectures)

- Universal and existential quantification (4 lectures)
- Sets and Binary relations: properties of relation, equivalence relation, ordering relation (10 lectures)
- Applications: infectivity, subjectivity, one to one, direct image, composition (4 lectures)
- Algebra calculation (3 lectures)
- Polynomials and fractions (4 lectures)
- Arithmetic of integers (2 lectures)