

# MC358: Mathematical Foundations of Computer Science

---

Since 2016.

**Prerequisite:** None.

**Description:**

Basic concepts on discrete mathematics and logic for computing. Proof techniques, mathematical induction. Relations and graph theory concepts. Modeling problems using graphs.

**Programme:**

1. Sets
2. Mathematical speech: mathematical reading and writing
3. Elements of logic:
  - proposition, logical connectives and quantifiers.
4. Proof strategy
5. Mathematical induction
6. Relations
  - restriction, composition and inverse
  - order relation and extreme elements
  - relations and equivalence classes
7. Functions
  - injective, surjective and bijective functions
  - inverse functions
  - sequences
  - floor and ceil functions
8. Summation and productory
  - index manipulation and order change
  - upper and lower bounding summations
9. Recurrences
  - simple additive and multiplicative recurrences
  - linear recurrences and characteristic polynomial
  - upper and lower bounding recurrences
10. Counting
  - basic principles of counting (additive and multiplicative)
  - permutations, arrangements and combinations
  - binomial identities

**Recommended Literature:**

- I. A. Gomide e J. Stolfi, Elementos de Matemática Discreta para a Computação <http://www.ic.unicamp.br/~anamaria/>
- II. D. J. Velleman, How to prove it - A structured approach (2nd edition), Cambridge (2006)
- III. K. H. Rosen, Discrete Mathematics and its applications (7th edition), McGraw-Hill (2011)
- IV. J. L. Gersting, Fundamentos Matemáticos para a Ciência da Computação (5th edition in portuguese), LTC Editora (2004)
- V. M. Ben-Ari, Mathematical Logic for Computer Science (3rd edition), Springer (2012)