

## Syllabus

August 31, 2023

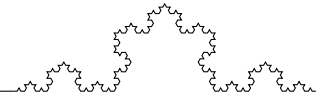
**Lecturer:** Prof. dr.hab. Viorel Bostan  
**E-mail address:** viorel.bostan@adm.utm.md  
**Lecture hall:** 3–3 Amdaris Auditorium  
**Lecture hours:** F 9:45–11:15  
**ECTS credits:** 5  
**Course web page:** on platform `else.fcim.utm.md`  
**Office:** 3–204  
**Office hours:** Monday 18:00 online on MS TEAMS  
**Prerequisites:** High school mathematics.

**Course outline.** This is a fast-paced course. This course gives an introduction to Mathematics used in Computer Science and not only. We will cover topics from Set Theory, Mathematical Logic, Number theory, Graph Theory, Boolean Functions, Computability Theory. On completion of this course, you will understand and have the ability to apply the general methods of Mathematics (mostly discrete) in Computer Science. You will be able to use these methods in next courses such as Design and Analysis of Algorithms, Computer Architecture, Formal Languages and Compilers, Information Security, Databases, Software Engineering, Computer Networks and Systems, and many others.

**Course Objectives.** There are 3 main objectives and 9 specific learning outcomes.

- O1.** Reason mathematically about basic data types and structures (such as numbers, sets, functions, relations, graphs, trees) used in computer algorithms and systems; distinguish mathematical rigorousness; synthesize proofs.
- O2.** Model and analyze computational processes (and algorithms) using analytic methods.
- O3.** Understand ideas underlying theoretical Computer Science such as recursive data types, structural induction and computation models.
- LO1.** Use logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, and integers.
- LO2.** Evaluate elementary mathematical arguments and identify wrong reasoning.
- LO3.** Synthesize induction hypotheses and simple induction proofs.
- LO4.** Prove elementary properties of number theory and explain its applications in cryptography and cybersecurity.
- LO5.** Apply graph theory models of data structures to solve problems such as connectivity, minimal spanning trees, shortest routes, flow networks, scheduling etc.
- LO6.** Apply the method of invariants and well-founded ordering to prove correctness and termination of processes.
- LO7.** Minimize boolean functions and optimize logic expressions.
- LO8.** Problem solving with required mathematical rigorousness.
- LO9.** Construct recursive data types and use structural induction.

**Class procedure.** The majority of each class period will be lecture oriented. Suggested and required reading as well as homeworks and lecture slides will be posted on course page. I strongly advise to attend lectures, seminars and labs, do your homework, work consistently, and ask questions. Lecture time is at premium; you cannot be taught everything in class. **It is your responsibility to learn the material**, the instructor's job is to guide you in your learning. As a general rule, you will find it necessary to spend approximately 2-3 hours of study



for each lecture meeting, and additional time will be needed for HWs and exams preparation. **It is strongly advised that you start working on this course from the very beginning.** The importance of doing the assigned homework cannot be over emphasized.

**Grading policy.** The final grade will be based on weekly tests, 3 exams, homework and seminar participation as follows:

1. There will be two 1-hour written midterm exams given after 7, and respectively 12 weeks of classes at a time arranged later. These exams will count each 15% of the final course grade.
2. The final 2-hour comprehensive exam will be given during the scheduled examination time at the end of the semester, it will cover all of the material, and it will count 40%.
3. HW and test grades will count 15%.
4. Lab grades will count 15%.

**NOTICE.** Late homework submissions are not accepted!

**Exams.** The exams will be closed notes, i.e. you will not be allowed to use your class notes or any other materials. It is very important that you take the examinations at the scheduled times. Alternate exams will be scheduled only in exceptional circumstances.

**Quizzes.** There will be given 7-8 multiple choice quizzes in the first 10–15 minutes of the class. **Don't be late!** Quizzes will cover previous lectures. For each question there will be allocated 0.5–1min. Each question will have four possible answers with only one answer being correct and/or complete. For each correct answer you get +1 pt, incomplete or wrong answers are worth 0 pt.

**Homework.** There will be given up to 10 homeworks. Work on them individually. Show your work! In case you got assistance from someone else, you should mention it. The HW will be graded on a scale from 0 to 4 with a possibility of getting extra bonus point at each homework. Grades will be given according to the following guidelines: 0 – no homework turned in; 1 – poor lousy job; 2 – incomplete job; 3 – good job; 4 – very good job. Also, an additional bonus +1 point will be given for bonus problems.

**NOTICE 1.** The smallest HW grade and quiz grade will be dropped at the end of semester.

**NOTICE 2.** In order to be admitted to the final exam, the grades for midterm, HWs and Labs should be 5 or higher!

**Collaboration.** I encourage you to discuss homeworks. Studying together is a good idea to learn, but you must write up solutions on your own, neither copying solutions nor providing solutions to be copied. If you do collaborate on individual homeworks or projects (exceptions are possible in case of team projects), you must mention in your written solutions and reports, all of your collaborators. Do not be neither a “free rider” nor a “free rider” provider. (“Free rider” = individuals who are allowed to consume more than their fair share of the shared resource or pay less than their fair share of the costs).

**Academic misconduct.** Any kinds of academic misconduct (such as cheating, plagiarism or other non-ethical behavior) will not be tolerated. If a situation arises where you and your instructor disagree on some matter and cannot resolve the issue, you should see the Program Coordinator or the Dean. However, any problems concerning the course should be first discussed with your instructor (Me!).